

Submittal of Conditional Use Permit Application and Supporting Documents

for

WestWater Farms Production Water Recycling Facility
Westwater, Utah

November 24, 2010 Project No.: 4422.001(10)

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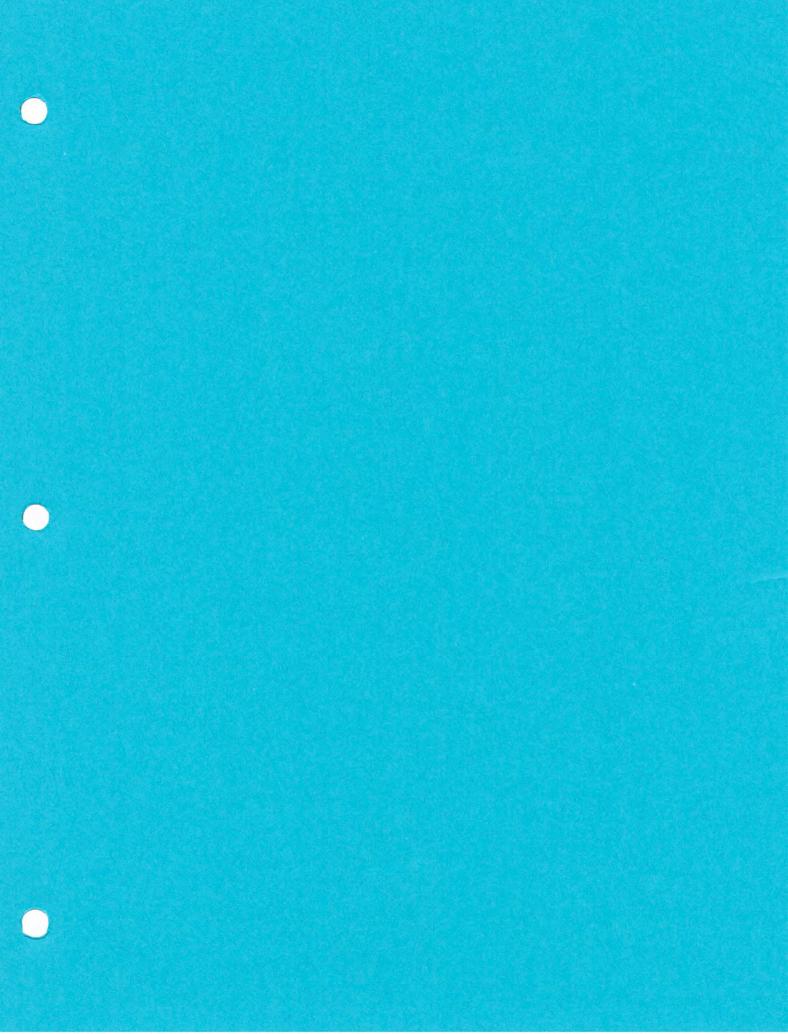
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CONDITIONAL USE APPLICATION

Grand County Courthouse: 125 E. Center St. Moab, UT 84532; Phone: (435)259-1371

FOR OFFICE USE ONLY			
Date of Submittal:			
Submittal Received by:	Amount Paid:	Fees Received by:	
CONTACT INFORMATION			
Property owner: WestWater Fa	rms, LLC and ER & PWD Joint \	/enture, LLC	
Address: P.O. Box 324, Cisco, Ut	ah 84515		
Phone: 970-513-8034	cell: _720-938	-3950 fax: 970-513-1648	
Email address: tomwarnes53@m	sn.com		
Engineer: David R. Stewart, P.E.,	Stewart Environmental Consulta	ants, LLC	
Address: 3801 Automation Way, S	Suite 200, Fort Collins, Colorado	80525	
CALL CONTRACTOR OF THE PARTY OF		80525 fax: <u>970-226-4946</u>	
The state of the s	cell:		
Phone: 970-226-5500 ext. 204 Email address: dave.stewart@st	cell:tewartenv.com	fax: <u>970-226-4946</u>	
Phone: 970-226-5500 ext. 204 Email address: dave.stewart@st	cell:tewartenv.com	fax: <u>970-226-4946</u>	
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Phone: 970-226-5500 ext. 204 Email address: dave.stewart@st Property owner representati Address: P.O. Box 324, Cisco, Ut	cell:tewartenv.com ive: _Tom Warnes, WestWater F ah 84515	fax: <u>970-226-4946</u>	
Phone: 970-226-5500 ext. 204 Email address: dave.stewart@st Property owner representati Address: P.O. Box 324, Cisco, Ut	cell:tewartenv.com ive: _Tom Warnes, WestWater F ah 84515cell: _720-938-3950	fax: <u>970-226-4946</u> Farms, LLC	
Phone: 970-226-5500 ext. 204 Email address: dave.stewart@si Property owner representati Address: P.O. Box 324, Cisco, Ut Phone: 970-406-1466	cell:tewartenv.com ive: _Tom Warnes, WestWater F ah 84515cell: _720-938-3950	fax: <u>970-226-4946</u> Farms, LLC	
Phone: 970-226-5500 ext. 204 Email address: dave.stewart@si Property owner representati Address: P.O. Box 324, Cisco, Ut Phone: 970-406-1466	cell:tewartenv.com ive: _Tom Warnes, WestWater F ah 84515cell: _720-938-3950	fax: <u>970-226-4946</u> Farms, LLC	
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Conditional Use Permit applications shall contain, at a minimum, the following supporting materials through the approval process according to the following submittal schedule:

1. <u>APPLICATION SUBMISSION.</u> Two complete sets (with the exception of the title report and fee) of all supporting materials shall be submitted with this application. These complete sets

- should include two large (24" x 36") and two small (11" x 17") sets of all plans.
- 2. PRIOR TO MEETING. Three (3) revised sets of large (24" x 36") and fourteen (14) small (11" x 17") plans shall be submitted prior to the application being placed on a Planning Commission /County Council meeting.
- 3. <u>POST MEETING.</u> If the revised sets of plans are not approved as submitted two corrected sets of plans both large and small shall be submitted that comply with the Planning Commission's approval.

Site Plan (& Survey if applicable). The applicant shall submit a site plan (and certified survey if applicable) of the proposed land area. The site plan shall require, at a minimum, the following information:

- 1. Subject land area acreage;
- 2. Adjacent uses and predominant uses in the vicinity;
- 3. Existing zoning designation within 100 feet of the exterior boundary of the parcel;
- 4. A vicinity map;
- 5. Drives, streets, and rights-of-way;
- 6. Easements:
- 7. Location and dimensions of structures and signs;
- 8. Typical elevations of such buildings;
- 9. Access ways, including points of ingress, egress;
- 10. Landscaping;
- 11. Topography; and
- 12. Specific areas proposed for specific types of land use.

Applicant Statement. A statement by the Applicant <u>explaining the rationale for the conditional use request</u> relative to the Conditional Use Criteria imposed by Sec 9.11.6 (Grand County LUC). In making its determination, the County Council shall consider the recommendation of the Planning Commission, staff reports, and the written and oral testimony presented, and the following criteria:

Sec. 9.11.6 Conditional Use Criteria:

A. Effect on Environment

The location, size, design and operation characteristics of the proposed use shall not be detrimental to the health, welfare, and safety of the surrounding neighborhood or its occupants, nor be substantially or permanently injurious to neighboring property, nor cause substantial or permanent interference with the right to peaceful enjoyment of property.

B. Compatible with Surrounding Area

The proposed site plan, circulation plan and schematic architectural designs shall be complementary with the character of the surrounding area with relationship to scale, height, landscaping and screening, building coverage, and density.

C. External Impacts Minimized

The proposed use shall not have negative impacts on existing uses in the area and in the county through the creation of noise, glare, fumes and odors, dust, smoke, vibration, fire hazard, excessive light, or other injurious or noxious impact. The applicant shall provide adequate mitigation responses to these impacts.

D. Infrastructure Impacts Minimized

The proposed use shall not have negative impacts on existing uses in the area and in the county through impacts on public infrastructure such as roads, parking facilities and water and sewer systems, and on public services such as police and fire protection and solid waste collection, and the ability of existing infrastructure and services to provide services adequately.

E. Consistent with LUC and General Plan

The proposed use will be consistent with the purposes of this LUC, the General Plan, and any other statutes, ordinances or policies that may be applicable, and will support rather than interfere with the uses otherwise permitted in the zone in which it is located.

F. Parcel Size

The proposed use may be required to have additional land area, in excess of the lot area otherwise allowed by the underlying zoning district, as necessary to ensure adequate mitigation of impacts on surrounding land uses and the zoning district.

☑Title Report. A preliminary title report from a licensed title company or attorney listing the name of the property owner(s) and all liens, easements and judgments of record affecting the subject property, and of the preliminary plat.

☑ Taxes. A statement from the County treasurer showing the status of all current taxes due on the parcel.

☑Posting. The applicant is responsible for posting a sign noticing the public hearings (please see attached for a reduced size template and requirements). The applicant is responsible for wind and water proofing the sign as well as placing it in a prominent place on the land area proposed for subdivision with a notice of the hearing at least 10 days prior to the public hearings.

Please note, we submitted the fee with our first application on September 22, 2010.

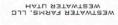
☑ Operating Data & Evaluation. Any and all information, operating data and expert evaluation necessary to clearly explain the location, function and characteristics of any building or use proposed;

APPLICANT CERTIFICATION

I certify under penalty of perjury that this application and all information submitted as a part of this application are true, complete and accurate to the best of my knowledge. I also certify that I am the owner of the subject property and that the authorized agent noted in this application has my consent to represent me with respect to this application. Should any of the information or representations submitted in connection with this application be incorrect or untrue, I understand that Grand County may rescind any approval, or take any other legal or appropriate action. I also acknowledge that I have reviewed the applicable sections of the Grand County Land Use Code and that items and checklists contained in this application are basic and minimum requirements only and that other requirements may be imposed that are unique to individual projects or uses. Additionally, I have reviewed and understand the section from the Consolidated Fee Schedule and hereby agree to comply with this resolution. I also agree to allow the Staff, Planning Commission, or County Council or appointed agent(s) of the County to enter the subject property to make any necessary inspections thereof.

Property Owner's Signature:	Eom haines	Date:11/24/10	_

WESTWATER FARMS PRODUCTION WATER RECYCLE FACILITY



COVER SHEET WESTWATER FARMS PRODUCTION
WATER RECYCLE FACILITY WESTWATER FARMS, LLC

4422.001 TO CONCORD

0-0



CONDITIONAL USE APPLICATION

NOVEMBER 2010

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0

0

PROJECT SITE

WESTWATER FARMS, LLC POST OFFICE BOX 324

STEWART ENVIRONMENTAL CONSULTANTS, INC

VICINITY MAP

SHEET INDEX

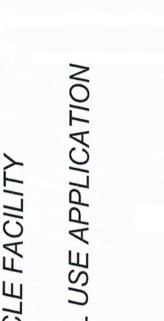
COVER SHEET SITE PLAN 35225 45

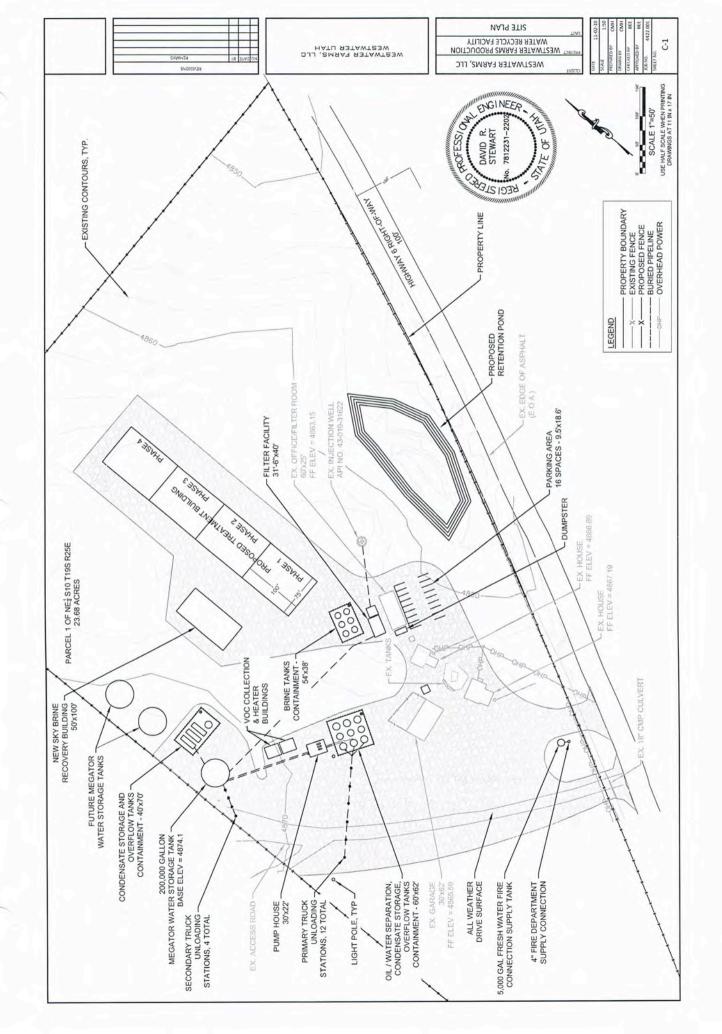
CIVIL DETAILS LANDSCAPE PLAN DRAINAGE PLAN

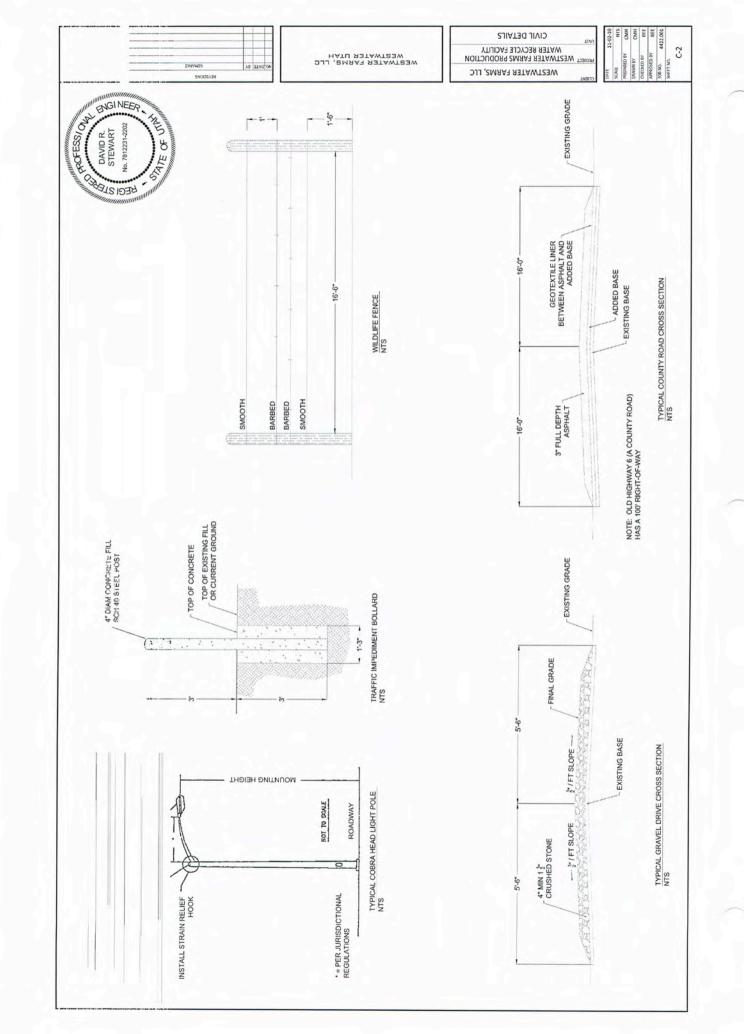
LEAK DETECTION SYSTEM

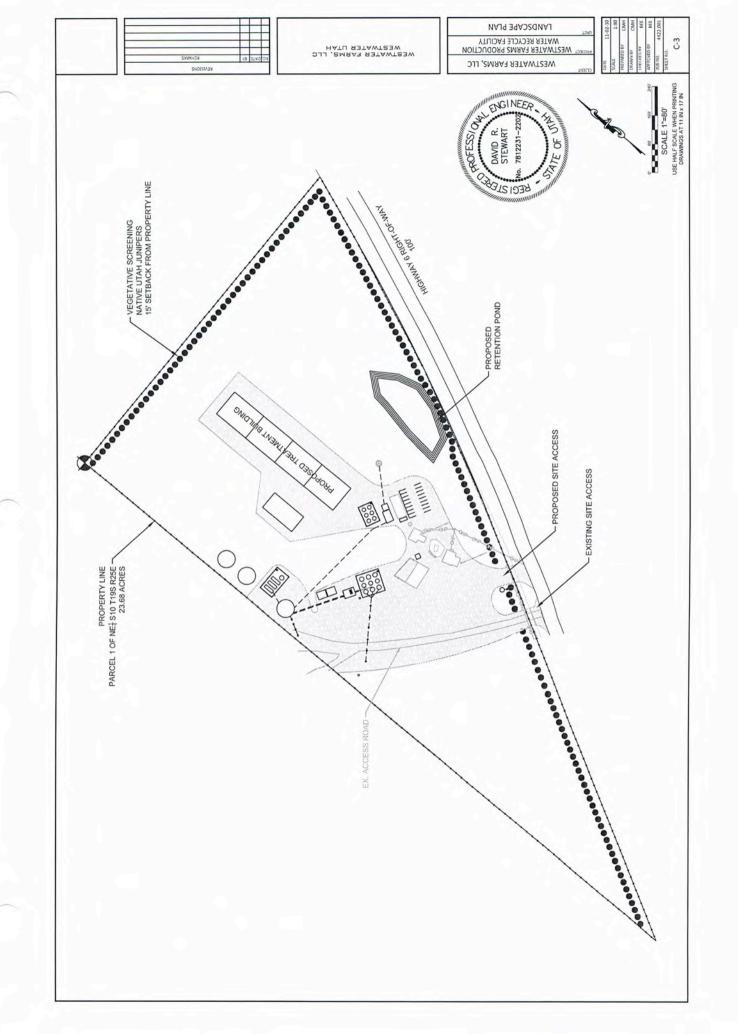
(970) 406-1466 CONTACT: TOM WARNES CISCO, UTAH 84515

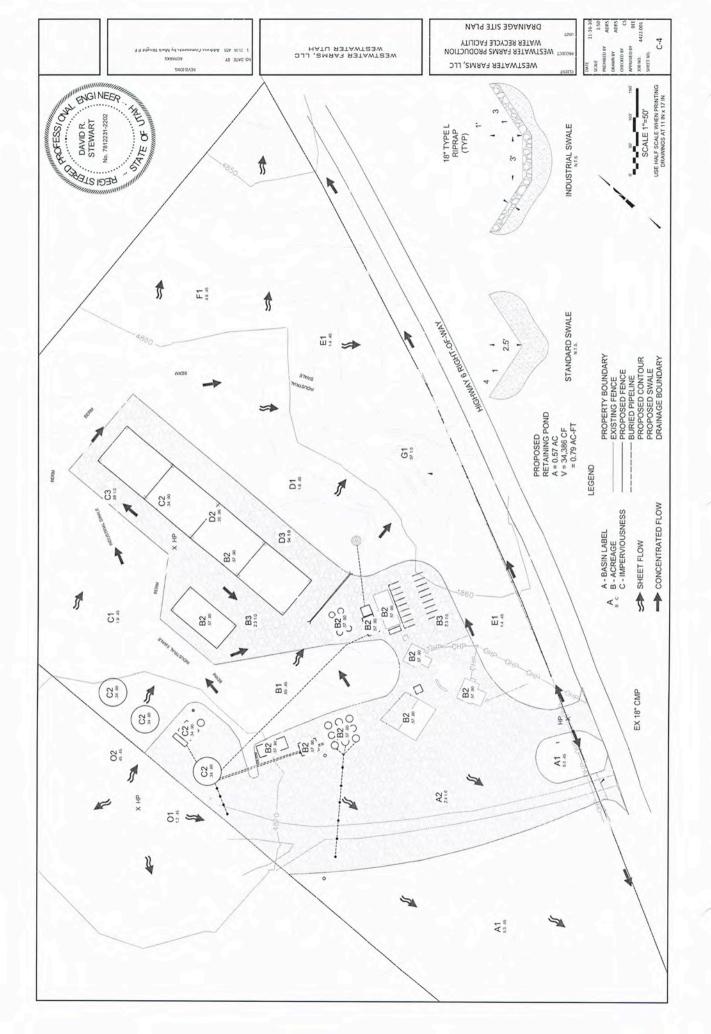
3801 AUTOMATION WAY, SUITE 200 (970) 226-5500 CONTACT: BRAD EATON, P.E. FORT COLLINS, CO 80525

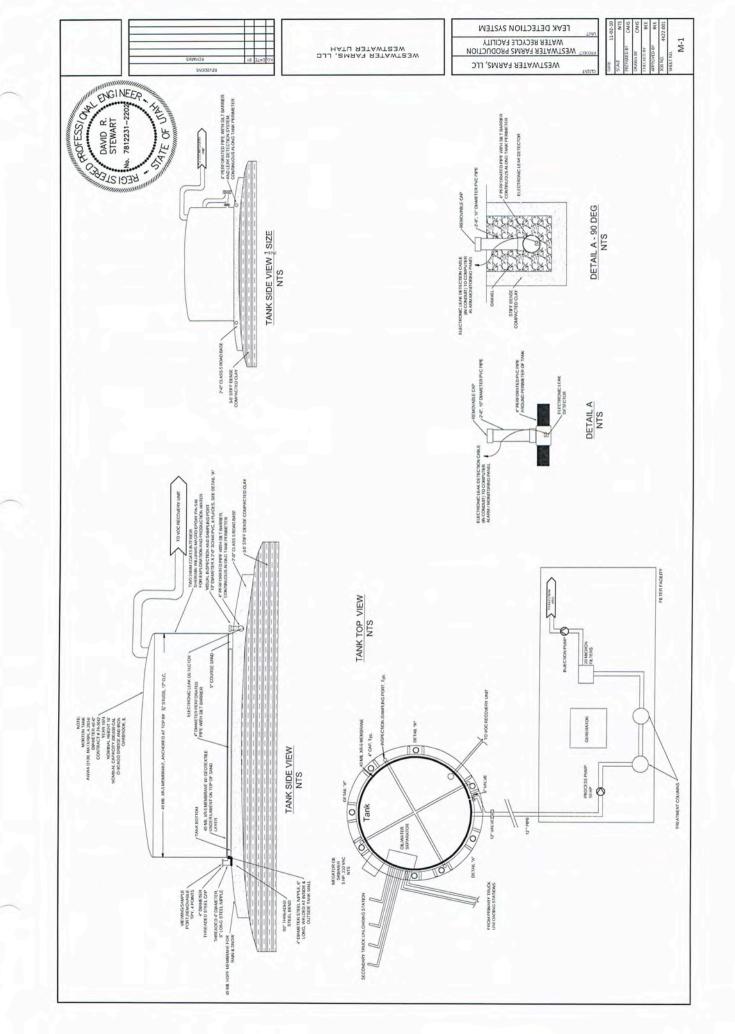












WESTWATER FARMS RECYCLING FACILITY

APPLICANT STATEMENT

The following is a statement by WestWater Farms, LLC, explaining the rationale behind the conditional use request relative to the conditional use criteria as imposed by Section 9.11.6 of the Grand County Land Use Code (LUC) and Grand County Ordinance 490, 2010. The WestWater Farms Recycling Facility is located at 100 West Highway 6 in Westwater, Utah. The project is to consist of treating, injecting, and discharging produced water from gas and oil wells within the area. Please see the attached Project Summary for further information.

Section 9.11.6 of the LUC requires the following criteria be met for approval: effect on environment, compatible with surrounding area, external impacts, infrastructure impacts, consistency with the land use code and general plan, and the parcel size. Please see our explanations below for each criterion:

A. Effect on Environment

The location of the site is completely surrounded by Bureau of Land Management land. Therefore the location, size, design, and operational characteristics should not be detrimental to the health, welfare, and safety of the surrounding environment or its occupants. The site will not be injurious to neighboring property, nor cause substantial or permanent interference with the right to peaceful enjoyment of property.

B. Compatible with Surrounding Area

The proposed site plan mimics the curvature of the land to complement the characteristics of the surrounding area. The site plan creates a relationship with the proposed site to the scale, height, landscaping, screening, building coverage, and density of the existing site.

C. External Impacts Minimized

The proposed system is a completely closed system with a recovery system for volatile organic compounds. The end product will be a viable water source with the potential for either resale or irrigation on the property. The system has an in-place fire prevention plan and will mitigate dust created by trucks on and off the site.

D. Infrastructure Impacts Minimized

The proposed site shall not have negative impacts on the surrounding infrastructures. The proposed site will actually improve the surrounding roads and parking facilities. The proposed site will enable the existing infrastructure and services to be provided with better protection and easier access to the site.

E. Consistent with LUC and General Plan

The proposed system is consistent with the purposes of the land use code and its subsequent statutes, ordinances, and/or policies that are applicable to the site. The system will support and help the surrounding area. The system is located within a zoning area adequate for its industry.

F. Parcel Size

The	proposed	system	is 1	located	within	a	large are	ea c	of lan	d that	should	be	adequate	to	mitigate
anv	impact of	the surre	oun	iding la	nd uses	aı	nd zonin	g di	stricts	S.					

WESTWATER FARMS RECYCLING FACILITY

PROJECT SUMMARY

The proposed WestWater Farms Production Water Recycling Facility, to be located near Westwater, Utah, will be a state-of-the-art produced water recycling facility capable of treating a minimum of 15,000 barrels (bbls) per day of produced water for beneficial reuse as irrigation, augmentation, or frac make-up water. There will be a single injection well located on the site and operated under an Underground Injection Control (UIC) permit issued by the State of Utah. Initially, the facility will be set up to receive produced water from oil and gas operations, which will be treated to meet the UIC permit parameters for re-injection. During this initial phase, the produced water will be treated to meet the UIC permit requirements and then injected; no water will be directly discharged during this initial phase.

This first phase of the project is critical to generating cash flow for funding the remainder of the project, which will consist of a state-of-the-art treatment system for recovering as much of the produced water as possible for beneficial uses including irrigation, augmentation, and frac water. The treatment process will then be built in stages, with the first stage of the facility consisting of a complete treatment facility designed to recover oil, water, and a byproduct brine. The goal of the process will be to recover as much water and oil as possible, which will minimize the amount of brine that will be re-injected by the injection well located on site; eventually, the plant will be retrofitted to recover and treat the byproduct brine, which will produce additional economically viable products in the form of an acid (hydrochloric acid) and base (sodium carbonate). The first stage of the treatment system will be designed to treat 15,000 bbls of produced water per day from both oil and gas wells local to the Harley Dome area. All water will be trucked to the site and stored in large holding tanks for processing. There will be several buildings on the site to house equipment associated with the process. The majority of process equipment will be housed inside one large building, which is shown on the site plan as the "proposed treatment building."

The produced water will be delivered to the site by trucks and offloaded at an unloading station designed to service up to 12 trucks simultaneously. Adjacent to the truck unloading area will be a series of nine tanks designed to separate oil from water using a "gunbarrel" arrangement within the tanks. The recovered oil will be pumped up to the oil collection tank on the west side of the property. Water from the gunbarrel tanks will be pumped into one of three large holding tanks located on the west boundary of the site; the storage tanks vary in size from 200,000 to 400,000 gallons each, for a total storage capacity of one million gallons. These storage tanks will use a Megator skimmer system for recovering the residual oil that is not recovered in the gunbarrel tanks; again, the recovered oil will be sent to the oil collection tank and held for sale. From the Megator tanks, the produced water will be pumped to the treatment plant. Once the treatment plant is installed (anticipated January 2011), the majority of the water received will be sent through the treatment process. Only water that is not suitable for treatment (such as flowback water) will be sent directly to injection; byproducts from the treatment process, such as the brine stream from the reverse osmosis system, will also be injected. Prior to injection, all water will be treated to meet UIC permit requirements.

The treatment process is proprietary and confidential, so the overall goals and parameters of the process are discussed here, but specific design parameters are not disclosed. The intent of the produced water treatment is to recover as much water and oil as possible. The produced water is considered non-tributary; therefore, it is considered a new water resource to whichever watershed it is discharged within, and the water rights have economic value. The treatment process will be robust enough to handle varying water quality and many processes will have redundant equipment to ensure 24/7 operation. The basic process train will incorporate processes to: recover oil, remove solids, organics, and dissolved metals, and reduce the salt concentration of the final effluent. There will be several qualities of water created, from basic frac water (with salt concentrations of 12,000 to 15,000 parts per million) to very clean water (with salt concentrations less than 500 parts per million) for direct discharge under a National Pollutant Discharge Elimination System permit. The plant will be highly automated and detailed record keeping will be employed to ensure consistent operation, which will comply with all permit requirements for re-injection and direct discharge.

SOUTH EASTERN UTAH TITLE COMPANY

(SEUTCO)

150 East 100 North, P.O. Box 700 Moab, Utah 84532

Phone: (435) 259-7635 Fax: (435) 259-7637

ORDER NO. 56,967-G

SUMMIT ENERGY COMPANIES C/O DAVE KNUDSON 1441 W UTE BLVD STE 280 PARK CITY, UTAH 84098

Enclosed is the Commitment for Title Insurance that you ordered. If the sale or loan carries through to completion, the fee for this title commitment is absorbed into, and is a part of the insurance issued at closing.

If the sale or loan fails, or if title insurance will not be needed, Utah State Law requires that South Eastern Utah Title Company collect a cancellation fee of \$300.00. (+\$50.00 each additional parcel=\$450.00) If no title insurance will be issued, please consider this note as the billing for the cancellation fee, and send the fee to the Moab office listed above.

If there are any items that need clarification or further explanation, please contact the office listed above.

If you need to send documents for recording or for closing via UPS or FEDEX, please send them to the street address listed above, or you can email closing documents to: joeline@southeasttitle.com or chad@southeasttitle.com.

Thank you for allowing South Eastern Utah Title Company to become part of your transaction, we appreciate your business.

Form No. 1402.06 Owners Form No. 1056.06 Lenders ALTA Commitment (6-17-06)

SCHEDULE A

Commitment No. 56,967- G

FIRST AMERICAN TITLE INSURANCE AGENCY Policy or Policies to be issued:

Lenders: \$200,000.00 Standard Policy Fee: \$762.00 (best available rate)

Additional 20% premium due to Broken Priority: \$153.00

Effective Date: September 7, 2010 at 8:00 A.M.

1. Proposed Insured:

Lender SUMMIT ENERGY COMPANIES

2. Fee Simple interest in the surface estate described in this Commitment is owned, at the Commitment Date by:

PARCEL 1:

ER & PWD Joint Venture, LLC, a Delaware Limited Liability Company

PARCELS 2, 3 & 4: WESTWATER FARMS, LLC, a Utah Limited Liability Company

3. The land referred to in this Commitment is situated in the State of Utah, County of Grand and is described as follows:

PARCEL 1: A PARCEL OF LAND IN THE NE1/4 SECTION 10, T19S, R25E, SLM, GRAND COUNTY, UTAH, MORE PARTICULARLY DESCRIBED AS FOLLOWS:
BEGINNING AT THE NORTH 1/4 CORNER SECTION 10, T19S, R25E, SLM, AND PROCEEDING THENCE WITH THE NORTH LINE OF SAID SECTION 10 N 89 DEG. 35'55"E 980.20 FT. TO THE WESTERLY R-O-W OF OLD HIGHWAY 6 & 50, THENCE WITH SAID R-O-W THE FOLLOWING THREE COURSES: S 20 DEG. 25'50"W 194.41 FT., THENCE ALONG THE ARC OF A 5668.54 FT. RADIUS CURVE TO THE RIGHT 770.54 FT. (SAID CURVE HAS A CHORD WHICH BEARS S 24 DEG. 19'29"W 769.95 FT.), THENCE S 28 DEG. 12'47"W 1253.90 FT. TO THE WEST LINE NE1/4 SAID SECTION 10, THENCE WITH SAID LINE N 00 DEG. 04'49"W 1980.64 FT. TO THE POINT OF BEGINNING.

Tax Serial No.: 04-0025-0096 Property Address: none assigned PARCEL 2: ALSO: A PARCEL OF LAND IN THE NE1/4 SECTION 10, T19S, R25E, SLM, GRAND COUNTY, UTAH, MORE PARTICULARLY DESCRIBED AS FOLLOWS:

BEGINNING AT A POINT ON THE NORTH LINE OF SECTION 10, SAID POINT BEARS S 89 DEG. 35'55"W 221.03 FT. FROM THE NE CORNER OF SECTION 10, T19S, R25E, SLM, AND PROCEEDING THENCE WITH THE NW R-O-W OF 1-70 THE FOLLOWING THREE COURSES: S 43 DEG. 05'21"W 246.54 FT., THENCE S 43 DEG. 03'35"W 130.61 FT., THENCE S 38 DEG. 00'02"W 227.35 FT., THENCE WITH THE NORTH R-O-W OF THE 1-70 TO OLD HWY. 6 & 50 CONNECTOR ROAD ALONG THE ARC OF A 1195.92 FT. RADIUS CURVE TO THE LEFT 490.35 FT. (SAID CURVE HAS A CHORD WHICH BEARS N 64 DEG. 01'07" W 486.93 FT.), THENCE WITH SAID R-O-W N 75 DEG. 45'54"W 568.37 FT. TO THE EASTERLY R-O-W OF OLD HWY 6 & 50. THENCE WITH SAID R-O-W N 20 DEG. 25'50"E 98.27 FT. TO THE NORTH LINE OF SAID SECTION 10, THENCE WITH SAID LINE N 89 DEG. 35'55"E 1351.93 FT. TO THE POINT OF BEGINNING.

Tax Serial No.: 04-0025-0095 Property Address: none assigned

ALSO: A PARCEL OF LAND IN THE NEI/4 SECTION 10, T19S, R25E, SLM, GRAND COUNTY. UTAH, MORE PARTICULARLY DESCRIBED AS FOLLOWS: BEGINNING AT THE CENTER 1/4 CORNER SECTION 10, T19S, R25E, SLM, AND PROCEEDING THENCE WITH THE WEST LINE NE1/4 SAID SECTION 10, N 00 DEG. 04'49" W 452.99 FT. TO THE EASTERLY R-O-W OF OLD HWY. 6 & 50, THENCE WITH SAID R-O-W THE FOLLOWING THREE COURSES: N 28 DEG. 13'08"E 1438.54. FT., THENCE ALONG THE ARC OF A 5768.54 FT. RADIUS CURVE TO THE LEFT 784.13 FT. (SAID CURVE HAS A CHORD WHICH BEARS N 24 DEG. 19'29"E 783.53 FT.), THENCE N 20 DEG. 25'50"E 34.13 FT., THENCE WITH THE SOUTH R-O-W OF THE OLD 6 & 50 TO 1-70 CONNECTOR ROAD THE FOLLOWING TWO COURSES: S 75 DEG. 45'54"E 579.11 FT., THENCE ALONG THE ARC OF A 1095.92 FT. RADIUS CURVE TO THE RIGHT 448.39 FT. (SAID CURVE HAS A CHORD WHICH BEARS S 64 DEG. 02'38" E 445.27 FT.) TO THE NW R-O-W OF 1-70, THENCE WITH SAID R-O-W THE FOLLOWING FOUR COURSES: S 30 DEG. 30'32"W 995.77 FT., THENCE S 37 DEG. 08'56" W 482.03 FT., THENCE ALONG THE ARC OF A 22718.31 FT. RADIUS CURVE TO THE RIGHT 1005.66 FT. (SAID CURVE HAS A CHORD WHICH BEARS S 41 DEG. 35'19"W 1005.58 FT.), THENCE S 43 DEG. 18'11"W 182.85 FT. TO THE SOUTH LINE NE1/4 SAID SECTION 10, THENCE WITH SAID LINE S 89 DEG. 43'27"W 387.36 FT. TO THE POINT OF BEGINNING.

Tax Serial No.: 04-0025-0097 Property Address: none assigned

PARCEL 4: A PARCEL OF LAND IN THE NEI/4 SECTION 10, T19S, R25E, SLM, GRAND COUNTY. UTAH, MORE PARTICULARLY DESCRIBED AS FOLLOWS:
BEGINNING AT A CORNER ON THE EAST LINE OF THE NEI/4 OF SECTION 10, SAID CORNER BEARS N 00 DEG. 01'42"E 1101.79 FT. FROM THE EAST 1/4 CORNER SECTION 10, T19S, R25E, SLM, AND PROCEEDING THENCE S 30 DEG.03'32" W 1276.55 FT. TO A CORNER, THENCE WITH THE SOUTH LINE OF THE NEI/4 OF SAID SECTION 10, S 89 DEG. 43'27" W 700.85 FT. TO THE SOUTHERLY R-O-W INTERSTATE 70. THENCE WITH SAID R-O-W N 48 DEG. 34'01"E 1787.70 FT. TO A CORNER ON THE EAST LINE OF THE NEI/4 SAID SECTION 10, THENCE WITH SAID LINE S 00 DEG. 01'42"W 74.76 FT TO THE POINT OF BEGINNING.

Tax Serial No.: 04-0025-0094 Property Address: 04-0025-0094

SCHEDULE B - Section 1

Requirements

The following requirements must be met:

- (a) Pay the agreed amounts for the interest in the land and/or the mortgage to be insured.
- (b) Pay us the premiums, fees and charges for the policy.
- (c) Documents satisfactory to us creating the interest in the land and/or the mortgage to be insured must be signed, delivered and recorded.
- (d) You must tell in writing the names of anyone not referred to in this commitment who will get an interest in the land or who will make a loan on the land. We may then make additional requirements or exceptions.
- (e) Release(s) or Reconveyance(s) of item(s): #19, 22 & 23
- (f) Other: #9 Taxes to be paid, plus interest, penalty and costs on parcel 1
- (g) You must give us the following information:
 - 1. Any off record leases, surveys, etc.
 - 2. Statement(s) of identity, all parties
 - 3. Other: #24 The following will be required to delete Materialman's and Mechanics Liens exception:
 - a) Certificate of Occupancy
 - b) Lien wavers are required from the Builder
 - c) Lien wavers are required from all Subcontractors
 - d) Borrowers financials
 - e) Mechanic's Liens Indemnity Agreement from Borrower
 - f) Underwriter approval.

Order No. 56,967- G ALTA Commitment (6-17-06)

SCHEDULE B - Section 2

Exceptions From Coverage

This policy does not insure against loss or damage (and the company will not pay costs, attorneys' fees or expenses) that arise by reason of:

PART 1:

- 1. The lien of real estate taxes or assessments imposed on the title by a governmental authority that are not shown as existing liens in the records of any taxing authority that levies taxes or assessments on real property or in the public records.
- 2. Any facts, rights, interests, or claims that are not shown in the public records but that could be ascertained by an inspection of the land or by making inquiry of persons in possession of the land.
- 3. Easements, claims or easement or encumbrances that are not shown in the public records.
- 4. Any encroachment, encumbrance, violation, variation, or adverse circumstance affecting the title including discrepancies, conflicts in boundary lines, shortage in area, or any other facts that would be disclosed by an accurate and complete land survey of the land, and that are not shown in the public records.
- 5. Unpatented mining claims; reservations or exceptions in patents or in acts authorizing the issuance thereof; Claim, right, title or interest to water or water rights whether or not shown by public records.
- 6. Any lien, or right to a lien, for services, labor or material theretofore or hereafter furnished, imposed by law and not shown in the public records.
- 7. Defects, liens, encumbrances, adverse claims or other matters, if any created, first appearing in the public records or attaching subsequent to the effective date hereof but prior to the date the proposed insured acquires of record for value the estate or interest or mortgage thereon covered by this commitment.

The above numbered exceptions: 1 -7 will be eliminated in an ALTA Extended Coverage Policy or Lenders coverage policy.

Order No. 56,967- G

ALTA Commitment (6-17-06)

8. General and Real Property Taxes for the year 2010 are now accumulating, not yet due. Plus any other Assessments including but not limited to Special Service Districts and Personal property Taxes. Claim, right, title or interest to water or water rights whether or not shown by the public records. The taxes for the year 2009 were paid in the amount of \$27.30 on parcel 2 AND in the amount of \$853.90 on parcel 3 AND in the amount of \$32.77 on parcel 4.

Tax Serial No. 04-025-0096; 04-025-0095; 04-025-0097 AND 04-025-0094

9. Sales to Grand County for unpaid taxes as follows, plus interest, penalty and costs:

Parcel #:	TAX #:	YEAR:	AMOUNT:
Parcel 1	04-0025-0096	2009	\$77.50

- 10. Said land is located within the boundaries of Grand County, and may be subject to taxes or assessments levied by said (District).
- 11. Subject to any rights, title or interests in minerals of any kind, together with any associated rights to mine or remove said minerals. Title Company does not purport to disclose documents of record pertaining to the above referenced rights.
- 12. Easements and Rights of Ways for roads, ditches, canals, tunnels fence lines, pipelines and pole lines which may be established on said property including but to limited to any portion located within I-70 Right of Way. Highway 6 & 50 and Frontage Roads.
- 13. A Right of Way Contract recorded July 15, 1955, in Book 6Q at page 154. (Affects: the NE1/4 of Section 10, T19S, R25E, SLBM).
- 14. An Order of Immediate Occupancy, filed in the Seventh District court, Civil No. 3172, State of Utah by and through its Road Commission, Plaintiff vs Emmett Elizondo, a single man, Defendant, for Highway Project No. I-70-4(10)226, recorded Sept. 9, 1971 in Book 191 at page 595, and Final Order of Condemnation, recorded September 6, 1972 in Book 199 at page 1.
- 15. A Grant of Easement recorded March 28, 1980 in Book 305 at page 593, (Affects: the NE1/4 of Section 10, T19S, R25E, SLBM).
- 16. A Grant of Easement recorded Nov. 22, 1993 in Book 458 at page 181, (Affects: the SE1/4NE1/4, Section 10, T19S, R25E, SLBM), excepting a tract of land deeded to Mid-America Pipeline Company in Book 449 at page 537.
- 17. An access easement recorded March 10, 1993 in Book 449 at page 537.
- 18. Subject to the General Warranty Deed and Grant of Easements, recorded July 13, 2007 in Book 701 at page 581 entry no 478704.

19. A Trust Deed given to secure a note bearing even date thereof, with interest thereon, as therein provided: (Affects: parcels 1 & 4)

Dated August 10, 2007 Amount \$187,500.00

Trustor San Arroyo Environmental, LLC
Trustee South Eastern Utah Title Company

Beneficiary Sam Kirkland

Recorded August 15, 2007 in Book 704 at Page 353; Entry No. 479449

ASSIGNED TO Desert Ridge, LLC, a Colorado Limited Liability Company, by Assignment of Deed of Trust, recorded December 18, 2008 in Book 742 at page 1, Entry No. 489870.

A Deed of Partial Reconveyance was recorded September 1, 2010 in Book 763 at page 373, Entry No. 495674 releasing Parcel 2.

- 20. A Right of Way Easement recorded December 27, 2007 in Book 716 at Page 406, Entry No. 483227.
- 21. A Notice of Acknowledgment of Right of Way Grant recorded May 27, 2008 in Book 730 at Page 258, Entry No. 486392, AND A Notice of Acknowledgment of Right of Way Grant recorded May 27, 2008 in Book 730 at Page 271. Entry No. 486393.
- 22. A Trust Deed given to secure a note bearing even date thereof, with interest thereon, as therein provided: (parcel 3:)

Dated August 18, 2008 Amount \$125,000.00

Trustor San Arroyo Environmental, LLC
Trustee South Eastern Utah Title Company
Beneficiary Harley Dome Interests, LLC

Recorded August 22, 2008 in Book 737 at Page 667; Entry No. 487970

NOTICE OF DEFAULT AND ELECTION TO SALE, recorded March 18, 2010 in Book 758 at page 283, entry no. 494374.

ASSIGNED TO Michael C. Zink, by Assignment of Deed of Trust, recorded August 26, 2010 in Book 763 at page 110, Entry No. 495612.

23. A Trust Deed given to secure a note bearing even date thereof, with interest thereon, as therein provided: (parcel 2:)

Dated August 24, 2010 Amount \$12,388.55

Trustor Westwater Farms, LLC

Trustee South Eastern Utah Title Company Beneficiary Harley Dome Interests, LLC

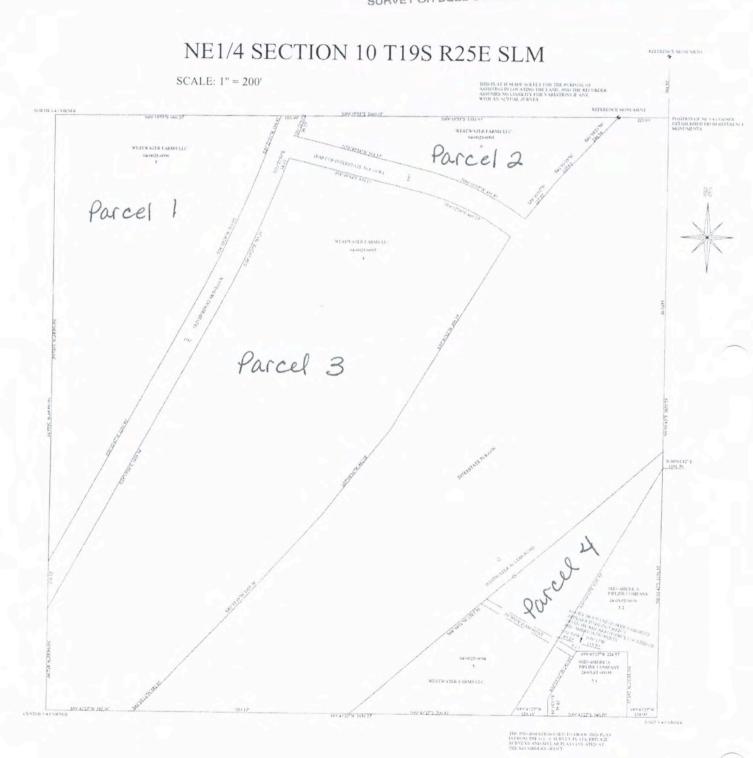
Recorded August 26, 2010 in Book 763 at page 112, Entry No. 495613

24. Materialman's and Mechanics Liens which may attach as a result of construction. (Informational note: this exception will stay on the lenders policy)

A judgment search, tax lien search, and bankruptcy search was made in the following names and none were found of record that affect the subject property except as noted above.~~

WESTWATER FARMS, LLC, a Utah Limited Liability Company SAN ARROYO ENVIRONMENTAL, LLC

TITLE INQUIRIES concerning this Commitment can be directed to: Cricket Green/Title Agent ~ cricket@southeasttitle.com or Chad Frandsen Escrow Agent/marketing~chad@southeasttitle.com "SOUTHEASTERN UTAH TITLE COMPANY"
FURNISHES THIS PLAT SOLELY FOR THE
PURPOSE OF ASSISTING IN LOCATING THE
LAND. THE TITLE COMPANY ASSUMES NO
LIABILITY FOR VARIATIONS WITH AN ACTUAL
SURVEY OR DEED DESCRIPTION.



GRAND COUNTY CORPORATION

September 9, 2010

Tax Roll Master Record

1:19:26PM

Parcel: 04-0025-0096

Serial #:19-25-10-7

Entry: 490620

Name: WESTWATER FARMS LLC

c/o Name:

Address 1: 1089 GENESEE VISTA RD

Address 2:

City State Zip: GOLDEN

Mortgage Co

Status: Active

Property Address:

1-70 INTERCHANGE AT WESTWATER

WESTWATER

CO 80401-0000

Acres: 23.68

District: 004 COUNTY GENERAL

0.009470

77.50

Owners

Interest

Year: 2010

Entry

Comment

WESTWATER FARMS LLC

490620

(0743/0934)

	2	010 Val	2009	Values & Taxes			
Property Information	Units/Acres	Market	Taxable	Taxes	Market	Taxable	Taxes
LV01 LAND VACANT	23.68	8,288	8,290	78.51	8,288	8,290	77.50
Totals:	23.68	8,288	8,290	78.51	8,288	8,290	77.50

**** SPECIAL NOTE ****

Tax Rates for 2010 have been set and approved. All levied taxes and values shown on this printout for the year 2010 should be correct.

2010 Taxes: 78.51 2009 Taxes: Special Taxes: 0.00 Penalty: 0.00 Abatements: (0.00) Payments: (0.00) Amount Due: 78.51

Back Tax Summary

Year	Principal	Specials Total	Penalty	Interest Due	Interest Rate	Total Payments	Total Due
2009	77.50	0.00	10.00	0.00	6.25%	0.00	87.50
Totals:	77.50	0.00	10.00	0.00	***************************************	0.00	87.50

Legal Description

BEG AT THE N1/4 COR SEC 10 T19S R25E SLM TH WITH N LN N89°35'55"E 980.20 FT TO W R/W OF OLD HWY 6 & 50, TH WITH SAID R/W THE NEXT 3 COURSES: S 20°25'50"W 194.41 FT TH ALONG THE ARC OF A 5668.54 FT RADIUS CURVE TO THE RIGHT 770.54 FT (CHORD BEARS S 24°19'29"W 769.95 FT) TH S 28°12'47"W 1253.90 FT TO W LN NE'/SAID SEC 10, TH N 00°04'49"W 1980.64 FT TO BEG. 23.68 AC

History

PARANT PARCEL (04-025-0008)

Parcel

Page: 1 of 1

GRAND COUNTY CORPORATION

September 9, 2010

Tax Roll Master Record

1:19:22PM

Parcel: 04-0025-0095

Serial #:19-25-10-6

Entry: 490620

Name: WESTWATER FARMS LLC

Property Address:

c/o Name:

Address 1: 1089 GENESEE VISTA RD

1-70 INTERCHANGE AT WESTWATER

Address 2:

WESTWATER

City State Zip: GOLDEN

CO 80401-0000

Acres: 7.27

Mortgage Co

Status: Active

Year: 2010

District: 004 COUNTY GENERAL

0.009470

Owners

Interest

Entry

Comment

WESTWATER FARMS LLC

490620 (0743/0934)

	20	10 Val	2009	Values & Taxe			
Property Information	Units/Acres	Market	Taxable	Taxes	Market	Taxable	Taxes
LV01 LAND VACANT	7.24	2,534	2,535	24.01	2,534	2,535	23.
Totals:	7.24	2,534	2,535	24.01	2,534	2,535	23.
**** SPECIAL NOTE **** Tax Rates for 2010 have been set and approved. All levied taxes and values shown on this printout for the			10 Taxes: cial Taxes: Penalty:	24.01 0.00 0.00	200	9 Taxes:	23.70
year 2010 should be correct.			Payments: (0.00)			.v=a
		Ar	mount Due:	24.01	NC	BACK TA	AXES

Legal Description

BEG S 89°35'55"W 221.03 FT FROM THE NE COR SEC 10 T19S R25E SLM, TH WITH NW R-O-W OF I-70 THE FOLLOWING THREE COURSES: S 43°05'21"W 246.54 FT; S 43°03'35"W 130.61 FT, S 38°00°02"W 227.35 FT, TH WITH N R/W OF HWY I-70 TO OLD HWY 6 & 50 CONNECTOR ROAD ALONG THE ARC OF A 1195.92 FT RADIUS CURVE TO THE LEFT 490.35 FT (CHORD BEARS N 64°01'07"W 486.93 FT) N 75°45'54"W 568.37 FT TO EASTERLY R/W OF HWY 6 & 50 TH WITH SAID R/W N 20°25'50"E 98.27 FT TO N LN OF SAID SEC 10 TH N 89°35'55"E 1351.93 FT TO BEG. 7.27 AC <<<>>>

History

PARANT PARCEL (04-025-0008)

Parcel 2

Page: 1 of 1

September 9, 2010

Tax Roll Master Record

1:19:30PM

Parcel: 04-0025-0097

Serial #:19-25-10-8

Entry: 490620

Name: WESTWATER FARMS LLC

c/o Name:

Address 1: 1089 GENESEE VISTA RD

Address 2:

City State Zip: GOLDEN

Mortgage Co

Status: Active

Property Address:

1-70 INTERCHANGE AT WESTWATER

WESTWATER

Acres: 49.47

0.009470

Owners

Year: 2010

District: 004 COUNTY GENERAL

Interest

CO 80401-0000

Entry

Comment

WESTWATER FARMS LLC

490620 (0743/0934)

	2	010 Val	2009	Values & Taxes			
Property Information	Units/Acres	Market	Taxable	Taxes	Market	Taxable	Taxes
BA01 AG BUILDING	0.00	3,000	3,000	28.41	3,000	3,000	28.05
BC03 COMMERCIAL BLDG	0.00	10,000	10,000	94.70	10,000	10,000	93.49
BS01 RESIDENTIAL SECONDARY	0.00	48,063	48,065	455.18	48,063	48,065	449.36
LS01 SECONDARY LAND	1.00	15,000	15,000	142.05	15,000	15,000	140.24
LS03 LAND OVER 1 AC.	48.47	15,270	15,270	144.61	15,270	15,270	142.76
Totals:	49.47	91,333	91,335	864.95	91,333	91,335	853.90

Property Type		Property Type Year Built Square Fo		Square Footage	Basement Size		Building Type
BS01 RESID	ENTIAL SECONDARY	Y	1947			1,072 2 SFR	
**** SPECIAL NOTE **** Fax Rates for 2010 have been set and approvided taxes and values shown on this pringle year 2010 should be correct.		and approved. A	ne Pe Abatem Paym	axes: nalty: ents: (864.95 0.00 0.00 0.00) 0.00)	2009 Taxes: 853.90 Review Date 02/12/2009	
		***************************************		Amount	Due:	864.95	NO BACK TAXES
08/27/2010	11:49 AM 00007282	2009	SEUTCO 56938GV	WESTWATERFARM	IS #182	Interest - Check	44.08 eggy
08/27/2010	11:49 AM 00007282	2009	SEUTCO 56938GV	WESTWATERFARM	IS #182	Penalty - Check	17.08 eggy
08/27/2010	11:49 AM 00007282	2009	SEUTCO 56938GV	VESTWATERFARM	IS #182	Redemption - Cher	853.90 eggy
						Total Payments:	915.06

Back Tax Summary

Principal	Specials Total	Penalty	Interest Due	Interest Rate	Total Payments	Total Due
0.00	0.00	0.00	0.00	6.25%	915.06	0.00
0.00	0.00	0.00	0.00		915.06	0.00
	0.00	0.00 0.00	0.00 0.00 0.00	0.00 0.00 0.00 0.00	0.00 0.00 0.00 0.00 6.25%	0.00 0.00 0.00 0.00 6.25% 915.06

Legal Description

BEG AT THE C1/4 COR SEC 10 T19S R25E SLM, TH N 00°04'49"W 452.99 FT TH WITH HWY 6 & 50 R/W THE FOLLOWING 3 COURSES: N 28°13'08"E 1438.54 FT, TH ALONG THE ARC OF A 5768.54 FT RADIUS CURVE TO THE LEFT 784.13 FT (CHORD BEARS N 24°19'29"E 783.53 FT) TH N20°25'50"E 34.13 FT TH WITH THE S R/W HWY 6 & 50 TO I-70 CONNECTOR ROAD THE FOLLOWING TWO COURSES: S 75°45'54"E 579.11 FT, TH ALONG THE ARC OF A 1095.92 FT RADIUS CURVE TO THE RIGHT 448.39 FT (CHORD BEARS S 64*02'38"E 445.27 FT) TO THE RW I-70 THE FOLLOWING FOUR COURSES: S 30°30'32"W 995.77 FT, S 37°08'56"W 482.08 FT, TH ALONG THE ARC OF A 22718.31 FT RADIUS CURVE TO THE RIGHT 1005.66 FT (CHORD BEARS S 41°35'19"W 1005.58 FT) TH S 43°18'11"W 182.85 FT TO S LN NE½ SEC 10, TH S 89°43'27"W 387.36 FT TO BEG. 49.47 AC.

History

PARENT PARCEL: 04-025-0008

Page: 1 of Parcel 3

GRAND COUNTY CORPORATION

September 9, 2010

Tax Roll Master Record

1:19:17PM

Parcel: 04-0025-0094

Serial #:19-25-10-5

Entry: 493551

Name: WESTWATER FARMS LLC

Property Address:

c/o Name:

Address 1: 1089 GENESEE VISTA RD

1-70 INTERCHANGE AT WESTWATER

Address 2:

WESTWATER

City State Zip: GOLDEN

CO 80401-0000

Mortgage Co

Acres: 10.01

Status: Active

Year: 2010

0.009470

Owners

District: 004 COUNTY GENERAL

Interest

Entry 493551

(0755/0094)

Comment

WESTWATER FARMS LLC

	20	Values	& Taxes				
erty Information	Units/Acres	Market	Taxable	Taxes	Market	Taxable	Taxes
ACANT	10.01	3,503	3,505	33.19	3,503	3,505	32.77
Totals:	10.01	3,503	3,505	33.19	3,503	3,505	32.77
**** SPECIAL NOTE **	**	20	110 Taxes:	33.19	200	09 Taxes:	32.77
or 2010 have been set and a		Spe	cial Taxes:	0.00			
levied taxes and values shown on this printout for the			Penalty:	0.00			
ould be correct.			Payments: (0.00)			
		Ar	mount Due:	33.19	N	O BACK TA	AXES
nould be correct.		At		0.00)	N	O BACK TA	١X

Legal Description

PARCEL B: BEG N 00°01'42"E 1101.79 FT FROM THE E1/4 COR SEC 10 T19S R25E SLM, TH S 30°03'32"W 1276.55 FT, S 89°43'27"W 700.85 FT TO HWY I-70, TH N 48°34'01"E 1787.70 FT TO E LN NE¼ SEC 10, TH S 00°01'42"W 74.76 FT TO BEG. 10.01 AC

History

PARENT PARCEL WAS 04-025-0008

Parcel 4

Page: 1 of 1

WESTWATER FARMS RECYCLING FACILITY

EVOLVING MARKETS

New Horizontal Drilling and fracturing techniques developed over the last two years has enabled a whole new natural gas supply to be extracted from shale formations. Natural gas locked in shale formations were until very recently thought to be unrecoverable and not even recorded as a recoverable reserve. The new techniques have been perfected and Exxon is moving in 30 H & H rigs into the Piceance shale formations to produce 200 million cubic feet per day by years end and ultimately one billion cubic feet per day from a field estimated to contain 45 trillion cubic feet of recoverable natural gas.

The Uinta Basin located in the Book Cliffs just north of the Westwater Farms Recycling Facility contains an even larger, over 50 trillion cubic feet reserve of recoverable natural gas in shale formations. The \$3 billion dollar 42" diameter Ruby Pipeline being installed north of the Uinta Basin connecting to the California, Las Vegas, and Pacific NW Markets will be able to move over 1.5 billion cubic feet of natural gas per day to market in two years.

Westwater Farms Recycling Facility plans to recycle much of the natural gas production water for re-use in the oil shale water intensive extraction processes, helping to conserve the water in our streams and rivers.

Shale gas now a rival

New technology can recover the material, which means less investment for the Rocky Mountain fields.

By Mark Jaffe The Denver Post

Competition from new natural-gas reserves may delay the rebound for Colorado gas production — now at a three-year low, industry analysts and operators say.

Emerging shale-gas fields — the Barnett in Texas, the Haynesville in Louisiana and the Marcellus in Pennsylvania and New York — will compete for drilling dollars when the market rebounds.

"We are looking at a major realignment of the natural-gas markets," said Pete Stark, vice president for industrial relations at energy consultant IHS Inc. "This is a good thing. It means there is a lot more gas."

It might, however, be less good in the short term for the Rocky Mountain region.

"Some investment is going to flow to the shale plays, so the Rockies rebound might take four years instead of two," said Ward Polzin, a managing director at energy investment bank Tudor, Pickering, Holt & Co.

The story of shale gas mirrors that of Western tight-sands gas. In both cases, the reserves were known, but there wasn't a way to get at them.

"Technology is the key that unlocks the reserves, and it wasn't until the last few years that shale technology was perfected," Stark said.

Shale-gas recovery uses horizontal

wells and fracking — a technique to create fissures in rock to release gas — and while it is more expensive to sink such a well, the yield is greater.

Fracking is also used in Colorado wells. Where it creates cracks in the tight sands, it shatters the shale like glass, said Jeff Wojahn, president of EnCana Oil & Gas USA.

"The Barnett shale before horizontal technology was going nowhere," said Wojahn, whose company has operations in Colorado and in the Barnett and Haynesville fields.

As a rough comparison, Stark said, a well in Colorado's Piceance Basin might cost \$1 million and yield 800,000 cubic feet per day of gas, while a shale well's price tag might be \$2.5 million with a yield of 5 million cubic feet per day.

"The logic is you are going to go to the place you can produce the most gas and get it to market, so shale gas may have an advantage," said Kobi Platt, an economist with the federal Energy Information Agency.

The agency projects shale gas' share of U.S. national dry gas tripling to about 18 percent in the next two decades

Colorado, Wyoming, Utah, New Mexico and Montana accounted for 32 percent of reserves in 2006 and 22 percent of production in 2007, according to the most recent Energy Information Agency data.

Still, the potential for the shale reserves — not even part of the national estimates four years ago — are huge.

The Barnett field may have 30 trillion cubic feet of developable reserves; the Haynesville may hold 70 trillion cubic feet and the Marcellus 52 trillion cubic feet, according to analysis by Tristone Capital, a Houston-based energy consultant.

There are also shale plays in Arkansas and Oklahoma.

The Rocky Mountain region is estimated to have a total of 123 trillion cubic feet of gas, according to the Potential Gas Committee, a nonprofit, independent group backed by industry.

Cracking the shale was "a game-changing event," Polzin said.

While shale is the hot play, that does not mean the eclipse of Rocky Mountain gas, said Ray Dinkins, an analyst with Pritchard Capital Partners.

"There is a lot of infrastructure that the shale needs — pipelines, cryogenic plants to separate out liquids — and in this credit crunch, that investment is hard to come by," Dinkins said.

The development of the Rockies Express pipeline heading east and El Paso Corp.'s proposed Ruby Pipeline heading west will help keep Western gas competitive, Dinkins said.

EnCana's Wojahn said there are a number of factors that go into deciding where to drill, including the geology, the cost structure of wells and the regulations at different sites.

Still, Dinkins said: "If you have a choice to drill one place or another, you choose the cheaper one."

Mark Jaffe: 303-954-1912 or mjaffe@denverpost.com

Europeans invest billions to tap U.S. shale projects

By Mark Williams The Associated Press

columbus, ohio» With one eye cast toward home, giant European energy companies are investing billions in U.S. natural-gas and oil fields where huge, hard-to-get reserves have been unlocked with new drilling technology.

That technology is the prize in Europe, where gas production has declined and where an international utility dispute recently left people in more than a dozen countries shivering in unheated homes.

Europe's natural-gas supply is routed through Ukraine from Russia. Russia supplies about one-quarter of the EU's natural gas, with 80 percent of it shipped through Ukraine. A rift between the two nations left more than a dozen European countries with little or no gas for two weeks last month.

Declines in European gas production have potentially made the new techniques used in the U.S. even more pivotal.

At least three European oil and gas giants are developing or have bought interests in oil and gas shale projects in the U.S. — Norwegian oil company StatoilHydro, the U.S. unit of British oil company BP Plc and the French company Total.

StatoilHydro and BP have agreed in recent months to pay billions of dollars for stakes in shale gas projects from the top U.S. producer of gas, Chesapeake Energy. Total has bought a 50 percent stake in a U.S. company exploring for oil shale in the Rocky Mountains.

Shale is a kind of layered, sedimentary rock that exists in formations throughout the world. In the U.S., gas production from shale dates to the 1800s.

But the gas, tightly locked in rock formations, had been extraordinarily expensive to extract. That began to change about 15 years ago as producers developed new techniques such as horizontal drilling, where the drill is turned in a right angle to bore into a gas reservoir horizontally.

Buying into the technology in the U.S. makes sense and could spare European companies years of development, said Don Hertzmark, an international energy expert.

"The Europeans never bothered to develop this stuff," he said.

\$3 BILLION PIPILINE CONNECTION NE UTAH GAS FIELDS TO WESTERN USA



Project Summary
Project Facilities Map
FERC Information

Ruby Roule Map

USGS Topographic Maps Filed Resource Reports

-Alignment Sheets

-Aughment Sheers

Typical Construction Methods

Other Filed Reports

FAQ

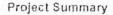
Newsroom Contacts

Project Open Season Notice of Available Capacity









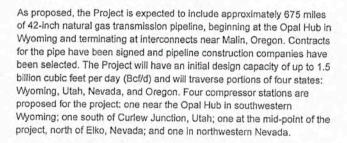


Proposed Project



To address our nation's growing demand for natural gas and associated transportation infrastructure, Ruby Pipeline, L.L.C. (Ruby) filed an application with the Federal Energy Regulatory Commission (FERC) on January 27, 2009, for a certificate of public convenience and necessity authorizing the construction and operation of the Ruby Pipeline Project (Project).

The Ruby Pipeline is a win-win project for natural gas consumers and producers. It represents an approximate \$3 billion investment in new pipeline infrastructure that will connect clean-burning and competitively priced natural gas reserves in the Rocky Mountain region with growing markets in the western United States.

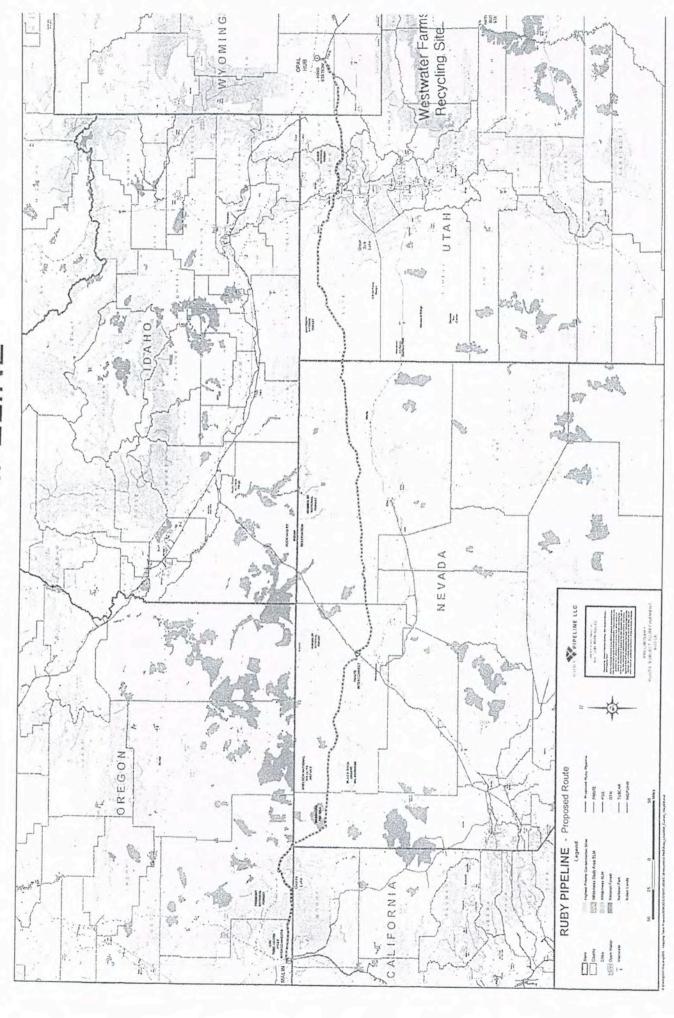


Ruby is committed to being the neighbor to have. As part of that vision, the Project will incorporate technology to minimize greenhouse gas emissions and will offset those emissions that cannot be reduced. Environmental reviews conducted during the planning for the Project identified several key areas for special attention or avoidance during construction: big game winter ranges, calving areas, and river crossings, as well as a number of federally protected species. Ruby is continuing to conduct surveys along the proposed route, including archaeological/cultural resource surveys to identify important historic sites, as well as biological and civil surveys. This information, along with stakeholder and community input, will be analyzed and, where needed, appropriate changes will be made to the route. Once the Project is thoroughly reviewed by the FERC in cooperation with state and federal agencies, including the Bureau of Land Management and the U.S. Forest Service, a certificate of public convenience and necessity may be granted and construction could begin in early 2010. The estimated in-service date is March 2011.

El Paso Corporation, parent company of Ruby Pipeline, L.L.C., provides natural gas and related energy products in a safe, efficient, and dependable manner. The company owns North America's largest interstate natural gas pipeline system and one of North America's largest independent natural gas producers. For more information, visit www.elpaso.com, or call our toll free telephone number 1-866-683-5587.

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BUSINESS

Exxon project ready to go

The energy giant will produce gas in the Piceance Basin by the end of the month, using a new fracturing technique.

By Andy Vuong The Denver Post

Exxon Mobil's latest project in western Colorado will produce natural gas by the end of this month, the energy giant said Thursday.

The first phase of the company's Piceance Basin project will produce 200 million cubic feet of gas per day — about 10 percent of the current total daily production in the basin, according to consultant Bentek Energy in Evergreen.

Exxon said the project, located in Rio Blanco County, will use a new fracturing technique that allows it to extract more gas at lower costs.

"They drill down holes to a certain depth, and they perforate the first intervals and begin producing gas out of it, and as that well begins to decline, they come back up the hole and drill up and perforate other intervals to keep the well flowing at the same rate," said Anthony Scott, a senior production analyst at Bentek.

The technology could give Exxon an advantage over other producers in the Rockies, where a pipeline shortage for transporting gas creates an oversupply and, as a result, lower pric"If you can keep the production at a higher sustained rate for months on end because you're hitting all of these other intervals that you weren't hitting before, then it should really drive the cost down for Exxon in the Piceance and allow them to produce economically even at lower gas prices," Scott said

Exxon said it expects the project to ultimately produce 1 billion cubic feet of gas per day, enough to supply 8 percent of U.S. households.

The development was announced in 2007. Costs haven't been disclosed.

Exxon produces about 55 million cubic feet per day in the Piceance, a prolific basin that the company said could hold as much as 45 trillion cubic feet of recoverable gas. Exxon holds leases to 300,000 acres of land in the area.

The Texas-based company on Thursday also said it will spend up to \$30 billion annually over the next five years on exploration and production.

The announcement, made at an analysts meeting in New York, comes as competitors scale back on drilling as energy prices plunge.

There were 31 rigs in the Piceance at end of February, down 64 percent from the third quarter of 2008, according to analyst David Tameron.

Andy Vuong: 303-954-1209 or avuong@denverpost.com

Gas project to start

By the end of this month, Exxon Mobil will begin producing gas from its Piceance



Source: U.S. Geological Survey

Thomas McKay, The Denver Post



Rockies Express pipeline

The completion of REX won't raise natural-gas prices in the Rockies, Bentek Energy says. It will probably force producers in the Gulf Coast region to lower their prices to match Rockies prices, Bentek says.

Natural gas/shale areas Completed pipeline Under-construction pipeline

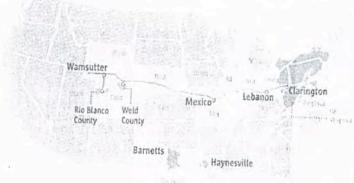
pipeline are lowered into the ground in eastern Missouri as part of the construction of the Rockies Express pipeline that will carry natural gas from Colorado to the Ohio Valley. Special to The Denver

4 Sections of

Gas warn Shale-gas

reserves figure to cut into Colorado natural-gas production. »88

The Denver Post



Sources: Bentek Energy, HaynesvilleshaleMap.com, Westside Energy Corp. and geology.com

Steady as she goes

Study: New line shouldn't boost natural-gas price

By Andy Vuong The Denver Post

The pending completion of a \$6 billion naturalgas pipeline from the Rockies to Ohio won't lead to a surge in prices for Colorado residents.

Instead, this year's opening of the east portion of the Rockies Express pipeline probably will force producers currently serving the Ohio area to lower prices to compete with Rockies supplies, according to a new study by Evergreenbased Bentek Energy.

Rockies natural-gas prices have long been lower than in other parts of the country because of the surplus created by a shortage of pipeline capacity.

"Unfortunately for Rockies producers, they have been so successful as a group at increasing production in the region that the pipeline is already full," said Rusty Braziel, Bentek's managing director. "Although the lower prices will be effectively exported to the Ohio Valley, that doesn't mean higher prices for Rockies producers."

The completion of the pipeline, however, will help bridge the gap between Rockies prices and national averages. That's because supplies for the Ohio area come from the Henry Hub region in Louisiana, the central pricing point for natural gas in the United States.

The gap between Rockies and national prices has traditionally ranged from \$2 to \$5 per million British thermal units. The differential Thursday was \$1.52, with Henry Hub prices at \$4.48 and Colorado Interstate Gas at \$2.96.

"The good news for Rockies consumers is that prices will remain low," Braziel said.

The west wing of the Rockies Express opened last year, running from Weld County to Missouri. The pipeline will open in Lebanon, Ohio, in June and reach Clarington, Ohio, in November.

"The pipeline is fully subscribed, and so while it certainly is a positive development, there's more pipeline capacity that's needed to really help raise the prices in the Rockies," said Doug Hock, a spokesman for EnCana Oil & Gas.

The region's next major pipeline project is El Paso Corp.'s Ruby Pipeline, scheduled to open in March 2011 and ship 1.5 billion cubic feet of gas per day from the Rockies to the Pacific Northwest.

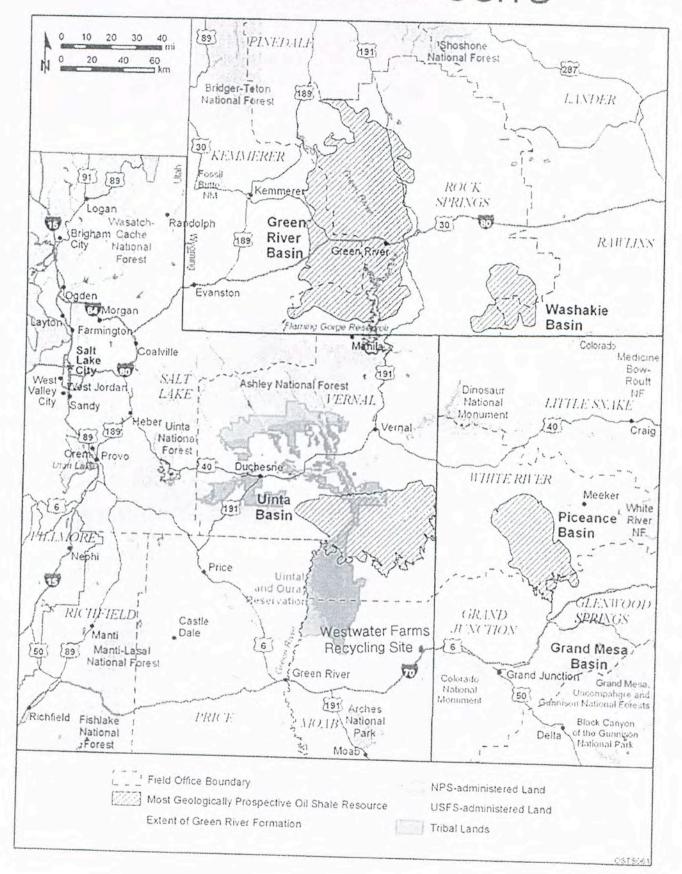
For producers, "a bigger factor to worry about is what kind of imports we might see this summer," said John Harpole, president of Mercator Energy, a natural-gas broker.

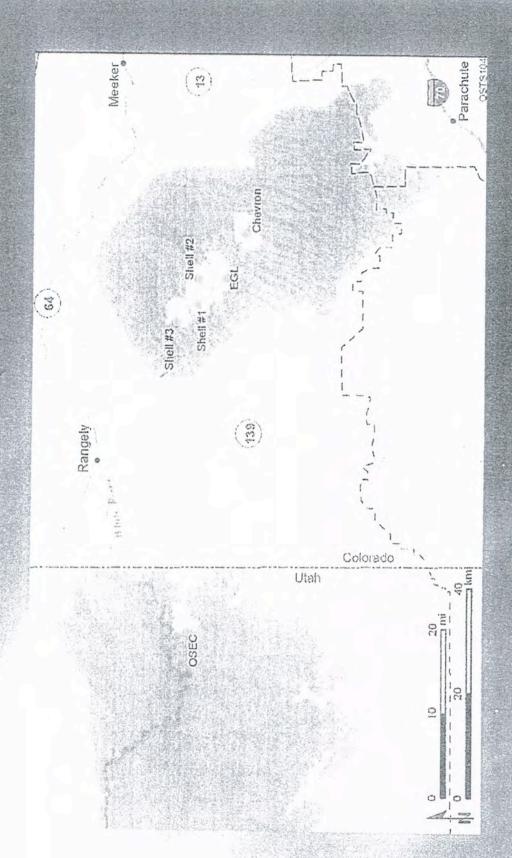
Prices could drop further if liquefied-naturalgas projects in Russia, Indonesia and other countries are completed and supplies are imported to the United States, Harpole said.

Andy Vuong: 303-954-1209 or avuong@denverpost.com

Draft: OSTS PEIS OIL SHALE DEPOSITS

December 2007





National Oil Shale Association

COGIS - Production Data Inquiry

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Maximum records are limited to: 5000	5000
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MACK HILLS PLATEAU PRODUCTION LLC - #10150	2007	- Andrews of the party of the p	And the second s	1 201 672	1.055.224	19,068
SLATE RIVER RESOURCES LLC - #10164	2007	Andreas and of the second seco		368,204	368,204	7,627
LAINS EXPLORATION AND PRODUCTION COMPANY - #10223	2007	5.836	4.062	1.945,993	1,821,908	49,584
JELTA PETROLEUM CORPORATION - #16800	2007	10.450	10,212	2.772.513	2,720,623	19,717
3 & G ROUSTABOUT SERVICE - #22370	2007	The same of the sa	-	11,716	11,716	
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SRYNBERG* JACK J - #36200	2007	758	481		And in case of the contract of the case of	
ONE MOUNTAIN PRODUCTION CO - #51090	2007	Man Planters and the Adoptions per out Management and Adoption and Ado	A STATE OF THE PARTY OF THE PAR	22.824	22,048	
JARALEX RESOURCES, INC - #53255	2007	The state of the s	And a second sec	90,083	78,295	8,309
JATIONAL FUEL CORPORATION - #62340	2007	107	174	707,226	707,226	
& M PETROLEUM MANAGEMENT LLC - #66565	2007	The state of the s			A CONTRACTOR OF THE PROPERTY O	
SLACK HILLS EXPLORATION AND PRODUCTION INC - #95715	2007			275,785	252,280	2,673
MILIAMS PRODUCTION RMT COMPANY - #96850	2007	Andreas and the second	A CONTRACTOR OF THE PERSON OF	Change and the state of the sta		
ENCANA OIL & GAS (USA) INC - #100185	2007	4,051	1,608	5,377,376	5,350,031	319,581
JOBLE ENERGY INC - #100322	2007	76	09	59,737	57,282	14,800
		37.809	34 348	18 040 189	17 487 576	627,620

ATIME COCCESTAGE. COUNTY

COGIS - County Monthly Production

PRODUCTION DATA REPORT -

COUNTY SELECTION OF THE COUNTY SELECTION ONLY	- lor county selection only
County:	RIO BLANCO
County Code:	103

PRODUCTION YEAR: 2008

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Feb	2,549	48267	437,791	436,487	437,791 436,487 3,336,285 3,178,842 12,470 37,198	3,178,842	12.470	37.198	107 775	107 775 8 427 454
Mar	2,454	50313	455,511	455,018	455,511 455,018 3,216,758 3,031,054 36,261 41,983	3,031,054	36,261	11.983	107 460	107 460 8 903 679
Apr	2,556	52289	448,797	448,961	448,797 448,961 3,377,655 3,229,908 23,965 38,912	3,229,908	23,965	38.912	84 870	84 870 8 239 759
May	2,563	52317	472,795	479,255	472,795 479,255 3,401,819 3,227,739 16,199 38,971	3,227,739	16.199	88 971	118 910	118 910 8 935 436
Jun	1,878	35357	24,306	22,856	22,856 2,666,857 2,605,145 15,646 29 717	2.605.145	15,646,2	9 717	16 340	366 450
Jul	2,533	50700	454,761	457,172	454,761 457,172 2.933,117 2.821,423 12,137 37,846	2.821.423	12 137	7 846	R1 711	61 711 8 478 874
Aug	1,438	23961	26,342	24,962	24,962,2.081,095,2.009,035	2,009,035	1 024 29 125	9 125	41 911	156 340
Sep	2,569	49088	422,356	419,497	422,356 419,497 2,728,087 2,624,414 17,835 37,392	2,624,414	17 835 3	7 392	48 446	48 446 8 345 838
Oct	1,936	35487	430,532	430,785	430,532 430,785 2,554,706 2,398,353	2,398,353	7.518 35,505	5.505	113 3308	113,330,8279,159
Nov	2,368	34822	429,694	426,520	429,694 426,520 2,173,441 2.047.262	2.047.262		2 047	89 844	89 844 8 183 964
Dec	1,185	20901	435,333 429,378	429,378	793.132	674.058		2 230	01 751	91 751 8 090 055
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SEARTOOTH OIL & GAS COMPANY . #6975	2007	210,110,111	(Darrols)	(MCF)	(MCF)	(Carrols)
:DX GAS LLC - #10026	2000	000		12,238	12,238	
ARAMIE ENERGY II C . #10654	1007	362	354	162,593	162,215	80
MIRO AKY DECOLOGIC 4400ED	7007	40		20,445	18,309	117
ARBEIT COROURATIONS BILL HANGES	2007			3,863	3.863	And the second s
MITTER DESCRIPTION BILL - #100/1	2007	385,843	383,420	23.804.425	23 577 960	1 745 769
ANTEND RESOURCES FICEANCE CORPORATION - #10079	2007	30,886	25.063	3.499.947	3 489 947	157 454
	2007	10,623	8.122	827.956	772 568	374 779
TONEER NATURAL RESOURCES USA INC - #10084	2007	Chippen of the Control of the Contro		127 253	125 605	1 248
SERRY PELKULEUM COMPANY - #10091	2007	-		A 763 34R	4 666 076	AL -pl.
JAION ENERGY PARTNERS LP - #10101	2007	601	394	39 012	37.255	1 363
SLACK MILLS FLATEAU PRODUCTION LLC - #10150	2007	-	The state of the s		200	300's
CONSUCH MATURAL GAS INC - #10163	2007			401 009	401 000	of the strong are required and the state of
JUAN JUM RESOURCES MANAGEMENT LLC - #10183	2007	638	233	264 774	26.8 77.4	834
LAINS EXPLORATION AND PRODUCTION COMPANY - #10223	2007	45		8 934	8 074	
AKAMIE ENEKGY II, LLC - #10232	2007	6.333	5 892	604 912	500 012	320 64
CHEVRON MIDCONTINENT LP - #16695	2007	783	892	530,505	516.154	COTIC!
MEVRON U S A INC - #16700	2007	1 800	4 090	000.000	010,104	And the second division of the second division in
3 & G ROUSTABOUT SERVICE - #22370	7000	1,099	1,033	407,455	401,152	33,544
EES JR AND SON OIL & GAS WAT TER C #200170	7007		the same of the sa	24,807	24,807	
CHE MOUNTAIN DECONICATION CO SECONO	7007	31		2,432	2,432	
ARRAI EX DECOLOS INC. APPORE	2007	183	194	340,624	323,510	A STATE OF THE STA
AEDDION OIL 9 CAP COOLS TREESES	2007			181,729	168,173	7,850
MENTALION OIL & GAS CORP - #56630	2007				The second secon	trape a manufacture of professional profession and profession of the contraction of the c
MONITOR THE STATE OF THE STATE	2007			2.920	2 920	
WATTOWAL FUEL CORPORATION - #62340	2007	133	-	200 SER	SAR NOE	The country of the special property of the party of the p
JON HASTAM GAS COMPANY INC - #64310	2007		- Company of the Comp		CO'CO'CO	Commission of the second secon
JXY USA WIP LP - #68571	2007	13.976	13 800	A 053 205	A GBO ORR	200 454
PETROGULF CORPORATION - #69100	2007	17 641	17,040	1 708 088	4 706 006	EC 202
PETROLEUM DEVELOPMENT CORP - #69175	2007	18 814	17610	000,000,000	0 000 044	200,000
IMBERLINE ENERGY INC - #88348	2007	A. D. O.	010'71	3.4.900, 144	0.330,911	600,551
WILLIAMS PRODUCTION RMT COMPANY - #96850	2007	300 016	Och 300	000000000000000000000000000000000000000	41.000	
INCANA OIL & GAS (USA) INC . #100185	10000	070,040	377,626	164,466,510	164,468,510	3,622,044
JOBI E FNERGY INC. #100322	7007	4/0,052	463,223	106,482,673	105,346,475	3,266,068
PRESCO INC. MODAKK	2007	5,628	5,611	3,271,954	3,248,023	192,741
	2007	7		68,993	66,993	2,770
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OIL SHALE UPDATE

National Oil Shale Association

Volume I, Issue I April 2008

Steady Progress made on Oil Shale Projects

During the first quarter of 2008 a number of oil shale projects reported progress in a steady and measured manner with the goal of completing research and development on technologies that hold promise for becoming economic, sustainable and environmentally acceptable. This research and development is needed before any oil shale projects are expected to be commercialized.

The projects included those on BLM RD&D leases, state leases, and on private oil shale lands. Work is being conducted on the oil shale project sites and in laboratories around the country. Essentially all of the current oil shale development work is being conducted with private funds. There are currently no major government grants or incentive programs for oil shale.

The principal firms involved in oil shale development in

the United States are Shell Unconventional Resources, American Shale Oil (formerly EGL Resources), Red Leaf Resources, Oil Shale Exploration (OSEC), Chevron, ExxonMobil, ConocoPhillips, ERTL Inc., Sage Geotech, and Shale Technologies International. A number of other firms are actively engaged in oil shale technology and project development in the United States.

Significant non-U.S. commercial oil shale programs are being carried out in China, Estonia and Brazil. Exploratory work and technology development is moving forward in Jordan, Israel, Morocco and Australia. Many other countries in the world have oil shale deposits that has been investigated and/or developed in past decades.

The federal government through the U.S. Department of Energy Office of Fossil Energy has completed a number of studies that indicate the value of oil shale for reducing dependence on foreign and expensive supplies of petroleum. A task force report can be found at

http://fossil.energy.gov/ programs/reserves/npr/ publications/

Challenges to successful oil shale commercialization are significant, expensive and time consuming.

- Technology must be demonstrated to be economic.
- Environmental issues must be solved.
- Political differences must be mediated.
- Both the public and government officials needs to be convinced of the potential for oil shale to help meet domestic energy demand.

Inside this issue:

New	Entrants	in	Oil	2
Shale	Arana			

Red	Leaf	Utah	Pro-	2
iece				

OSEC Utah Project 2

Shell Mahogany Project

American Shale Oil 3 Project

Oil Shale Leasing 3 PEIS

Innovative Tech- 4 nologies and Ideas

Special points of interest:

- IDT buys into EGL project and renames it American Shale Oil
 Project (AMSO)
 - Schlumberger buys
 Raytheon technology
 - Oil shale leasing PEIS comments submitted to BLM
 - Several new oil shale technologies surface

U.S. Oil Shale Resources are Immense

"The largest known oil shale deposits in the world are in the Green River Formation, which covers portions of Colorado, Utah, and Wyoming. Estimates of the oil resource in place within the Green River Formation range from 1.5 to 1.8 trillion barrels. Not all resources are recoverable. For potentially recoverable oil shale resources, we roughly derive an upper bound of 1.1 trillion barrels of oil to a lower bound of about 500 billion barrels." [Bartis, James T. etal, Rand Corporation, Oil shale Development in the United States, ISBN: 0-8330-3848-6, 2005]

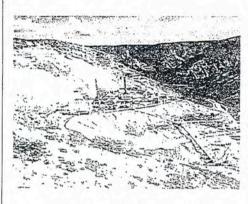




National Oil Shale

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natosa@comcast.net
www.oilshaleassoc.org

Gary Aho, Chairman



Unocal Oil Shale Plant circa 1982

NOSA Welcomes New Members

- The mission of the National Oil Shale Association (NOSA) is to educate the public about oil shale.
- NOSA is a not-for-profit 501(c)(6) corporation.
- The Association was formed in the 1970's when it actively engaged in oil shale education.
- Now NOSA has been reinstated in response to a renewed interest in oil shale. The organizers of NOSA have extensive experience in oil shale and energy development.
- There are two classes of membership: Sustaining and Associate Members. Sustaining Members are profit making firms and Associate Members are individuals and not-for-profit groups.
- NOSA's Web Site at <u>www.oilshaleassoc.org</u> provides copies of the Bylaws and a membership application form.

The information presented in this document has been prepared by the staff of NOSA and is intended to give a snapshot of the status of oil shale technology and projects, and is not endorsed by the principals of those technologies or projects. NOSA has drawn upon publically available information.

Innovative Technologies and Ideas

The resurgent interest in oil shale has resulted in new technologies and proposed research and development projects. A partial list of projects receiving attention during this period follows:

Shell Mahogany Project

Electric heated in-situ process pilot tested in the field. Freeze wall test in progress. Tests planned on three RD&D leases in Colorado.

Chevron

CO2 injected in-situ process planned for testing at its RD&D lease in Colorado.

AMSO

Indirect heated in-situ process planned for testing at its RD&D lease in Colorado.

OSEC

Surface retorting and under-

ground mining project in Utah with mine opening planned in the near term.

ExxonMobil

In-situ Electrofrac process under development with field tests planned in the future.

Phoenix WY

Microwave in-situ oil shale process planned for testing in the future.

Raytheon/Schlumberger

Microwave in-situ technology tested at laboratory scale with field tests in the planning stage.

CRE Energy

Surface retorting process combined with coal gasification with pilot testing planned in the future.

Mountain West Energy

In-situ process that includes

hot gas injection and in-situ vapor extraction.

Independent Energy Partners

In-situ process using geothermic fuel cells with plans for testing in the field.

Blue Ensign Technologies

Surface retorting process using liquid extraction tested at laboratory scale. Funding being sought for test in Australia.

Shale Technology International

Paraho surface retorting technology with pilot plant in Colorado where tests have been conducted on oil shales from around the world.

For more information see links page on www.oilshaleassoc.org and individual project web sites.



Shale Technology International pilot plant near Rifle, Colorado

NOSA

"You're talking about tremendous reserves-if we can recover up to one trillion barrels of oil. that's more proven reserves than all of the proven reserves in the Middle East put together."

US Senator Orrin Hatch

New Entrants in the Oil Shale Arena

This period saw the entrance of several new businesses and leaders in the oil shale arena.

American Shale Oil Co.

EGL Oil Shale, LLC reportedly closed a deal to sell 75% of its assets to IDT Corporation. The new firm is called American Shale Oil Company, or AMSO. The President of the firm is Howard Jonas, Chairman of IDT and author of books on management. Alan Burnham, (PhD), Roger Day and Claude Pupkin are the key managers of the project on

EGL's Oil Shale RD&D Lease in Rio Blanco County, Colorado.

Howard Jonas is quoted as saying "We intend to pursue, and are urging the other participants in the industry to join us in, an open collaboration approach to solving the challenges that have stymied shale oil extraction for decades."

Schlumberger

Raytheon announced that it was selling its oil shale technology to Schlumberger, a well known oil field

service company. The technology developed by Raytheon uses microwaves to generate heat underground to release shale oil from the resource. Raytheon reportedly developed the technology with CF Technologies of Massachusetts. Earlier the Illinois Institute of Technology and other firms experimented with the use of micro waves to retort oil shale.

Frank Smith-Western Colorado Congress

Frank Smith was named oil shale coordinator for the Western Colorado Congress.

Red Leaf- EcoShale Oil Shale Project in Utah

According to its web site, the mission of Red Leaf Resources Inc. is to develop the Ecoshale In-Capsule Process to bring economical liquid hydrocarbon transportation fuels to the market from unconventional hydrocarbons (oil shale, tar sands, coal, lignite) soon enough, and in sufficient quantity, to significantly impact economic and political dependence on conventional oil.

The Great Basin of the

western United States holds some of the world's richest deposits of oil shale. The states of Wyoming, Colorado, and Utah together represent more than a third of the earth's supply.

Red Leaf Resources, Inc owns School Institutional Trust Lands leases in Utah containing approximately 1.5 billion barrels of oil. The hydrocarbon resource is world class and lies beneath an average of 0.45 to 1.0 overburden ratio.

The property can sustain a multi-billion dollar mining project which could produce up to 50,000 barrels per day -- more oil than all of Utah's other conventional output combined.

Red Leaf is currently planning for field testing of its technology in Utah.



Oil Shale Exploration Company (OSEC) Project

OSEC has reported that it has a three phase research, development and demonstration (RD&D) program to mine and process oil shale from the Green River Formation in Utah.

Phase 1 began with the signing of the BLM lease. effective July 1, 2007, on the 160-acre RD&D site of

the White River Mine. Oil shale samples have been sent to three independent laboratories for testing. In September 2007 OSEC processed 300-tons of crushed shale through the Alberta Taciuk Process (ATP) pilot plant in Calgary, Canada.

During Phase 2, the Com-

pany plans to construct a 250-ton-per-hour processing facility at the White River Mine near Bonanza, Utah. The facility would include an on-site shale oil upgrading plant and shale oil product storage tanks.

During Phase 3, OSEC will seek to secure the Preferential Lease Property so that commercial operations can be initiated.



Shell Mahogany Research Project

Research and development activities continue on Shell's private property in the northern Piceance Basin. Field activities have been ongoing since 1996, with the last heating test successfully recovering oil and confirming the viability of Shell's In-situ Conversion Process (ICP) technology. The main currently active project in Colorado is the Freeze Wall Test (FWT) where Shell is testing the ability to isolate an area to be heated, while protecting the adjacent water-bearing formations, by surrounding the perimeter of the area to

be heated with a subsurface curtain of ice. This is being done in a novel application of conventional engineering technology typically used in places such as construction sites where soil moisture is an issue. The FWT was constructed in 2006 and 2007. became fully operational in late 2007, and will continue for 3-4 years as we learn more about how best to manage and protect groundwater in proximity to our operations.

In the next phase of testing, Shell intends to propose a pilot project on federal research leases to demonstrate a fully integrated application of combined heating and freeze wall technology.

The ultimate objective is to make a decision about commercial scale development in the middle of the next decade, depending on the timing and results of ongoing research and on the timely development of a supporting federal and state regulatory scheme that facilitates its implementation.

For more information, see web site

www.shell.com/us/mahogany.



Shell's Office in Rio Blanco County, Colorado

American Shale Oil Project (AMSO)

AMSO's reported strategy is to produce shale oil and gas from the illite-rich oil shale 2000-ft below the surface of its RD&D lease in order to prevent contamination of drinking water aquifers. They are exploring how to prove and best implement EGL's patented Conduction, Convection, Reflux (CCRTM) retort concept.

Upon completion of the RD&D program and ap-

proval, commercial operations employing these techniques could start sometime in the 2015 to 2020 time frame. Production could expand to the 100,000 bbl/day rate over the course of several years given favorable economics and acceptable impacts.

The figure at the right is a diagram of the initial field test envisioned by AMSO.

Gas Product separation and flare and flare Recirculating hot fluid Production well R-1 Zone 2000-ft deep

Programmatic EIS for Oil Shale Leasing

In December 2006 the Bureau of Land Management (BLM) issued a Draft Oil Shale and Tar Sands Programmatic Environmental Impact Statement (PEIS).

The purpose was to identify those areas where oil shale and tar sands resources are present, decide which of those areas will be open to application for commercial leasing, exploration and

development, and amend the BLM's applicable land use plans.

Comments were encouraged from the public into April of 2008.

The PEIS offered three options for oil shale development, including a no-leasing option. The BLM expects several thousand com-

ments. The issuance of a Final PEIS and Record of Decision is anticipated by the end of 2008 if funding is made available to BLM to complete its work.

NOSA submitted comments to BLM that focused upon the factual content of the document and can be found on the NOSA web site: www.oilshaleassoc.org.

"If commercial oil shale leasing occurs, it will not occur for a number of years."

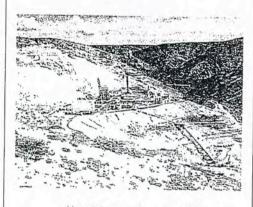
Kent Walter, Field Manager, BLM White River Office, Meeker, CO—3/20/08



National Oil Shale Association

Glenn Vawter, Executive Director National Oil Shale Association P.O. Box 3080 Glenwood Springs, CO 81601 Phone: 970-389-0879 Fax: 970-945-2423 natosa@comcast.net www.oilshaleassoc.org

Gary Aho, Chairman



Unocal Oil Shale Plant circa 1982

NOSA Celebrated One Year Anniversary

- The mission of the National Oil Shale Association (NOSA) is to educate the public about oil shale.
- NOSA is a not-for-profit 501(c)(6) corporation.
- The Association was formed in the 1970's when it actively engaged in oil shale education.
- Now NOSA has been reinstated in response to a renewed interest in oil shale. The organizers of NOSA have extensive experience in oil shale and energy development.
- There are two classes of membership: Sustaining and Associate Members. Sustaining Members are profit making firms and Associate Members are individuals and not-for-profit groups.
- NOSA's Web Site at <u>www.oilshaleassoc.org</u> provides copies of the Bylaws and a membership application form.

Estonia Announces International Oil Shale Symposium

Tallinn, Estonia—June 8/10, 2009 In association with the Colorado School of Mines http://www.oilshalesymposium.com

The information presented in this document has been prepared by the stoff of NOSA and is intended to give a snapshot of the status of oil shale technology and projects, and is not endorsed by the principals of those technologies or projects. NOSA has drawn upon publically available information.

Innovative Technologies and Ideas

A partial list of projects receiving attention during this period follows:

Shell Mahogany Project

Electric heated in-situ process pilot tested in the field. Freeze wall test in progress on private land.

Chevron

CO2 injected in-situ process planned for testing at its RD&D lease in Colorado.

AMSO

Indirect heated in-situ process with a unique ground water protection strategy planned for testing at its RD&D lease in Colorado.

OSEC

Surface retorting and underground mining project in Utah with mine opening planned in the near term. See more information on page 2.

ExxonMobil

In-situ Electrofrac process under development with field tests planned in the future.

Raytheon/Schlumberger

Microwave in-situ technology tested at laboratory scale with field tests in the planning stage.

EcoShale

Modified insitu retorting process being tested in Utah

Shale Technology International

Paraho surface retorting technology with pilot plant in Colorado.

Independent Energy Partners

Geothermic fuel cell process with work being conducted at PNNI

PyroPhase

Radio frequency insitu process

Monarch Mining

Surface retorting process using proven mining methods and surface retort. Work conducted at Idaho National Laboratory.

University of North Dakota

Process uses water and ethyl alcohol in a surface reactor to recover shale oil.

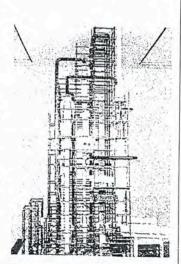
CRE Energy

Process uses a rotary kiln fired with hydrogen to reduce CO_2 emissions.

QER Australia

Surface mine and retort evaluating future commercialization approach at Stuart plant near Gladstone.

For more information see links page on www.oilshaleassoc.org and individual project web sites.





Colorado Water District issues water study

The Colorado Water Conservation District has recently issued for comment a report titled Energy Development Water Needs Assessment (Phase I Report). URS Corporation prepared the report for the District with the assistance of an advisory group from industry, government and private citizens. The report covers the needs for water in North Western Colorado through 2050 for natural gas. coal, uranium, oil shale and electric power generation. study estimated the direct demands as well as the water requirements for communities. Phase II will estimate water availability.

Due to the large potential water demands for oil shale, it became the focus of the report.

Assumed production levels ranged from zero (2007-2017), zero to 550,000 b/d (2018-2035), and from zero to 1.55 million b/d (2035-2050) with a mix of surface and insitu retorting.

Direct water consumption was assumed to be 1.5 and 2.9 barrels of water per barrel of shale oil produced respectively for insitu and surface retorting.

Total direct water demand therefore equates to a maximum of 112,625 acre-ft/year for the maximum case described above.

Indirect oil shale industry related population increase for the maximum case was estimated to be 94,200. That equates to an additional estimated 21,100 acre-ft/yr totaling 133,725 acre-ft/yr of water demand for a 1.55 million b/d shale oil industry.

The conclusions reached in the study on oil shale are as follows:

- Great uncertainty and challenge if commercial oil shale industry emerges
- On the high end (1.5 million b/d) oil shale water demand could exceed available compact water
- Non compact sources of water will be investigated in Phase II (e.g. waste waters)



White River in Rio Blanco County

Western Energy Corridor Initiative

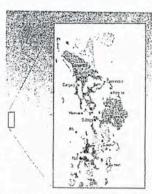
The Western Energy Corridor, which extends from Alaska through western Canada and the United States, contains some of the world's richest deposits of hydrocarbons and energy minerals, including trillions of barrels of oil equivalent in place (BOE) of conventional oil, natural gas, coal, oil shale, oil sands, heavy oil and uranium. Development of the world-class unconventional hydrocarbon resources within this corridor, could help alleviate U.S. energy supply vulnerability, providing a strategic source of energy, including liquids fuels and other products far into the future.

Concurrent development of unconventional fuels and other energy and mineral resources will create increasing competition for limited resources of water, and impacts to air, habitat, and wildlife in the region. Local communities, infrastructures, and economies will face increasing demand for roads, electricity, law enforcement,

labor and other services as a result of this development.

Therefore, this initiative is focused upon an effort to coordinate, integrate, and organize the scientific and engineering efforts required to conclusively evaluate the potential impacts of this potentially large development activity.

Entities from government, industry, national laboratories and educational institutions are investigating how to proceed with this initiative.



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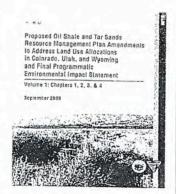
Programmatic EIS and Regulations for Oil Shale Leasing

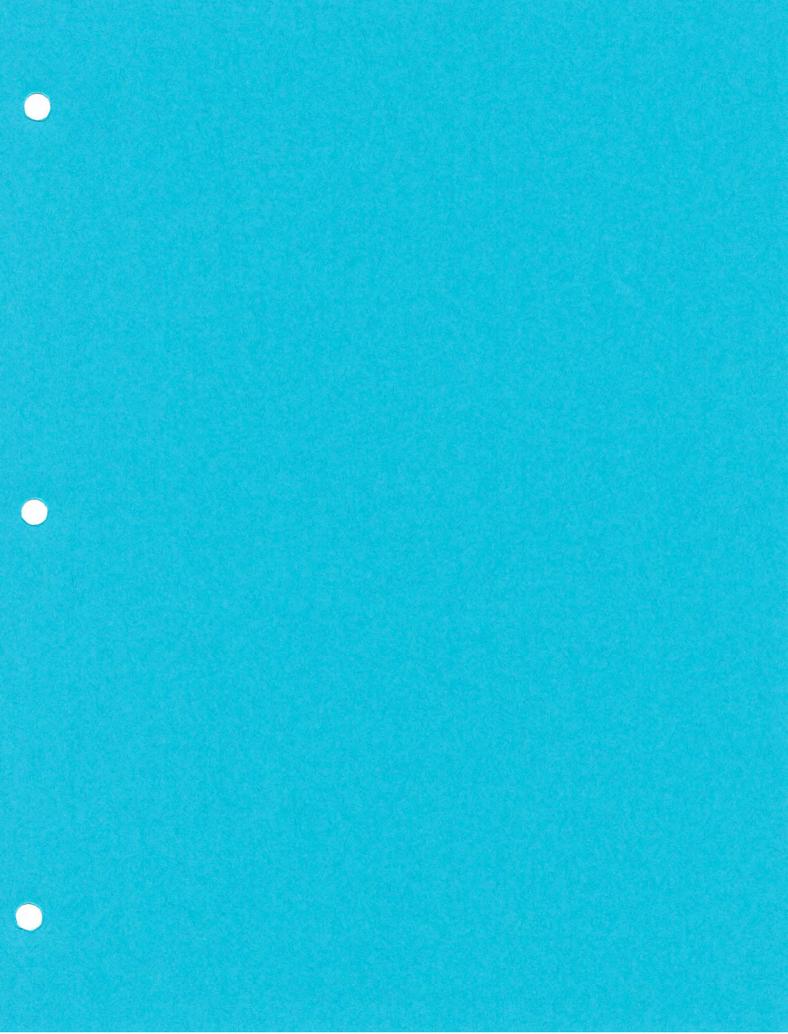
The Proposed Oil Shale and Tar Sands Programmatic Environmental Impact Statement was issued in final form in September 2008. BLM selected Alternative B as the Proposed Plan Amendment. Alternative B makes 1,991,222 acres of oil shale lands available for commercial leasing in Colorado, Utah and Wyoming. One million

acres of these designated lands are in Wyoming, 631,000 acres in Utah, and 360,000 acres in Colorado. "Additional NEPA Analyses will be required before leases will be issued for commercial development."

Draft regulations to establish a commercial oil shale leasing program were issued and comments sought from the public by BLM . As of the writing of this report final regulations had not been issued.

A Congressional moratorium prohibiting BLM from competing the PEIS and regulations was allowed to expire September 30, 2008. No other Congressional action has been taken to date.









November 24, 2010

Grand County Community Development Department Grand County Planning Commission 125 East Center Street Moab, Utah 84532

Subject: Response to Grand County Community Development Department Conditional Use Memorandum of

October 15, 2009 regarding WestWater Farms Conditional Use Application and Public Hearing of

October 14, 2009

Project No.: 4422.001(10)

Dear Grand County Planning Commission:

Stewart Environmental Consultants, LLC, on behalf of WestWater Farms, LLC, is pleased to provide this response to staff review comments of the WestWater Farms, LLC Conditional Use permit application and public hearing of October 14, 2009. The comments from the Grand County Community Development Department are provided in italics; with responses following.

1. Please provide the Site Plan including employee parking, lighting cut sheets, and a refuse area to complete the application.

Attachment 1 contains the updated site plans, including designated employee parking and refuse areas. Attachment 2 includes cut sheets for the proposed onsite outdoor lighting.

2. Please provide the Utah Division of Oil, Gas, and Mining (UDOGM) concurrence letter approving the leak detection system.

We have submitted the required information to UDOGM for their review of the leak detection system, and requested a document acknowledging approval at their earliest convenience. Subsequently, we received verbal confirmation on November 1, 2010 that the proposed leak detection system is acceptable to UDOGM and they provided e-mail correspondence to that effect November 2, 2010. Please see Attachment 3 for a copy of this correspondence.

3. Please provide proof of UDOGM bond for updated reclamation cost and submission of separate bond to be held in the interest of the County for the road improvement cost estimate.

Proof of UDOGM bond for reclamation costs is provided in Attachment 4.

WestWater Farms understands that the road improvement bond can be acquired upon execution of the road maintenance agreement by the County, which will occur after the Planning Commission approves the conditional use permit application. A cost estimate for the road improvements is provided in Attachment 4.

- 4. Please provide a response to the County Engineers Comments:
 - a. The 1:1 slope shown on the 10k condensate may not be stable, please provide a geotechnical engineering analysis.
 - b. Provide foundation design and calculations for condensate tanks. Condensate tanks will require a building permit prior to construction. Issues a) and b) may be addressed at building permit.

The 1:1 slope shown on the original 10k condensate tank drawing will not be used. A new foundation has been designed so that the 1:1 slope can be eliminated. The foundation design and calculations for all tanks, including the condensate tanks, are complete and will be provided to the building department as part of the building permit submittal. WestWater Farms has engaged a geotechnical consultant who has performed soil sampling and analysis, information from which has been used for the referenced foundation design.

- c. How is the manifold connection from the 200k tank prevented from overfilling the 50k condensate storage available?
- d. There needs to be positive prevention from overfilling the receiving tank.

The manifold connection from the 200k tank is prevented from overfilling the 50k condensate storage tank by having two 300-barrel overflow tanks (12-foot diameter by 15 feet high) and an automatic shutoff valve that will disallow the tank to overflow by preventing flow into the system. The shutoff valve will be controlled by a programmable logic controller (PLC) to ensure positive prevention from overfilling the tanks.

- 5. The Staff recommends WestWater Farms submit the State Agency Permits including:
 - a. Permit to Receive and Treat Production Water (UDOGM)
 - b. Underground Injection Control Permit (UDOGM)
 - c. Permit to Drill (UDOGM)
 - d. Operating Permit (Division of Water Quality)

Please see Attachment 5 for a description of the permitting process and the status of each permit listed above, plus other permits that have been applied for regarding this site.

6. The Staff recommends WestWater Farms submit the Referral Agency letters, specifically letters indicating water quality standards for all proposed uses (onsite irrigation, off-site resale, and injection).

Currently, WestWater Farms is in possession of a referral letter from the Utah Department of Environmental Quality, Divison of Water Quality (DWQ), as shown in Attachment 6. The letter discusses requests for groundwater discharge for treated produced water and its expected effluent quality. The DEQ exempts WestWater Farms from obtaining a construction permit, but does require an operating permit to be obtained. All other referral agency letters are not currently in possession by WestWater Farms. WestWater Farms will continue to work with the Planning Commission to coordinate additional letters needed for approval.

7. The Staff requires that drilling muds of any kind are not permitted and shall not be accepted.

WestWater Farms recognizes that drilling muds of any kind are not permitted and will not accept drilling muds of any kind.

8. The Staff recommends WestWater Farms submit building permit applications for any new structures or alterations to existing structures.

In accordance with the requirements of the Grand County Building Department, WestWater Farms will submit a complete building permit application package for all relevant structures promptly. This application will include the required calculations and drawings for building permitting purposes.

9. The Staff requires that 100 percent of the production water received by WestWater Farms shall be subject to the Grand County fee schedule as updated annually.

WestWater Farms understands this and will comply.

10. The Staff recommends WestWater Farms submit a monthly summary report of barrels received to the County Clerk by the 5^{th} day of the following month.

WestWater Farms accepts this term.

11. The Staff notes that Grand County requires to be notified within 30 days of any changes in ownership, operation, or state permit provisions. WestWater Farms shall be subject to routine site inspections as determined by the County Engineer and County Council.

WestWater Farms accepts this term.

12. The Staff requires that at the County Council's request, the conditional use permit may be subject to an annual statement of compliance including a detailed and specific report on steps taken in the prior year to comply with applicable local, state, and federal requirements and laws (LUC 9.11.7C).

WestWater Farms accepts this term.

13. The Staff requires that if the facility has not been in operation within one year of obtaining the conditional use permit and a request for extension has not been received and approved by the County Council, the conditional use permit shall expire. Additionally, if the facility at anytime shuts down for a period of one year, the conditional use permit shall expire and the reclamation bond shall be utilized for site restoration.

WestWater Farms accepts this term.

Please contact us if you have any further questions regarding the information contained herein.

Sincerely,

STEWART ENVIRONMENTAL CONSULTANTS, LLC ON BEHALF OF WESTWATER FARMS, LLC

Andrew Stewart Project Engineer

Brad E. Eaton, PE Senior Project Manager

Enc.

Attachment 1

Site Plans

WESTWATER FARMS PRODUCTION WATER RECYCLE FACILITY



COVER SHEET WESTWATER FARMS PRODUCTION
WATER RECYCLE FACILITY WESTWATER FARMS, LLC

4422.001 0.0

CONDITIONAL USE APPLICATION

NOVEMBER 2010

WESTWATER FARMS, LLC POST OFFICE BOX 324 STEWART ENVIRONMENTAL CONSULTANTS, INC 3801 AUTOMATION WAY, SUITE 200

SHEET INDEX

CIVIL DETAILS COVER SHEET SITE PLAN

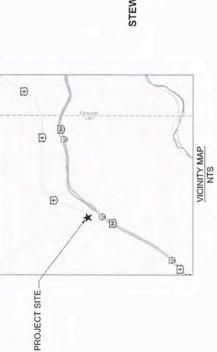
LEAK DETECTION SYSTEM ANDSCAPE PLAN DRAINAGE PLAN

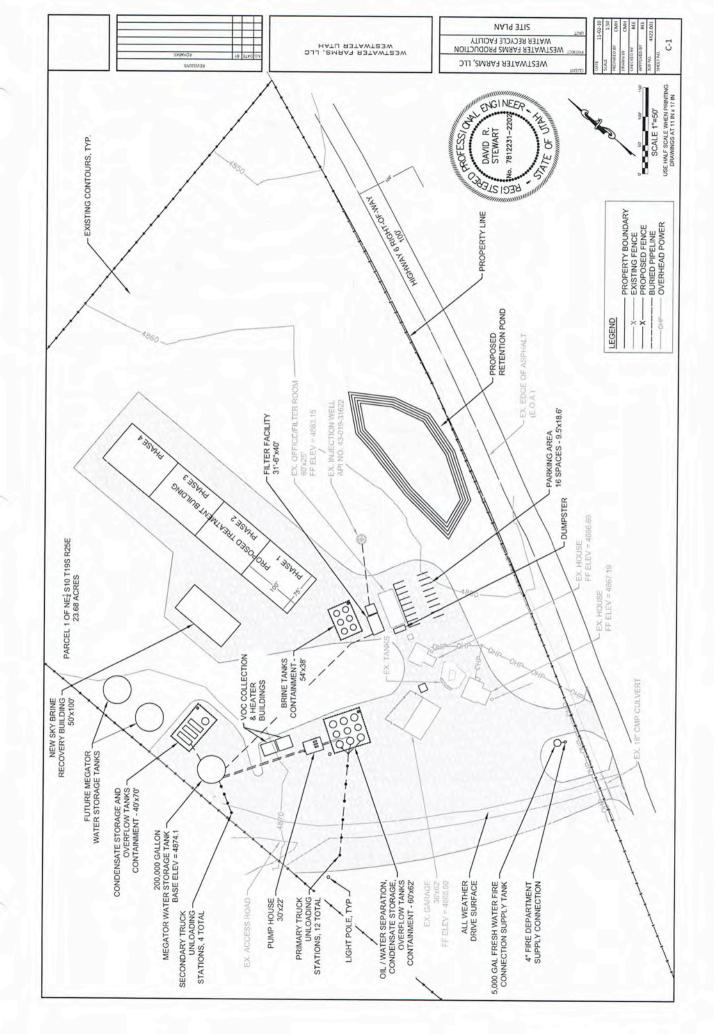


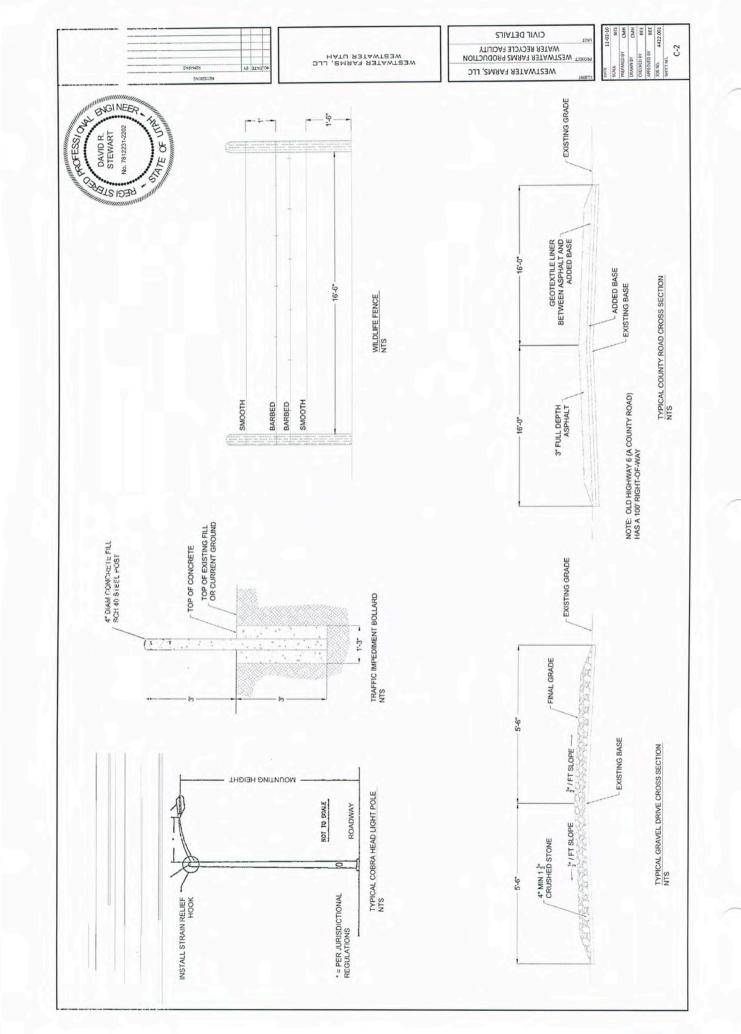


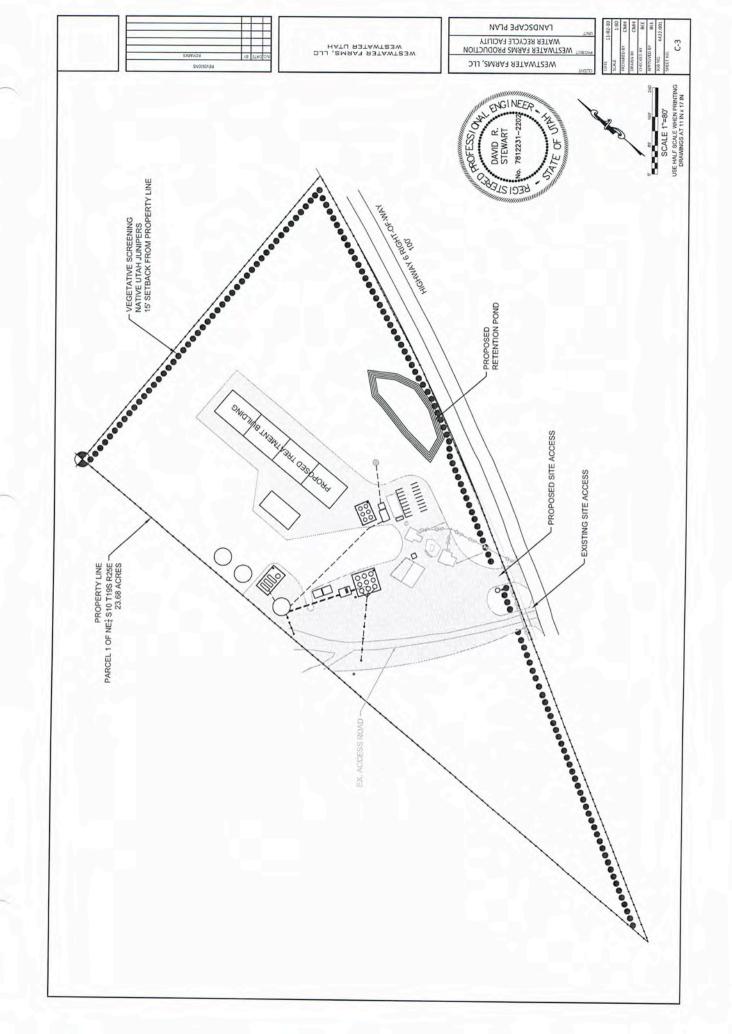
(970) 406-1466 CONTACT: TOM WARNES CISCO, UTAH 84515

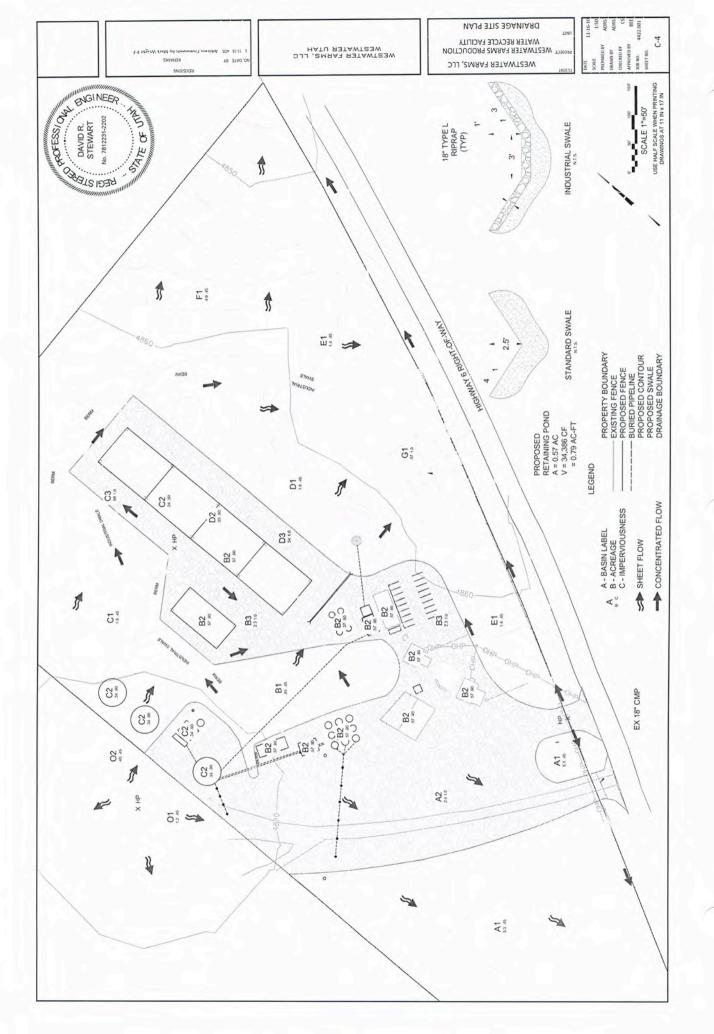
FORT COLLINS, CO 80525 (970) 226-5500 CONTACT: BRAD EATON, P.E.

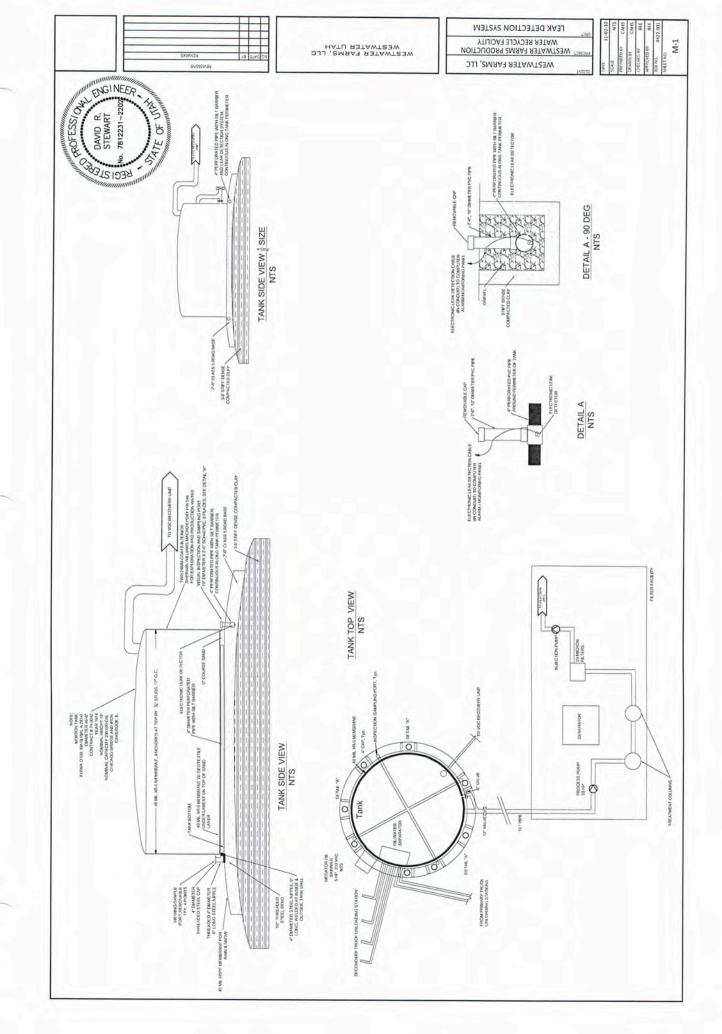












Attachment 2

Lighting Cut Sheets



EverLast® Induction Lighting ESB-EC-250W

Wattage: 250w

• Lamp Life Rating: 100,000 hours

CCT: 5000KCRI: 86-90IP Rating: IP54

Vibration & Shock Resistance: ExcellentApplications: Parking lots, plazas, shopping

malls, athletic courts

EPA: 1.9 ft.²

Lamp Specifications

Wattage (W)	Lumens (LM)	L/W Ratio	CRI	CCT (Kelvin)	Rated Life (Hours)
250	21,000	84	86-90	5000	100,000

Ballast Specifications

Input	Input Voltage	Input Current	Input Freq.	Power	Operating	THD
Power (W)	(V)	(A)	(Hz)	Factor (PF)	Temp. (°F)	(%)
265	120-277/480*	2.21-1.00/0.56	50/60	>.95	-40 to 130	<10

^{*480}v option available for additional cost

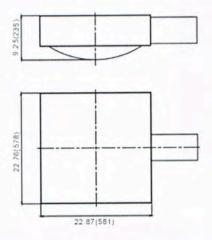
Physical Specifications

- Welded aluminum housing with bronze powder coated finish for corrosion-resistance
- Anodized aluminum reflector designed to optimize light distribution
- Clear polycarbonate or tempered glass lens
- Electronic ballast with high power factor

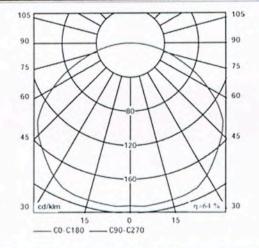


EverLast® Induction Lighting ESB-EC-250W

Dimensions



Photometric Data



EverLast® Terms and Conditions of 10 Year Limited Warranty

EverLast® Induction Lighting warrants that our fixtures, ballasts, and lamps will be free from defects in materials and workmanship for a period of ten (10) years or 60,000 hours (whichever comes first) from date of installation or date of manufacture if installation date is unknown. Ballasts, lamps, fixtures demonstrated to be defective within the warranty period will be repaired or replaced at EverLast® Induction Lightings discretion, at no cost provided the fixtures are installed and operated in accordance with manufacturers recommendations. This warranty applies only to the original purchaser, for fixtures used within the US, Canada, or other countries as specified by EverLast® Induction Lighting. The warranty is non-transferable. EverLast® Induction Lighting reserves the right to examine all failed induction lighting systems and reserves the right to be the sole judge as to whether any housing, lamp and/or ballast is defective and covered under this warranty.

To view the full terms and conditions please visit the EverLast® website http://www.everlastlight.com/terms and conditions.html.

EverLast® Lighting A Product of Full Spectrum Solutions, Inc. 2009, All Rights Reserved

888-383-7578

www.everlastlight.com

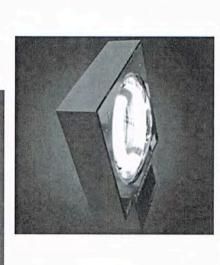
2021 Wellworth Street Jackson, Michigan 49203 U.S.A

NDUCTION LIGHTING

EverLast®

UltraLux T5_ Resources _ Comparisons _ Smart Lights Indoor Lighting Outdoor Lighting Wet Locations Street & Parking PVW Hybrid Home > Street & Parking > EverLast® Induction Shoe Box Lights EverLast® Breaking News Home

Classic Shoe Box



Lamp Life Rating: 100,000 hours Model Number: ESB-EC-250W

Lumen Maintenance: 70% over 100,000 hours Energy Savings: 60% over HID sources

IP Rating: IP54

Comparison Pages

Light Output: 5000 Kelvin, 86-90 CRI

EPA: 1.9ft²

Applications: Parking lots, billboards, athletic courts BUG rating: B3-U3-G3

Warranty: 10 year warranty (see terms and conditions)

Compare to Basic Indoor Lighting

Compare to LED Lighting

Comparisons

New! EverLast® Electrodeless Fluorescent **Technology**



Cut Sheet

Search

IES Photometrics

Photometric Report

EverLast® Interactive Layout Calculator



Installation Photo Gallery

Request Quote

Or call toll-free 888-383-7578

Lamp Specifications:

Wattage	Lumens	S CK		CCT(Kelvin)	Rated Life	
250 watts	21,000	86-90		2000	100,000 hours	
Ballast Specifications:	ions:					
Input Wattage	Input Voltage Input Current Input Freq. Power Factor	Input Current	Input Freq.	Power Factor	tor Operating Temp.	표
265	120-277v / 480v	120-277v / 480v 2.21-1.00A / 0.56A	20/60 Hz	>.95	-40 to 130 °F	<10%

Physical Specifications:

- Welded aluminum housing with bronze powder coat finish for corrosion-resistance
 - Clear polycarbonate or tempered glass lens for increased strength
- Anodized aluminum reflector designed to optimize light distribution
 Electronic ballast with high power factor, flicker free instant re-strike

 - Excellent vibration & shock resistance

Attachment 3

UDOGM Correspondence

Alison Rosso

From: Brad Eaton

Sent: Tuesday, November 02, 2010 10:14 AM

To: Alison Rosso

Subject: FW: West Water Farms

UDOGM leak detection approval correspondence

STEWART ENVIRONMENTAL
CONSULTANTS, LLC

ENGINEERING FOR LIFE Brad E. Eaton, PE Senior Project Manager 3801 Automation Way, Suite 200 Fort Collins, Colorado 80525 t: 970.226.5500 ext. 213

f: 970.226.4946

e: brad.eaton@stewartenv.com

w: stewartenv.com

From: Dan Jarvis [mailto:danjarvis@utah.gov] Sent: Tuesday, November 02, 2010 10:13 AM

To: Brad Eaton

Subject: West Water Farms

Brad

Bart Kettle of our Price field office conducted an inspection of the West Water Farms facility on 10/05/2010. Based on his inspection of the leak detection system in the produced water tank, the Division has approved that portion of the construction of the facility. Should you have any other questions, feel free to contact me.

Daniel J. Jarvis, P.G. Environmental Manager/Geologist Utah Division of Oil, Gas and Mining 801-538-5338 phone 801-359-3940 Fax

Attachment 4

Reclamation Bond Road Improvement Cost Estimate

WESTWATER FARMS RECYCLING FACILITY

21. BONDING

Westwater Farms will be bonding Site Reclamation with The State of UTAH Department of Gas and Minerals. Westwater Farms will be bonding two Class II Injection Wells with The State of UTAH Department of Gas and Mineral. Westwater Farms will be bonding Road Paving on Hay Road and Highway 6 the I-70 Right-o-Way to the entrance to the Westwater Farms Recycling Facility.

PLANT DECOMMISSIONING

AND SITE RECLAMATION

WESTWATER FARMS RECYCLING FACILITY

COST ESTIMATE

Tank Removal			
Labor-welders	70 hours	\$65/hr	\$7,800
Boom truck	24 hours	\$65/hr	\$1,560
Mobilization			\$720
Project Management			\$400
General Conditions			\$880
Sub-Total			\$11,360
Less Salvage			\$4,000
Total Tank Removal	\$7,360		
Removal of Buildings, Concrete, Piping			\$3,280
Regrading and Natural Grass Seeding			\$3,840
TOTAL DECLAMATIO	N COST		Ø14.400
TOTAL RECLAMATIO	N COSI		\$14,480

STATE OF UTAH FORM 4D DEPARTMENT OF NATURAL RESOURCES DIVISION OF OIL, GAS AND MINING Bond No. COLLATERAL BOND EXPLORATION AND PRODUCTION WASTE DISPOSAL FACILITY KNOW ALL MEN BY THESE PRESENTS: That (operator name) Westwater Farms LLC as Pri authorized and qualified to do business in the State of Utah, is held and firmly bound unto the State of Utah in the sum of: as Principal, which is duly lawful money of the United States by virtue of the following financial instruments (cash account; negotiable bonds of the United States, a state, or municipality; or negotiable certificate of deposit): Negotlable Certificate of Deposit payable to the Director of the Division of Oil, Gas and Mining, as agent of the State of Utah, for the use and benefit of the State of Utah for the faithful payment of which we, as the authorized, undersigned officers of the Principal, bind ourselves, our heirs, executors, administrators and successors, jointly and severally by these presents. THE CONDITION OF THIS OBLIGATION IS SUCH THAT, WHEREAS the Principal is or will be engaged in the construction and/or operation of a waste disposal facility in the State of Utah, for the purpose of disposal of exploration and production wastes for the following described facility and land: Westwater Farms LLC 10 25e Township: Range: Grand County: NOW, THEREFORE, if the Principal shall comply with all the provisions of the laws of the State of Utah and the rules, orders and requirements of the Board of Oil, Gas and Mining of the State of Utah, Including, but not limited to the proper maintenance and operation of the above listed facility in such a manner as not to cause pollution of the waters of the state or other adverse environmental impacts, and upon abandonment of the facility and the proper closure of the facility site, then this obligation is vold; otherwise, the same shall be and remain in full force and effect. IN TESTIMONY WHEREOF, said Principal has bereunto subscribed its name and has caused this instrument to be signed by its duly authorized officers and its corporate or notary seal to be affixed this Vovem b

Aptary Seal fi (Corporate) My Commission Expires Sept. 20, 2011

Westwater Farms LLC Principal (company name)

Paul Jeffrey Dyke

Manager/Member

Name (prify)

Title

(5/2002)

Bond No.		STATE OF UTAH TMENT OF NATURAL RE ON OF OIL, GAS AN	ESOURCES	FORM 48
	C	COLLATERAL BO	OND	
KNOW ALL MEN BY THESE PR	ESENTS:			
That we (operator name) Wests which is duly authorized and qual	vater Farms LLC	the State of Utah, are held	d and firmly bound unto the Sta	as Principal te of Utah in the sum of:
Fifteen Thousand and nollawful money of the United States or municipality, or negotiable cert	100 by virtue of the follow	ing financial Instruments (
Negotiable Certificate of D	Deposit			
payable to the Director of the Div feithful payment of which we blod THE CONDITION OF THIS OBLI repairing, operating, and plugging oil or gas production and/or the in	GATION IS SUCH TH	executors, edministrators a IAT, WHEREAS the Prince a well or wells and restoring	and successors, jointy and sav	erally by these presents, chilling, redrilling, deepening ate of Utah for the purposes o
Blanket Bond:		drilled in the State of Utal		
Individual Bond:	Well No: N352			
		Township: 19s		
NOW, THEREFORE, if the above requirements of the Board of Oil, of and well site restoration, then this IN TESTIMONY WHEREOF, said officers and its comparate or notary.	Sas and Mining of the S obligation is void; other Principal has hereunte	State of Uteh, including, but envise, the same shall be subscribed its name and	it not limited to the proper plugg and remain in full force and eff	ing and abandonment of well: fect.
(Corporate of Bully Seal Ment) NOTARY OF COLOR Altestee: Altestee:	20, 2011/1-17-09 Date:	Westwater Farms	Principal (company name)	
(5/2002)				

WESTWATER FARMS RECYCLING FACILITY

ROAD IMPROVEMENT COST ESTIMATE

County Road 192 1140 LFT. x 32' - 0" wide	4,053 s.y.
County Road 193 1360 LFT. x 24' - 0" wide	3,627 s.y.
Total Paving	7,680 s.y.
Road Base: Class 6; 1,031 tons @ \$9.80	\$10,104.00
Geotextile: Terratex G.S. Fabric	\$5,625.00
3" Asphalt: @ 1,354 tons @ \$98.00 ton	\$132,692.00
Mobilization	\$1,926.00
Asphalt removal, grading, compacting, traffic control, stripping, signage	\$15,781.00
TOTAL ROAD IMPROVEMENTS	\$166,128.00

Attachment 5

Permitting Process Description and Status





November 24, 2010

Mr. Mark Wright, County Engineer Ms. Kristine Killoy, County Planner Grand County Community Development 125 East Center Street Moab, Utah 84532

Subject:

Permit Process Description and Status

Project No.:

4422.001(10)

Dear Mr. Wright and Ms. Killoy:

Stewart Environmental Consultants, LLC, on behalf of WestWater Farms, LLC, is pleased to provide this narrative describing the process and the status of the required permits for the WestWater Farms, LLC produced water treatment facility under consideration in Grand County. The following permits are required for the site:

1. Utah Division of Oil, Gas, and Mining (UDOGM) Permit to Receive and Treat Production Water

UDOGM received WestWater Farms' application August 14, 2008 and granted approval July 28, 2009, after several application amendments. Please see Attachment 1 for this approval letter.

2. UDOGM Permit to Drill Injection Well

UDOGM granted approval to drill the Harley Dome 1 Well, API identification number 43-019-31622, on December 1, 2009. The approval will expire one year from that date, unless "substantial and continuous operation is underway." This well was completed in July 2010, and operation of the injection well is planned to begin when the underground injection control (UIC) permit and operating permit are granted by UDOGM. Please see Attachment 2 for the UDOGM approval letter.

3. UDOGM UIC Permit

The 30-day public notice period for WestWater Farms' May 26, 2009 UIC permit application was closed on September 15, 2010. The public notice received four responses. Three of the responders requested a hearing. The fourth response was a letter of concern from the U.S. Fish and Wildlife Service (FWS) that provided information regarding water quality and endangered species on the Colorado River, but did not ask for a hearing. Stewart Environmental submitted a water monitoring program in early October 2010 to both UDOGM and FWS to satisfy FWS's concerns, and followed up with the results of our baseline survey (the first step of the water monitoring program) in mid-November 2010. See Attachment 3 for the FWS's letter, a letter regarding the water monitoring program, and the results of our baseline survey.

The three entities that asked UDOGM for a hearing on the UIC permit were the U.S. Bureau of Land Management (BLM), one individual, and the Living Rivers organization. Stewart Environmental and David Allin, the project's hydrogeologist, also met with the staff at the BLM to discuss their concerns. We provided information on the geology and why this injection well will not affect the helium deposit to which they own the mineral rights nor water quality on the Colorado River. The BLM has since withdrawn its objection and has withdrawn from any hearing. Please see Attachment 4 for the BLM's protest letter and protest withdrawal letter.

WestWater Farms has filed a Request for Agency Action with UDOGM (see Attachment 5), with an agency hearing scheduled for December 8, 2010, in the hopes of resolving the remaining objectors' concerns and having the UIC permit issued administratively. Please note, this conditional use permit (CUP) application only addresses Parcel 1 of the WestWater Farms property. WestWater Farms has applied for a second UIC permit for an injection well on a different parcel, which has not been acted upon by UDOGM. *UIC permits for wells on other parcels will be addressed in future CUP applications*.

4. Utah Department of Environmental Quality (UDEQ), Division of Water Quality (DWQ) Operating Permit

WestWater Farms has not received notification from the DWQ's Engineering Section regarding new rules for the Operating Permit Program, but will abide by these rules once drafted. We will follow up with DWQ to this effect.

We understand that a separate operating permit for the treatment facility will be issued by Grand County upon approval of the CUP by the County Council.

5. UDEQ DWQ Groundwater Discharge Permit

The Utah DWQ provided WestWater Farms with a letter dated August 27, 2008 (see Attachment 6). This is an explanation of the division's approval of the discharge of produced water under the "Permit by Rule". This is a permit for groundwater discharge of treated produced water for agricultural purposes. This letter specifically states that the discharge will need to meet a total dissolved solids concentration of 500 milligrams per liter (mg/l) or less and have a total petroleum hydrocarbon value of 10 mg/l or less. Our pilot testing and design to date on the treatment facility show that we will meet these requirements.

6. National Pollutant Discharge Elimination System (NPDES) Discharge Permit

Current design includes several methods of releasing treated produced water from this treatment facility. One of the proposed methods is through an NPDES discharge permit. WestWater Farms will submit the NPDES discharge permit application shortly. However, this will not be part of the CUP submittal at this time. If this permit is granted and WestWater Farms decides to pursue this in the future, then a modification to this CUP or a new CUP application will be submitted at that time. Currently, WestWater Farms plans to use treated water from the plant for onsite irrigation through the DWQ groundwater discharge permit-by-rule provided in Attachment 4. Please note, the NPDES discharge permit is not part of the CUP submittal; WestWater Farms will file for amending the CUP or submit a new CUP application if they decide to discharge treated water under the NPDES permit.

7. UDEQ Division of Air Quality (DAQ) Air Pollution Permit

A previous conversation with DAQ personnel suggested the facility will not need this permit, as it is designed to produce less than the permit's limits of 500 pounds per year of a single contaminant or combined contaminants totaling 1 ton per year. See Attachment 7 for a letter describing this conversation.

8. Grand County Building Permits

WestWater Farms has been in contact with the Grand County building official, Mr. Jeff Whitney, and will submit a complete building permit application package for all relevant structures promptly. This application will include the required calculations and drawings for building permitting purposes.

Please contact us if you have any further questions regarding the information contained herein.

Sincerely,

STEWART ENVIRONMENTAL CONSULTANTS, LLC ON BEHALF OF WESTWATER FARMS, LLC

Alison Rosso

Project Administrator

alison Rosso

David R. Stewart, PE President and CEO

Enc.

Attachment 1

UDOGM Production Water Approval Letter



Lieutenant Governor

State of Utah

DEPARTMENT OF NATURAL RESOURCES

MICHAEL R. STYLER Executive Director

383375040AII

Division of Oil, Gas and Mining JOHN R. BAZA Division Director

July 28, 2009

Tom Warnes Westwater Farms, LLC P.O. Box 23358 Silverthorne, Colorado 84515

Subject: Approval to Construct a Commercial Produced Water Disposal Facility Westwater Farms Facility -Section 10, Township 19 South, Range 25 East SLB&M, Grand County, Utah

Dear Mr. Warnes,

Your application/maps to construct the above referenced facility ("the Facility") was received on August 14, 2008 and subsequently amended several times through June 25, 2009. The application was reviewed by Division staff and meets the requirements for a commercial produced water disposal facility in accordance with Utah Administrative Code R649-9 et al., of the Oil and Gas General Rules.

Therefore approval to commence construction of the Facility, which will consist of an unloading station/tank battery, water processing plant and secondary containment "berm & catchment pit", is hereby granted in accordance with the following stipulations:

- 1. The facility shall be constructed under the supervision of a registered professional engineer and shall meet all the conditions and requirements of the submitted application/maps.
- 2. The Division requires that our staff be informed of all phases of construction and be allowed the opportunity for inspection during the construction and installation activities including but not limited to leak detection system emplacement and secondary containment construction. Call Dan Jarvis at (801) 538-5338 or Bart Kettle (435) 820-0862 at least 2 days prior to construction activity.
- 3. The leak detection system shall be emplaced in the main tank as specified in the engineering plans, and the lines in the tank shall be exposed at time of inspection.
- 4. The facility shall be fenced to deter livestock, wildlife, and unauthorized personnel.



1594 West North Temple, Suito 1210, PO Bax 145801, Salt Lake City, UT 84114-5801 telephone (801) 538-5240 . facstroile (801) 359-3940 . TTY (801) 538-7458 . www.ogm.wah.gov Page 2 July 28, 2009 Westwater Farms, LLC

- Secondary containment is required at the Facility to prevent any waters from leaving the site in the event of catastrophic tank failure.
- 6. The full bonding requirement for the Facility is \$10,000.00.

Final approval to operate the facility/pits will be issued upon completion of the construction phase, and compliance with all the stipulations.

This approval does not exempt the operator from complying with all other federal, state and local rules and ordinances.

If you have any questions concerning this approval, please contact Brad Hill at (801) 538-5315.

Sincerely,

Gil Hunt

Associate Director

Mig That

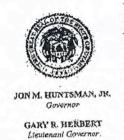
GLH/BGH/js

cc: Bart Kettle, Price Office
Rob Herbert, DEQ/Water Quality (SL)
Grand County Planning Office
Bond File
Facility File

N:\O&G Permits\Disposal Facilities (Pits, LF, etc)\Westwater Farms

Attachment 2

UDOGM Approval to Drill Injection Well



State of Utah DEPARTMENT OF NATURAL RESOURCES

MICHAEL R. STYLER Executive Director

Division of Oil Gas and Mining

JOBN R. BAZA
Division Director

December 1, 2009

JEFF DYKE

Westwater Farms, LLC P.O. Box 23358 Silverthome, CO 80498

Re: Harley Dome 1 Well, 600' FNL, 2139' FEL, NWNE, Sec. 10, T. 19 South, R. 25 East, Grand County, Utah

Gentlemen:

Pursuant to the provisions and requirements of Utah Code Ann. § 40-6-1 et seq., Utah Administrative Code R649-3-1 et seq., and the attached Conditions of Approval, approval to drill the referenced well is granted.

This approval shall expire one year from the above date unless substantial and continuous operation is underway, or a request for extension is made prior to the expiration date. The API identification number assigned to this well is 43-019-31622.

Sincerely,

Gil Hunt

Associate Director

Sty Flat

js Enclosures

cc: Grand County Assessor

Bureau of Land Management - Moab Field Office



JYLSD / BURNIL

Operator:	Westwater Farms, LLC
Well Name & Number	Harley Dome 1
API Number:	43-019-31622
Lease:	UTU-82619
	D 05 F 4

Location: NWNE_

Sec. 10

T. 19 South

R. 25 East

Conditions of Approval

1. General:

Compliance with the requirements of Utah Admin. R. 649-1 et seq., the Oil and Gas Conservation General Rules, and the applicable terms and provisions of the approved Application for Permit to drill.

2. Additional Approvals:

The operator is required to obtain approval from the Division of Oil, Gas and mining before performing any of the following actions during the drilling of this well:

- Any changes to the approved drilling plan contact Dustin Doucet
- Significant plug back of the well contact Dustin Doucet
- Plug and abandonment of the well contact Dustin Doucet

3. Notification Requirements:

The operator is required to notify the Division of Oil, Gas and Mining of the following actions during drilling of this well:

- 24 hours PRIOR to the spudding of the well contact Dan Jarvis or Dustin Doucet
- 24 hours prior to testing blowout prevention equipment contact Dan Jarvis
- 24 hours prior to cementing or testing casing contact Dan Jarvis
- Within 24 hours of making any emergency changes to the approved drilling program – contact Dustin Doucet
- 24 hours prior to commencing operations to plug and abandon the well contact
 Dan Jarvis

4. Contact Information:

The following are Division of Oil, Gas and Mining contacts and their telephone numbers (please leave a voicemail message if the person is not available to take the call):

Carol Daniels

801-538-5284 - office

Dustin Doucet

801-538-5281 - office

801-733-0983 - after office hours

Dan Jarvis

801-538-5338 - office

801-231-8956 - after office hours

Page 2 43-019-31622 December 1, 2009

5. Reporting Requirements

All reports, forms and submittals as required by the Utah Oil and Gas Conservation General Rules will be promptly filed with the Division of Oil, Gas and Mining, including but not limited to:

- Entity Action Form (Form 6) due within 5 days of spudding the well
- Monthly Status Report (Form 9) due by 5th day of the following calendar month
- Request to Change Plans (Form 9) due prior to implementation
- Written Notice of Emergency Changes (Form 9) due within 5 days
- Notice of Operations Suspension or Resumption (Form 9) due prior to implementation
- Report of Water Encountered (Form 7) due within 30 days after completion
- Well Completion Report (Form 8) due within 30 days after completion or plugging
- 6. Compliance with the Conditions of Approval/Application for Permit to Drill outlined in the Statement of Basis. (Copy Attached.)
- 7. Cement volumes for the 8 5/8" and 5 1/2" casing strings shall be determined from actual hole diameters in order to place cement from the pipe setting depths back to the surface.
- 8. If water is encountered in Entrada while drilling, it should be sampled prior to continuing drilling into the Kayenta Formation.

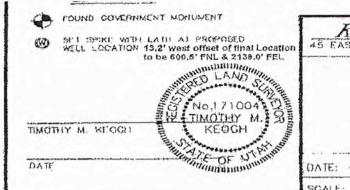
STATE OF UTAH DEPARTMENT OF NATURAL RESOURCES

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United States (BLM) Surface and All Minerals Section 10: W2, SE United States Oil & Gas Section 10: All, Leased under UTU-82619



45 EAST CENTER STREET MOAB, UTAH, 84532

A SURVEY OF

HARLEY DOME #1

WITHIN SECTION 10, T 19 S, M 25 E, SLM.

PREPARED FOR

GOLD MIN. REALTY

DATE: 4-7-09

DRAWN BY: INK CHECKED BY: IMK

SCALE: 1"-1000"

F.B.# 141

HARLEYDOME, DWG

Statement of Basis

7/21/2009

Utah Division of Oil, Gas and Mining

Page 1

APD No

API WellNo

Status

Well Type

Surf Owni

CBM

1612

43-019-31622-00-00

Surface Owner-APD

WI

Operator Well Name HARLEY DOME I

WESTWATER FARMS LLC

Tinit

Type of Work

Field GREATER CISCO NWNE 10 198 25E S 600 FNL 2139 FEL GPS Coord (UTM) 661253E 4337601N Location

Significant volumes of high quality ground water are likely to be encountered in the bedrock at this location. A poorly permeable soil is likely to be developed on the thin cover of Lower Shale Member of the Mancos Shale that may overlie the Cretaceous age Dakota Sandstone. Good quality water is likely to be encountered in permeable Mesozoic sandstones found below the Mancos Shale. The well is likely to penetrate as many as four locally recognized aquifers. The proposed casing and cementing program and benign mud system should adequately isolate any zones of fresh water that may be penetrated. No underground water rights have been filed on any area within a mile of the proposed well site.

Chris Kierst APD Evaluator

7/9/2009 Date / Time

Surface Statement of Basis

Pre-site evaluation completed June 16, 2009. In attendance: Bart Kettle-DOGM, Wayne Downs-Grand County, Mark Wright-Grand County, Tom Warnes-Westwater Farms, LLC

As proposed the project falls within a previously disturbed site for the proposed Westwater Farms water treatment facility. Vegetation is dominated by weedy annual species and soils are actively croding from spring winds at inspection. Drainage from tanks for water treatment facility into secondary containment flows through the proposed well pad. Additional culvert will be required for well pad access and work space.

Reserve pit is being permitted as 50' long x 10' wide x 5' deep. Pit shall be properly lined with a 12 mil liner. Reserve pit shall not be used for the storage of produced fluids, outside E&P waste or secondary containment for the proposed waste water treatment facility. Consistent with the Utah Oil and Gas Conservation General Rules R649-3 the reserve pit shall be reclaimed within one year following drilling of the well bore.

Grand County requires road encroachment permit for County Rd 193, building permit and compliance with land use code. In addition county is requesting funds for review to be placed on deposit.

Bart Kettle

6/16/2009

Onsite Evaluator

Date / Time

Conditions of Approval / Application for Permit to Drill

Category

Condition

Pits

A synthetic liner with a minimum thickness of 12 mils shall be properly installed and

maintained in the reserve pit.

Surface

Drainages adjacent to the proposed pad shall be diverted around the location.

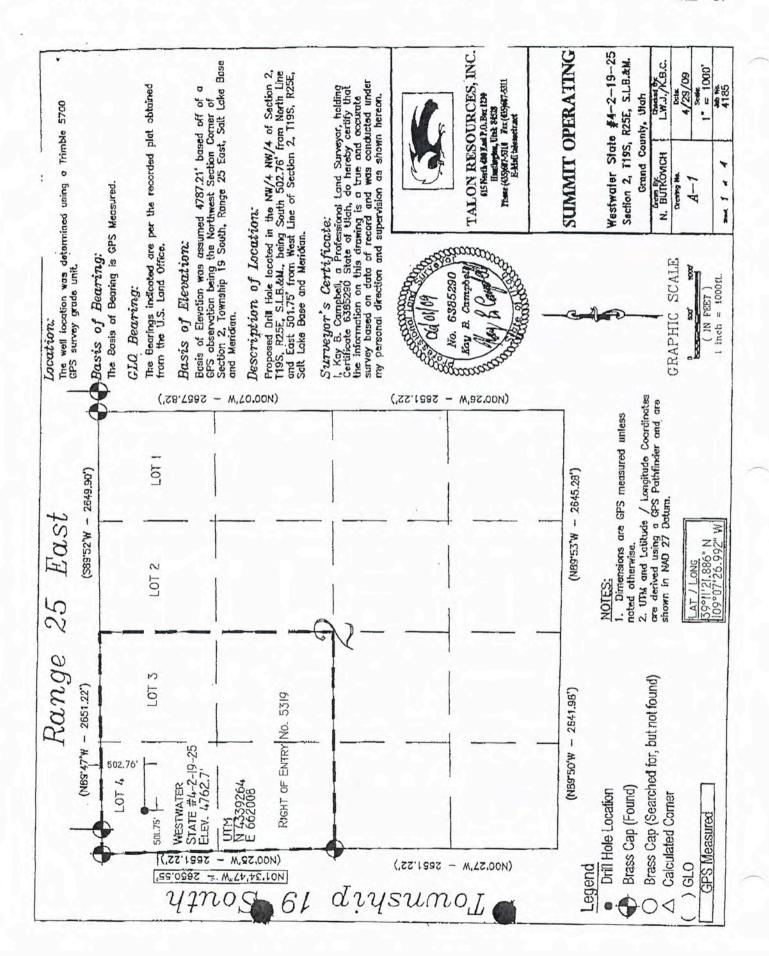


STATE OF UTAH DEPARTMENT OF NATURAL RESOURCES DIVISION OF OIL, GAS AND MINING

	FORM

AMENDED REPORT (highlight changes)

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DRILLING PROGRAM

Attached to UDOGM Form 3
Summit Operating, LLC
Westwater State 4-2-19-25
NW/4 NW/4, Lot 4, Sec. 2, T19S, R25E, SLB & M
503' FNL, 502' FWL
Grand County, Utah

1. The Geologic Surface Formation

Tununk Member Mancos Shale

2. Estimated Tops of Important Geologic Markers

KB	Ground + 10'
Dakota Sandstone	35'
Cedar Mountain Formation	115'
Brushy Basin Member Morrison	180'
/ Salt Wash Member Morrison	600'
Tidwell Member Morrison	817'
Summerville Formation	852'
Slick Rock Member Entrada	897'
/ Kayenta Formation	1145'
Wingate Sandstone	1353'
Chinle Formation	1687'
TD Chinle Formation	1735'

3. Projected Gas & Water Zones

No Groundwater is anticipated to be encountered. Water encountered will be reported on a Form 7 "Report of Water Encountered During Drilling".

Casing & cementing will be done to protect potentially productive hydrocarbons, lost circulation zones, abnormal pressure zones, and prospectively valuable mineral deposits. All indications of usable water will be reported.

Surface casing will be tested to 1000 psi for 10 minutes. Pressure drop is not to exceed 150 psi.



4. The Proposed Casing and Cementing Programs

Casing Program

HOLE SIZE	SETTING DEPTH	SIZE (OD)	WEIGHT, GRADE & JOINT	CONDITION
12-1/4"	170'	9-5/8"	32.3# H-40	New
8-5/8	1,725'	7"	23# J-55 LT&C	New

Cement Program

Only the surface casing will be cemented aback to surface.

Surface Casing:

90 sacks NEAT Class A Slurry

Weight: 15.6 # / gal Yield: 1.18 cu.ft / sk

Production Casing:

141 sacks Class H 50-50 Pozmix W/2% Bentonite &

Pounds/sk Gilsonite Weight: 13.6 #/ gal Yield: 1.40 cu.ft / sk

The following shall be entered in the driller's log:

- 1) Blowout preventer pressure tests, including test pressures and results;
- Blowout preventer tests for proper functioning;
- 3) Blowout prevention drills conducted;
- 4) Casing run, including size, grade, weight, and depth set;
- 5) How the pipe was cemented, including amount of cement, type, whether cement circulated, location of the cementing tools, etc.;
- 6) Waiting on cement time for each casing string;
- 7) Casing pressure tests after cementing, including test pressures and results.

Attachment 3

FWS Letter of Concern Water Monitoring Program Letter Results of Baseline Survey



United States Department of the Interior FISH AND WILDLIFE SERVICE

UTAH FIELD OFFICE 2369 WEST ORTON CIRCLE, SUITE 50 WEST VALLEY CITY, UTAH 84119

September 15, 2010

In Reply Refer To FWS/R6 ES/UT 10-TA-0338

Mr. Brad Hill, Permitting Manager Utah Division of Oil, Gas, and Mining Box 145801 Salt Lake City, Utah 84114-5801

RE: Cause No. UIC-358.1; Westwater Farms LLC; Harley Dome #1SWD Well

Dear Mr. Hill:

We have reviewed the referenced Underground Injection Control (UIC) Permit Application. The proposed project involves the operation of the Harley Dome #1 well as a salt water injection well (Class II) in Section 10, Township 19 South, Range 25 East, Grand County, Utah. The well will inject fluids into the Wingate formation at approximately 1,750 feet below the surface. We are providing the following comments for your consideration.

The Colorado pikeminnow (*Ptychocheilus lucius*), razorback sucker (*Xyrauchen texanus*), humpback chub (*Gila cypha*), and bonytail (*Gila elegans*) are federally listed endangered fishes endemic to the Colorado Basin. The location of the injection well is approximately five miles from the Colorado River, which is designated critical habitat for all four of the endangered fish species. We are concerned with possible seepage of injected liquids from the referenced project into the nearby Colorado River.

Last week Christopher Kierst of your staff explained in detail to Jana Mohrman from the Upper Colorado River Recovery Program that the receiving aquifer (in the Wingate formation) dipped northeast, away from the Colorado River. We understand that because of this orientation, there is only a remote chance that injected liquids could back up and seep into the Colorado River. Despite this low probability of seepage, we wish to make you aware of the importance of the nearby Westwater Canyon of the Colorado River for recovery of endangered fish species.

Westwater canyon is designated critical habitat for all four species of endangered fish (59 FR 13374). In particular, a large population of humpback chub inhabits this reach. This population is essential to species recovery. The Wingate/Chinle formations are exposed in the cliffs above this reach, creating a possible connection between the injection well receiving site and critical

habitat. We wish to prevent any negative impacts to the water quality in Westwater Canyon from the referenced project.

The Service requests that a water quality analysis and monitoring program be initiated if after the injection period begins, the Upper Colorado River Recovery Program observes contaminated water seeping down the canyon walls.

This response has been prepared under the authority of and in accordance with the provisions of the Fish and Wildlife Coordination Act (16 U.S.C. 661 et seq.) and the Endangered Species Act (16 U.S.C. 1531 et seq.). Thank you for description of the geology and operation of this injection well. We appreciate the opportunity to comment on this application. If you have any questions or need further information, please contact Jana Mohrman, hydrologist, at (303) 236-4486 or Kevin McAbee, ecologist, at (801) 975-3330 ext. 143.

Sincerely

Larry Crist

Paul Badame, Native Aquatics Project Leader Moab Field Station Utah Division of Wildlife

Utah Division of Wildlife 1165 So Hwy 191, Suite 4 Moab, UT 84532

MIOAD, U1 84532

Tom Chart, Director Upper Colorado Recovery Program 44 Union Blvd, Suite 120 Lakewood, Colorado 80228

Michelle Shaughnessy, Project Leader Colorado River Fishery Project

764 Horizon Drive, Building B Grand Junction, Colorado 81506





October 4, 2010

Mr. Brad Hill Utah Division of Oil, Gas, and Mining P.O. Box 145801 Salt Lake City, Utah 84114-5801

Re: Cause No. UIC-358.1

Application for Class II Injection Well

Westwater Farms, LLC Harley Dome 1 SWD Section 10, T19S, R25E Grand County, Utah

FWS/R6, ES/UT, 10-TA-0338

Project No.: 5001.010(4)

Dear Mr. Hill:

We are responding to a request by Westwater Farms, LLC to provide a monitoring program for the injection well to ensure that produced water does not seep from the Wingate formation into Westwater Canyon, to the south of the project. This concern was raised by the U.S. Fish and Wildlife Service on September 15, 2010. In their letter (attached), they are asking for a monitoring program that will provide for a baseline of the overall seeps in the area and if there are additional seeps found after the injection of produced water into the Wingate formation, that these will be monitored for any potential contamination.

It is the opinion of our hydrogeologist that the likelihood of this occurring is very remote. However, in the interest of cooperation, we are proposing the following activities:

- 1. We will have our professional geologist, Mr. Paul Stone, survey the applicable reach of Westwater Canyon and follow the Wingate formation to observe any current seeps. These seeps will be noted in a background document.
- 2. We will then observe the Wingate formation every six months for a period of three years. If we do not observe additional seeps that are the result of the injection well activity, we will then begin monitoring the formation on a yearly basis.
- 3. We will keep a log of the pressures on the injection well. We understand that the underground injection control (UIC) permit will set a limit on the injection pressures. We will stay below that pressure. However, on a monthly basis, we will turn off the injection well to observe the pressure drop with time. This will allow us to understand if there is any unexpected buildup of pressures within the formation.

All of this information will be kept on site for inspection by regulatory agencies. It is our understanding that this will satisfy the U.S. Fish and Wildlife Service as to their recommendation for a monitoring program.

Mr. Brad Hill Utah Division of Oil, Gas, and Mining Page 2 of 2 October 4, 2010

Please contact us with any further questions.

Sincerely,

STEWART ENVIRONMENTAL CONSULTANTS, LLC

David R. Stewart, PhD, PE President and CEO

Enc.

cc: Mr. Larry Crist, U.S. Fish and Wildlife Service

Ms. Jana Mohrman, U.S. Fish and Wildlife Service Mr. Eric Jones, U.S. Bureau of Land Management

Mr. Tom Warnes, WestWater Farms, LLC Mr. David Allin, Del-Rio Resources, Inc.



United States Department of the Interior FISH AND WILDLIFE SERVICE

UTAH FIELD OFFICE 2369 WEST ORTON CIRCLE, SUITE 50 WEST VALLEY CITY, UTAH 84119

September 15, 2010

In Reply Refer To FWS/R6 ES/UT 10-TA-0338

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RE: Cause No. UIC-358.1; Westwater Farms LLC; Harley Dome #1SWD Well

Dear Mr. Hill:

We have reviewed the referenced Underground Injection Control (UIC) Permit Application. The proposed project involves the operation of the Harley Dome #1 well as a salt water injection well (Class II) in Section 10, Township 19 South, Range 25 East, Grand County, Utah. The well will inject fluids into the Wingate formation at approximately 1,750 feet below the surface. We are providing the following comments for your consideration.

The Colorado pikeminnow (*Ptychocheilus lucius*), razorback sucker (*Xyrauchen texanus*), humpback chub (*Gila cypha*), and bonytail (*Gila elegans*) are federally listed endangered fishes endemic to the Colorado Basin. The location of the injection well is approximately five miles from the Colorado River, which is designated critical habitat for all four of the endangered fish species. We are concerned with possible seepage of injected liquids from the referenced project into the nearby Colorado River.

Last week Christopher Kierst of your staff explained in detail to Jana Mohrman from the Upper Colorado River Recovery Program that the receiving aquifer (in the Wingate formation) dipped northeast, away from the Colorado River. We understand that because of this orientation, there is only a remote chance that injected liquids could back up and seep into the Colorado River. Despite this low probability of seepage, we wish to make you aware of the importance of the nearby Westwater Canyon of the Colorado River for recovery of endangered fish species.

Westwater canyon is designated critical habitat for all four species of endangered fish (59 FR 13374). In particular, a large population of humpback chub inhabits this reach. This population is essential to species recovery. The Wingate/Chinle formations are exposed in the cliffs above this reach, creating a possible connection between the injection well receiving site and critical

habitat. We wish to prevent any negative impacts to the water quality in Westwater Canyon from the referenced project.

The Service requests that a water quality analysis and monitoring program be initiated if after the injection period begins, the Upper Colorado River Recovery Program observes contaminated water seeping down the canyon walls.

This response has been prepared under the authority of and in accordance with the provisions of the Fish and Wildlife Coordination Act (16 U.S.C. 661 et seq.) and the Endangered Species Act (16 U.S.C. 1531 et seq.). Thank you for description of the geology and operation of this injection well. We appreciate the opportunity to comment on this application. If you have any questions or need further information, please contact Jana Mohrman, hydrologist, at (303) 236-4486 or Kevin McAbee, ecologist, at (801) 975-3330 ext. 143.

Sincerel

Larry Crist

cc:

Paul Badame, Native Aquatics Project Leader Moab Field Station Utah Division of Wildlife 1165 So Hwy 191, Suite 4 Moab, UT 84532

Tom Chart, Director Upper Colorado Recovery Program 44 Union Blvd, Suite 120 Lakewood, Colorado 80228

Michelle Shaughnessy, Project Leader Colorado River Fishery Project 764 Horizon Drive, Building B Grand Junction, Colorado 81506





November 22, 2010

Mr. Brad Hill Utah Division of Oil, Gas, and Mining P.O. Box 145801 Salt Lake City, Utah 84114-5801

Subject: Results of Baseline Survey – Wingate Sandstone

WestWater Farms, LLC Harley Dome Well #1

Project No.: 4422.001(10)

Dear Mr. Hill:

In accordance with the monitoring plan outlined in our October 4, 2010 letter and subsequent conversations with the U.S. Fish and Wildlife Service (FWS), Stewart Environmental Consultants, LLC has completed our baseline survey of the Wingate Sandstone along the applicable reach of the Colorado River (river miles 132 to 137). The survey location is depicted on Figure 1. FWS concerns are cited in their September 15, 2010 letter and center on the possibility, albeit remote, that injection into the Wingate Sandstone via the Harley Dome Well #1 will promote seepage of liquids into the Colorado River, which is located approximately six miles southeast of the well site.

In their letter, FWS recognized that injection will occur into the Wingate Sandstone at a depth of approximately 1,750 feet and that the formation dips to the northeast, away from the Colorado River. However, the letter states that "Despite this low probability of seepage, we wish to make you aware of the importance of the nearby Westwater Canyon of the Colorado River for recovery of endangered fish species." As the letter states, the canyon is designated critical habitat for four endangered fish species: Colorado pikeminnow (Ptychocheilus lucius), razorback sucker (Xyrauchen texanus), humpback chub (Gila cypha), and bonytail (Gila elegans).

The headwaters of Westwater Canyon begin at river mile 125, approximately six linear miles southwest (downstream) of the survey area (see Figure 1). We observed the outcrop of the Wingate Sandstone from river miles 132 to 137 as an upgradient monitoring point to Westwater Canyon, searching for the presence or absence of seeps, springs, or other water features. This reach of the river is the closest outcrop of the formation to the WestWater Farms site and would be the first point of seepage, if seepage were to occur.

We found no seeps, springs, hanging gardens, or signs of groundwater emanating from the Wingate Sandstone in the survey area. There are signs of surface water flow, as evidenced by staining on the canyon walls, erosional features (from both wind and water) cut into the rock, side canyons (both large and small), and collection of sediment in dry washes at the base of the side canyons and in dry stream beds along the bench tops. The area is high desert terrain with an average rainfall of 9.4 inches per year. Other than the Colorado River, no perennial streams or river tributaries were observed in the area. Based upon topography, the type of erosional features observed, and the meteorological nature of the area, it is apparent that surface water flow occurs in short episodes

Mr. Brad Hill Utah Division of Oil, Gas, and Mining Page 2 of 2 November 22, 2010

in response to storm events, not from seeps or springs at the head of the dry washes or along the canyon walls. Photographs of the survey area are presented on Figure 2.

To confirm the findings of our survey, we spoke with two rangers from the Grand Junction office of the Bureau of Land Management (BLM) who report that they also know of no seeps or springs in our area of interest.

The current survey was intended to document baseline conditions for comparison during future monitoring, which will occur after injection begins. Stewart Environmental plans to observe the Wingate Sandstone every six months for a period of three years. If we do not observe additional seeps or springs that are the result of the injection well activity, we will then begin monitoring the formation on a yearly basis. We will supply additional information as it is obtained.

Please contact us if you have questions or need more information.

Sincerely,

STEWART ENVIRONMENTAL CONSULTANTS, LLC

Paul A. Stone, PG Senior Geologist

David R. Stewart, PhD, PE

President and CEO

Enc.

cc: N

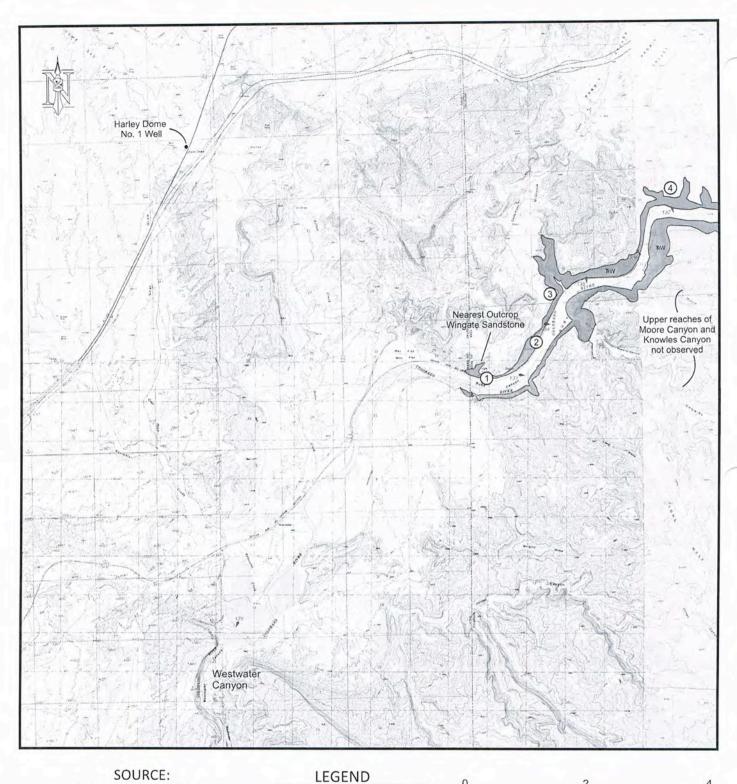
Mr. Larry Crist, U.S. Fish and Wildlife Service

Ms. Jana Mohrman, U.S. Fish and Wildlife Service

Mr. Eric Jones, U.S. Bureau of Land Management

Mr. Tom Warnes, WestWater Farms, LLC

Mr. David Allin, Del-Rio Resources, Inc.



SOURCE:

USGS TOPOGRAPHIC MAPS: Harley Dome, Bitter Creek Well, Ruby Canyon, Agate, Westwater, and Sieber Canyon USGS GEOLOGIC MAP:

Westwater 30'x60' Geologic Quad Map I-1765

Wingate Sandstone 1379 River Mileage

Observation/Photograph 2 Location

SCALE IN MILES

CONTOUR INTERVAL 40 FEET

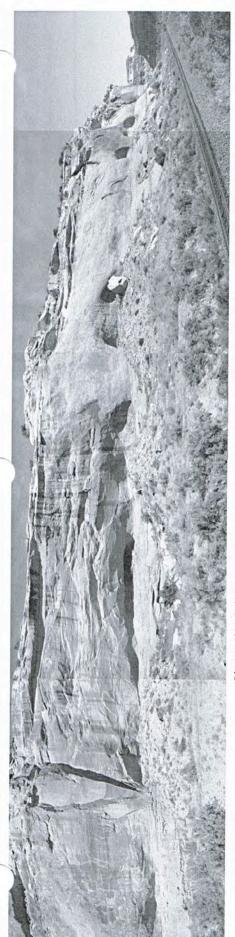


4422.001(10)

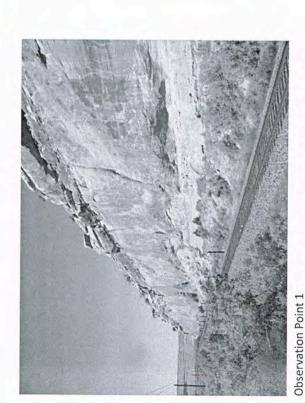
November 2010

WestWater Farms, LLC Production Water Recycling Facility Westwater, Utah

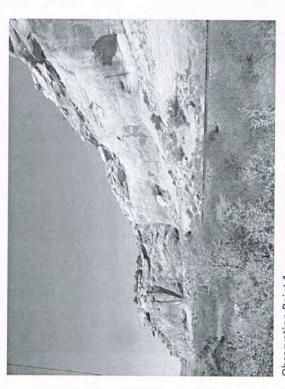
FIGURE 1 WINGATE SANDSTONE WATER SURVEY AREA



Observation Point 1 Panorth showing north wall Ruby Canyon near river mile 132. Staining on cliff wall is from surface flow over the lip of the canyon.



West view showing north wall of Ruby Canyon near river mile 132.



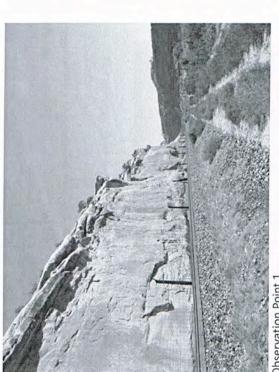
Observation Point 1 West view showing north wall of Ruby Canyon near river mile 132.

STEWART ENVIRONMENTAL CONSULTANTS, LLC

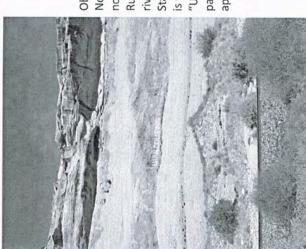
ROJECT NUMBER 4422.001(10) November 2010

WestWater Farms, LLC Produced Water Treatment Plant Westwater, Utah

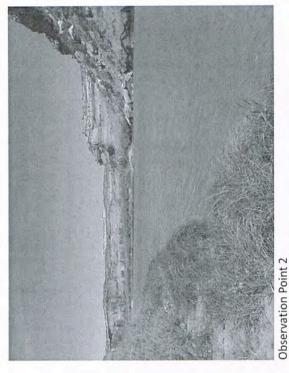
FIGURE 2
WINGATE SANDSTONE - WATER SURVEY AREA
PHOTOGRAPHS
PAGE 1 of 6



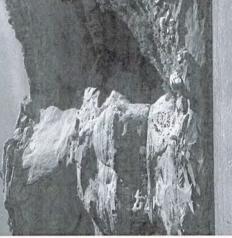
East view showing north wall of Ruby Canyon near river mile 132. Observation Point 1



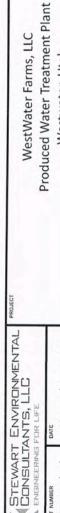
Staining on upper cliff painted on cliff wall is North view showing is from surface flow. approximate border. Observation Point 1 Ruby Canyon near "Utah Colorado" river mile 132. north wall of



East view showing south wall of Ruby Canyon near river mile 134.



Ruby Canyon near river mile 133.5. South view showing Observation Point 2 south wall of

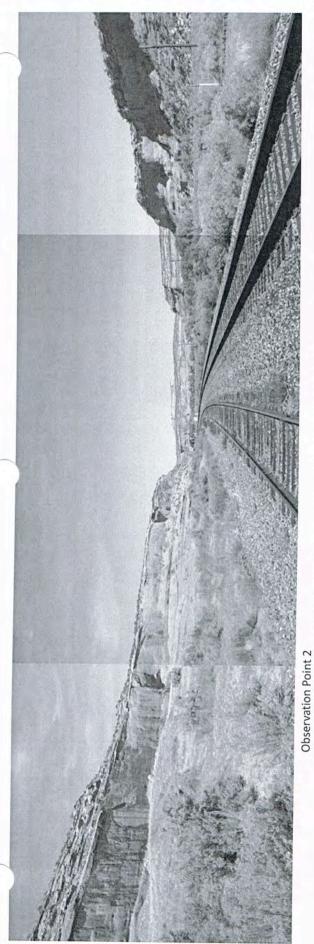


WestWater Farms, LLC

Westwater, Utah

WINGATE SANDSTONE - WATER SURVEY AREA **PHOTOGRAPHS** PAGE 2 of 6 FIGURE 2

4422.00~10)



Panoramic view facing east showing showing north and south walls of Ruby Canyon near river mile 133.5.



Observation Point 2

Northeast view showing north wall of Ruby Canyon near river mile 133. Note railroad cars for scale.



Observation Point 2

East view showing north wall of Ruby Canyon near river mile 134.

STEWART ENVIRONMENTAL CONSULTANTS, LLC ENGINEERING FOR LIFE

DATE November 2010

4422.001(10)

WestWater Farms, LLC Produced Water Treatment Plant Westwater, Utah

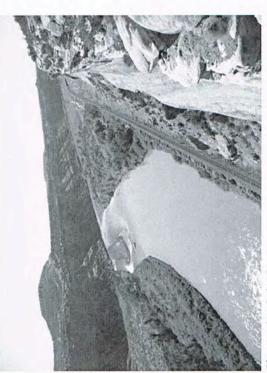
FIGURE 2
WINGATE SANDSTONE - WATER SURVEY AREA
PHOTOGRAPHS
PAGE 3 of 6



Panoramic view facing south showing river miles 133.5 to 136. Mouth of Knowles Canyon shown in center of photograph. Note dry wash meandering from Knowles Canyon to Colorado River. Observation Point3



East view showing north wall of Ruby Canyon near river mile 134.5. Mouth of McDonald Creek Canyon shown.



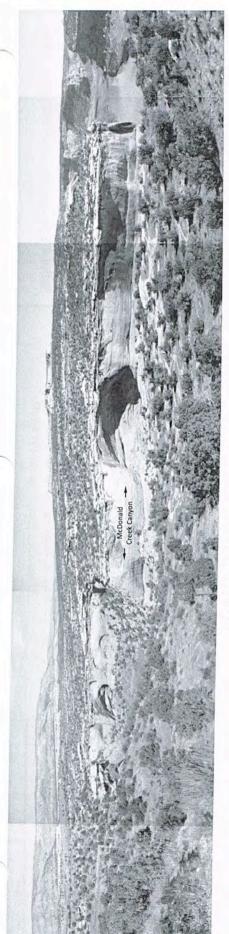
Observation Point 3

West view showing north and south walls of Ruby Canyon near river miles 133.5 to 134.5.

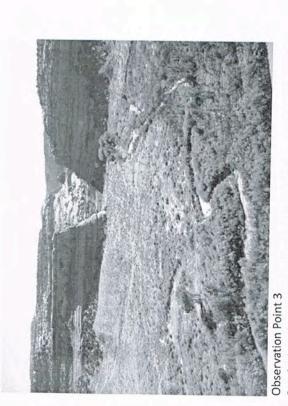
PRO	
STEWART ENVIRONMENTAL CONSULTANTS, LLC	30100
STEWART ENVIR	PARTICIPATION OF THE
7	1

WINGATE SANDSTONE - WATER SURVEY AREA **PHOTOGRAPHS** PAGE 4 of 6 FIGURE 2

4422.0r



Observation Point 3 Panoramic view facing east showing east face of McDonald Creek Canyon.



South view showing mouth of Knowles Canyon and dry wash meandering to Colorado River.



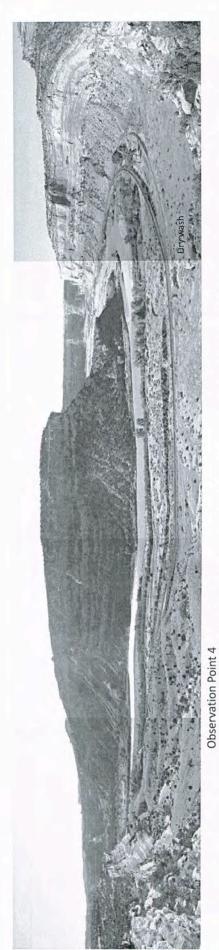
Observation Point 3 South view showing closeup of mouth of Knowles Canyon.

STEWART ENVIRONMENTAL PROJECT CONSULTANTS, LLC ENGINEERING FOR LIFE

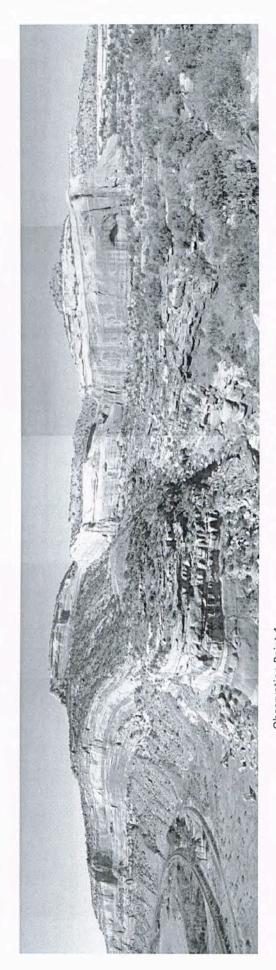
4422.001(10) November 2010

WestWater Farms, LLC Produced Water Treatment Plant Westwater, Utah

FIGURE 2
WINGATE SANDSTONE - WATER SURVEY AREA
PHOTOGRAPHS
PAGE 5 of 6



Panoramic view facing south showing river miles 136.5 to 137.5. Note dry wash in right foreground.



Panoramic view facing west near river mile 137. Note head of dry wash in center of picture. Observation Point 4



4422.00-10)

November 2010

WINGATE SANDSTONE - WATER SURVEY AREA **PHOTOGRAPHS** PAGE 6 of 6 FIGURE 2

> Produced Water Treatment Plant WestWater Farms, LLC

Westwater, Utah

Attachment 4

BLM Protest Letter BLM Protest Withdrawal Letter



United States Department of the Interior

BUREAU OF LAND MANAGEMENT Moab Field Office 82 East Dogwood Moab, Utah 84532



3100 UTU82619 (UTY012)

Mr. Brad Hill Utah Division of Oil, Gas and Mining P.O. Box 145801 Salt Lake City, Utah 84114-5801

AUG 27 2010

Re: Protest of an Informal Adjudicative Proceeding

Cause No. UIC-358.1

Application for Class II Injection Well

Westwater Farms, LLC Harley Dome 1 SWD Section 10, T19S, R25E Grand County, Utah

Dear Mr. Hill:

The Moab Field Office of the Bureau of Land Management (BLM) has reviewed the above referenced application and would like to advise the Division of some concerns relative to the conversion of the subject well to a Class II injection well.

The Federal government owns the oil and gas estate on the privately owned parcel (NE Section 10, T19S, R25E) on which the subject well is located, and has issued a lease for the rights to the oil and gas, and has reserved the helium. The surface and mineral estate of the lands surrounding this parcel are federally owned and are administered by the Moab Field Office of the BLM, with the exception of the northeastern corner of the parcel which abuts State of Utah land in section two.

Helium and low Btu gas are known to exist in the Entrada Sandstone in this area. The interest of the Moab Field Office in this proposal is to ensure that Federal oil and gas resources, including helium, will not be adversely affected, and adjacent Federal lands would not be degraded. For the following reasons, we are concerned that the proposal could adversely affect the helium resource:

 The proposal does not address the possibility of hydrogen sulfide generation which commonly results from the injection of produced water into subsurface formations.

RECEIVED

AUG 3 1 2010

DW. OF OIL, CAS & MINING

 The proposal does not provide evidence that the Kayenta Formation would act as a confining layer between the proposed injection zone in the Wingate Sandstone, and the gas/helium reservoir in the Entrada Sandstone.

Should hydrogen sulfide be generated from water injection, it does not appear that the Kayenta Formation would prevent migration of the gas into the Entrada Sandstone, which would degrade the gas/helium resource. Further, if hydrogen sulfide were generated, it is not certain that its migration would be limited to the Harley Dome Anticline due to the subject well's location at the southeastern margin of the structure. Gas which is not contained in the structure would tend to migrate up-dip toward the southeast. The Entrada, Kayenta and Wingate Formations crop-out in the Colorado River canyon approximately five miles southeast of the subject well. Although this is a substantial distance in terms of reservoir volume and the pace of subsurface fluid migration, there is no barrier to prevent that migration.

We respectfully submit these concerns and ask that you give them further consideration in your evaluation of this proposal. We would like to participate in a hearing on the matter should one be scheduled. Should you have any questions regarding this matter, please call Eric Jones of this office at 435-259-2117.

Sincerely,

Field Manager

cc: UT922, Utah State Office



United States Department of the Interior

BUREAU OF LAND MANAGEMENT Moab Field Office 82 East Dogwood Moab, Utah 84532



3100 UTU82619 (UTY012)

Mr. Brad Hill Utah Division of Oil, Gas and Mining P.O. Box 145801 Salt Lake City, Utah 84114-5801

SEP 30 2010

Re:

Protest Withdrawal Cause No. UIC-358.1

Application for Class II Injection Well

Westwater Farms, LLC Harley Dome 1 SWD Section 10, T19S, R25E Grand County, Utah

Dear Mr. Hill:

In the interest of ensuring that Federal oil and gas resources would not be degraded, the Moab Field Office of the Bureau of Land Management (BLM) filed a protest of the above referenced Cause on August 27, 2010. A summary of concerns identified in the protest include the potential for the proposal to generate hydrogen sulfide gas, uncertainty of the confining capability of the Kayenta Formation and, more generally, the shallow nature of the proposed injection zone which crops-out in the Colorado River canyon five miles away.

Since filing the protest, our staff has met with the proponent and their consultants, and the exchange has continued by email. Through the course of this communication, the proponent has provided sufficient evidence that the reservoir conditions in this instance are not favorable for hydrogen sulfide generation, and that operational controls will be applied to further minimize the possibility of reservoir souring. Additionally, the proponent has provided electric log data and comparative water analysis data which indicates the Kayenta Formation, locally, is a suitable confining layer to isolate the Entrada Sandstone helium reservoir above, from the proposed Wingate Sandstone injection zone below. Finally, the proponent has presented evidence that the Wingate Sandstone is sufficiently higher structurally, at the nearest Colorado River outcrop, relative to its position at the proposed injection well, to minimize the possibility of injection resulting in surface expression at the river.

In summary, the concerns expressed in our notice of protest have been suitably addressed by subsequent consultation with the proponent. We therefore respectfully withdraw our protest. Should you have any questions regarding this matter, please call Eric Jones of this office at 435-259-2117.

Sincerely,

s/ Jeffic, iv. Smith

Field Manager

cc: Allin Proprietary (consultant for Westwater Farms, LLC)
475 Seasons Drive
Grand Junction, CO 81507-8749
UT922, Utah State Office

EJones:mm:9/24/10



Attachment 5

Request for Agency Action

FILED

BEFORE THE BOARD OF OIL, GAS AND MINING

DEPARTMENT OF NATURAL RESOURCES

SECRETARY, BOARD OF OIL, GAS & MINING

OCT 1 8 2010

STATE OF UTAH

IN THE MATTER OF THE)	
APPLICATION OF WESTWATER)	REQUEST
FARMS, LLC FOR ADMINISTRATIVE)	FOR AGENCY ACTION
APPROVAL OF THE HARLEY DOME)	
1 SWD WELL LOCATED IN SECTION)	Docket No. 2010- 629
10, TOWNSHIP 19 SOUTH, RANGE 25)	Cause No. UIC-358.1
EAST, S.L.M., GRAND COUNTY,)	
UTAH, AS A CLASS II INJECTION)	
WELL)	

WESTWATER FARMS, LLC, Petitioner, by and through its undersigned attorneys, petitions the Board of Oil, Gas and Mining for an order approving the Harley Dome #1 SWD Well as a Class II injection well and authorizing the underground injection of produced water for purposes of water disposal, and shows as follows:

- Westwater Farms, LLC ("Westwater") is a Utah limited liability company
 in good standing, having its principal place of business in Cisco, Utah. Westwater is qualified to
 and is doing business in Utah.
- 2. The Board of Oil, Gas and Mining (the "Board") has jurisdiction of the parties and subject matter of this Request for Agency Action, pursuant to Section 40-6-5(5)(a) of the Utah Code Annotated and Rules R649-5-1 and R649-5-3(4) of the Utah Administrative Code ("U.A.C.").

PROCEDURAL POSTURE

3. Westwater originally filed its application for administrative approval of the Harley Dome #1 SWD Well located in the NW1/4NE1/4 of Section 10, Township 19 South, Range 25

East, S.L.M., Grand County, Utah (the "Subject Well" and "Subject Lands," respectively) as a Class II underground injection well for the disposal of produced water on May 26, 2009. The original application was amended and augmented with supplemental information filed with the Division of Oil, Gas and Mining (the "Division") during the summer of 2010 (together with the original application, the "Application").

- 4. Westwater gave notice of the Application pursuant to the requirements of Rule R649-5-3, U.C.A., and provided a copy of the Application to all operators, owners, and surface owners within a one-half mile radius of the Subject Well as required by Rule R649-5-2, U.A.C. On August 23, 2010, the Division published notice of the Application in the Salt Lake Tribune, Deseret News, and the website utahlegals.com. In addition, on August 26, 2010, the Division published notice of the Application in the Times-Independent.
- 5. Following publication of the notice of the Application, the Division received a letter dated August 27, 2010, from the United States Department of the Interior, Bureau of Land Management ("BLM") objecting to the Application, and another undated letter (received by the Division on September 7, 2010) from Bill Love, an individual, also objecting to the Application. The Division also received an objection to the Application by email dated September 3, 2010, from John Weisheit on behalf of the Living Rivers organization. The Division also received an advisory letter dated September 15, 2010, which included a request for water analysis and monitoring program, from the United States Department of the Interior, Fish and Wildlife Service. The BLM has since withdrawn its objection by letter dated September 30, 2010.
- 6. Based on the protests that have been filed in this Cause and pursuant to Rule R649-5-4, U.A.C., Westwater is concurrently filing with its Request for Agency Action a motion in this Cause for the Division to convert this informal adjudicative proceeding to a formal adjudicative

proceeding in accordance with Rule R649-10-1(2), U.A.C. The purpose of this Request for Agency Action is to set the matter for hearing by the Board at the Board's regularly scheduled hearing on December 8, 2010.

UNDERGROUND INJECTION OF WATER

- 7. Petitioner seeks approval of the Subject Well as a Class II underground injection well and the authorization of operations for the underground injection of produced water into the Wingate Sandstone for water disposal purposes.
- 8. The Application for Permit to Drill ("APD") for the Subject Well was filed with the Division on June 1, 2009, and the APD was approved on December 1, 2009. The Subject Well was spud on May 13, 2010, and completed as an injection well on July 13, 2010.
- Westwater will operate the Subject Well and the proposed injection operations.
- 10. The formation to be approved by the Board for water injection disposal operations is the Wingate Sandstone. In the vicinity of the Subject Lands, the Wingate Sandstone is an aeolian sandstone deposit approximately 337 feet thick. The proposed stratigraphic interval in the Wingate Sandstone to be used for injection purposes is from 1,344 feet to 1,631 feet in the Subject Well.
- 11. The Kayenta Formation, which overlies the proposed injection interval, will act as the hydrologic boundary (confining layer) above the injection interval, and the Chinle Formation, which underlies the injection interval, will act as the hydrologic boundary below that interval.

- 12. The injection interval in the Wingate Sandstone is not currently, nor is it ever expected to be, an underground source of drinking water ("USDW"). The Cedar Mountain, Morrison, Summerville, Entrada, Kayenta, and Chinle Formations in the vicinity of the Subject Well also are not USDW.
- 13. The following wells have been drilled and/or completed within a one-half mile radius of the Subject Well:
 - Elizondo Water Well situated in the NW¼NE¼ of Section 10, Township
 South, Range 25 East. The well was plugged and abandoned in June 1965.
 - b. Lansdale Government #5 Well situated in the NE¼NW¼ of Section 10, Township 19 South, Range 25 East. The well was plugged and abandoned in March 1968.
 - Lansdale Government #10-31-A Well situated in the NE¼SW¼ of Section
 Township 19 South, Range 25 East. The well was plugged and abandoned in August
 1975.
- 14. With the exception of the Subject well, all of the wells drilled within a one-half mile radius of the Subject Well were plugged and abandoned immediately following drilling operations and no mechanical logs were run.
- 15. The water to be used as the injection medium for the proposed water injection operations will come from oil and gas producing wells in the Uintah Basin, Paradox Basin, the San Rafael Swell and Book Cliff areas, including the Greater Cisco Field in Utah, and sources in the Piceance Basin in western Colorado. Westwater seeks authority to inject up to 10,000 barrels of produced water per day at an average injection pressure of 330 psi with a maximum injection pressure of 360 psi. The maximum pressure is based on the results of step-rate injection tests run in

the Subject Well on July 13, 2010 following installation of the final injection mechanical equipment.

16. Copies of various electrical or radioactive logs that were run in the Subject Well prior to the installation of casing and after casing was set and cemented have been filed with the Division and may be examined at the offices of the Division.

OWNERSHIP

- 17. Westwater owns fee simple title to the Subject Lands.
- 18. The minerals in the lands embraced within the Subject Lands and within a one-half mile radius of the Subject Well are subject to United States of America Oil and Gas Leases Nos. UTU-70176 and UTU-82619, and Utah State Mineral Lease No. ML-49255. As of September 9, 2010, Shiprock Helium, LLC owned the leasehold rights under UTU-70176, and Petro Resrc Corp. owned the leasehold rights under UTU-82619. Retamco Operating, Inc. owns the leasehold rights under ML-49255. The federal oil and gas leases are administered by the BLM, and the Utah State minerals are administered by the Utah School and Institutional Trust Lands Administration ("SITLA").
- 19. Besides Westwater, the surface owners within a one-half mile radius of the Subject Well include the United States of America, State of Utah, and Mid-America Pipeline Company. Grand County and the Federal Highway Administration own the surface rights to old highway 6 & 50 and Interstate 70, respectively. The subject federal public lands are administered by the BLM, and the Utah State lands are administered by SITLA.
- 20. A plat showing the area involved and identifying all wells, including the proposed injection well, within a one-half mile radius of the proposed Subject Well is attached hereto as Exhibit "A" and made a part hereof.

- 21. The names and addresses of all operators and owners as defined in Section 40-6-2, Utah Code Annotated, and of all surface owners within a one-half mile radius of the proposed Subject Well are set forth in Exhibit "B" attached hereto and made a part hereof.
- 22. The Affidavit required by Rule R649-5-1(2.9), U.A.C., is attached hereto as Exhibit "C" and made a part hereof.

WHEREFORE, Petitioner respectfully requests the Board to:

- A. Set this matter for hearing at the regularly scheduled meeting of the Board to be held on December 8, 2010, to consider Westwater's Application.
- B. Give notice of this Request for Agency Action and the hearing as provided by the laws of the State of Utah and regulations issued pursuant thereto. The names and addresses of the parties interested in this matter are set forth in Exhibit "B" to this Request for Agency Action.
- C. Conduct a hearing at which Petitioner and all interested parties may be allowed to present evidence regarding Westwater's Application.
 - D. To make its findings that:
- (1) The Harley Dome #1 SWD Well as proposed is suitable for approval as a Class II injection well; and
- (2) Good cause appears to authorize underground water disposal operations for produced water utilizing the Harley Dome #1 SWD Well as proposed.
- E. Enter its order approving the Harley Dome #1 SWD Well as a Class II injection well and authorizing the underground injection of produced water into the Wingate Sandstone beneath the Subject Lands for disposal purposes.

F. Provide such other relief as may be just and proper under the circumstances.

Dated this 18th day of October, 2010.

VAN COTT, BAGLEY, CORNWALL & McCARTHY

Thomas W. Clawson

Attorneys for Petitioner

36 South State Street, Suite 1900

Salt Lake City, Utah 84111

Telephone: (801) 532-3333

Petitioner's Address:

WESTWATER FARMS, LLC c/o Tom Warnes P.O. 23358 Silverthorne, CO 80498

EXHIBIT "A"

Attachment 1: Plat showing location of proposed Harley Dome 1 injection well in NWNE Section 10, T19S, R25E, SLM, Grand County, Utah, all abandoned or active wells, surface owners and O&G lessees and/or operators in the area and within a one-half mile radius area of review pertinent to this application submitted by Westwater Farms, LLC

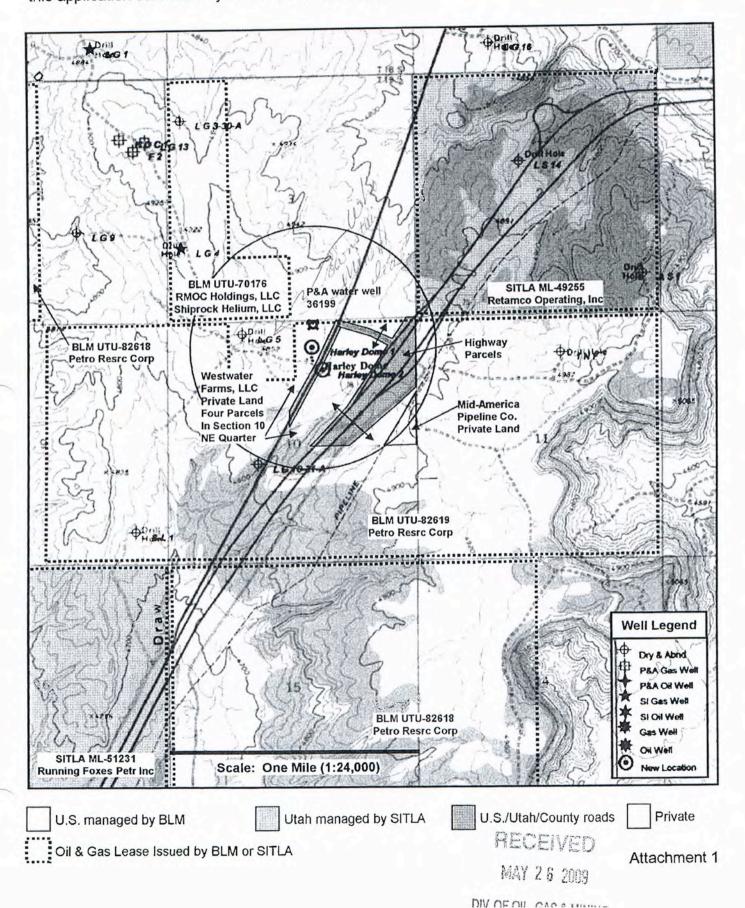


EXHIBIT "B"

NAMES AND ADDRESSES OF OWNERS, OPERATORS, AND SURFACE OWNERS WITHIN A ONE-HALF MILE RADIUS OF THE PROPOSED HARLEY DOME #1 SWD WELL, GRAND COUNTY, UTAH.

Steven F. Alder Assistant Attorney General Board of Oil, Gas and Mining 1594 West North Temple, Suite 300 Salt Lake City, UT 84116

Grand County Road Department 125 East Center Moab, UT 84532

Federal Highway Administration 2520 West 4700 South, Suite 9-A Salt Lake City, UT 84118-1847

Utah School and Institutional Trust Lands Administration 675 East 500 South, Suite 500 Salt Lake City, UT 84102-2818

RMOC Holdings, LLC 921 East Belleview Avenue Littleton, CO 80121

Retamco Operating, Inc. Attn: Joe Glennon P.O. Box 790 Red Lodge, MT 59068-0790

Bill Love 2871 East Bench Road Moab, UT 84532 Michael S. Johnson Assistant Attorney General Board of Oil, Gas and Mining 1594 West North Temple, Suite 300 Salt Lake City, UT 84116

United States Bureau of Land Management Moab Field Office 82 East Dogwood Moab, UT 84532

Mid-America Pipeline Company 1717 South Boulder Avenue Tulsa, OK 74121-1628

Petro Resrc Corp. 777 Post Oak Blvd, Suite 910 Houston, TX 77056

Shiprock Helium, LLC P.O. Box 51166 Amarillo, TX 79159

Living Rivers
Attn: John Weisheit
(No known address)
(sent via email to john@livingrivers.org)

United States Fish and Wildlife Service Attn: Larry Crist Utah Field Office 2369 West Orton Circle, Suite 50 West Valley City, UT 84119

EXHIBIT "C"

BEFORE THE BOARD OF OIL, GAS AND MINING

DEPARTMENT OF NATURAL RESOURCES

STATE OF UTAH

IN THE MATTER OF THE APPLICATION OF WESTWATER FARMS, LLC FOR ADMINISTRATIVE APPROVAL OF THE HARLEY DOME 1 SWD WELL LOCATED IN SECTION 10, TOWNSHIP 19 SOUTH, RANGE 25 EAST, S.L.M., GRAND COUNTY, UTAH, AS A CLASS II INJECTION WELL))))))	AFFIDAVIT OF THOMAS W. CLAWSON Docket No Cause No. UIC-358.1
STATE OF UTAH)		
	; ss.		
COUNTY OF SALT LAK	E)		

THOMAS W. CLAWSON, having been duly sworn, deposes and says that:

- He is a resident of Salt Lake County and over the age of 21 years.
- 2. He is an attorney licensed to practice law before the Utah Supreme Court and all inferior courts of the State of Utah.
- 3. He is familiar with the statutes, rules, and regulations of the Board of Oil, Gas and Mining pertaining to injection of fluids into underground formations for water disposal purposes.
- 4. He has caused the Request for Agency Action in this Cause, including the UIC Form 1, to be provided to all operators, owners, and surface owners within a one-half mile radius of the proposed Harley Dome #1 SWD Well as required by Rules R641-104-135, R649-5-1(1), and R649-5-2(2.12), U.A.C., by mailing copies thereof, properly addressed, with

postage prepaid. The names and addresses of the owners so served are set forth in Exhibit "C" to the Request for Agency Action in this Cause.

Dated this 18th day of October, 2010.

Thomas W. Clawson

STATE OF UTAH

SS.

COUNTY OF SALT LAKE)

SUBSCRIBED AND SWORN to before me this 18th day of October, 2010.

CONNIE C. WILSON
NOTARY PUBLIC - STATE OF UTAH
Commission No. 674854
My Comm. Exp. 05/13/2012

NOTARY PUBLIC

STATE OF UTAH DEPARTMENT OF NATURAL RESOURCES DIVISION OF OIL, GAS AND MINING

	APPLICATION FOR	INJECTION W	ELL	
Name of Operator Westwater Farms, LLC		Utah Account N	Number	Well Name and Number Harley Dome 1
Address of Operator P.O. Box 23358 CITY Silverthe	ome STATE CO ZIF 8049	8 Phone Number 8 970-513		43-019 - 3/6ZZ
Location of Well Footage: 600.5' fnl and 2,139.0'		Hintah Greater Cisco		Field or Unit Name
QQ, Section, Township, Range: NWNE				Westwater Farms
is this application for expansion of an ex	isting project?	Yes 🗌	No	
		Yes 🗖	No	X
Will the proposed well be used for:	Enhanced Recovery?	Yes 🛚	No No	= 1
	Dieposal?	Yes 🗆	No	_
	Storage?	. гов Ц	1.00	
Is this application for a new well to be dr	illed?	Yes 🛚	No	
If this application is for an existing well, I	nas a casing test been performe	od? Yes ∐	No	
Proposed injection interval: from		670'		
Proposed maximum injection: rate		260	peig	
Proposed injection zone contains oil	gas , and / or fresh water	within 1½ mile of t	he well.	
List of attachments: Attachment 1:				
Submissions to comply with R649-				
data, geological data on injection i	nterval and confining layers CH ADDITIONAL INFORMATION	and position of	nearest l	JSDW's; Att. 4: Water analyses;
	UTAH OIL AND GAS CONSER			SEN I
Att. 5: Affidavit certifying that copie of the proposed injection well.		nailed to operato	ors and o	wners within one-half mile radius
I hereby certify that this report to true and occupiete to the				
Name (Please Print) David L. Allin	(970) 254-3114	Titte Perm	it Agent	allinpro@bresnan.net
Signature 1212 allu		Date May	21, 2009	

(5/2002)

RECEIVED MAY 2 6 2009

BEFORE THE DIVISION OF OIL, GAS AND MINING

DEPARTMENT OF NATURAL RESOURCES

OCT 1 8 2010 SECRETARY, BOARD OF OIL, GAS & MINING

STATE OF UTAH

IN THE MATTER OF THE)		
APPLICATION OF WESTWATER	í	MOTION TO CONVERT	
FARMS, LLC FOR ADMINISTRATIVE	Ś	INFORMAL ADJUDICATIVE	
APPROVAL OF THE HARLEY DOME)	PROCEEDING	
1 SWD WELL LOCATED IN SECTION)		
10, TOWNSHIP 19 SOUTH, RANGE 25)	Docket No. 2010- 029	
EAST, S.L.M., GRAND COUNTY,)	Cause No. UIC-358.1	
UTAH, AS A CLASS II INJECTION)		
WELL)		

attorneys and pursuant to Rule R649-10-1(2) of the Utah Administrative Code, moves the Presiding Officer in this Cause to enter an order converting this informal adjudicative proceeding to a formal adjudicative proceeding. The conversion is warranted because objections have been filed in this Cause to Westwater Farms, LLC's ("Westwater") application for administrative approval of the Harley Dome #1 SWD Well as a Class II injection well. Conversion of the proceeding will not unfairly prejudice the rights of any party and is in the public interest. Concurrent with its Motion, Westwater is filing in this Cause its Request For Agency Action with the Board of Oil, Gas and Mining. A proposed form of Order Converting Informal Adjudicative Proceeding is attached hereto.

Dated this 18th day of October, 2010.

VAN COTT, BAGLEY, CORNWALL MCCARTHY

Thomas W. Clawson

Attorneys for Westwater Farms, LLC

36 South State Street, Suite 1900

Salt Lake City, Utah 84111 Telephone: (801) 532-3333

CERTIFICATE OF MAILING

I hereby certify that on this 18th day of October, 2010, I caused a true and correct copy of the foregoing Motion to Convert Informal Adjudicative Proceeding to be served via U.S. Mail, properly addressed with postage prepaid, upon each of the following:

Steven F. Alder Assistant Attorney General Board of Oil, Gas and Mining 1594 West North Temple, Suite 300 Salt Lake City, UT 84116

Grand County Road Department 125 East Center Moab, UT 84532

Federal Highway Administration 2520 West 4700 South, Suite 9-A Salt Lake City, UT 84118-1847

Utah School and Institutional Trust Lands Administration 675 East 500 South, Suite 500 Salt Lake City, UT 84102-2818

RMOC Holdings, LLC 921 East Belleview Avenue Littleton, CO 80121

Retamco Operating, Inc. Attn: Joe Glennon P.O. Box 790 Red Lodge, MT 59068-0790

Bill Love 2871 East Bench Road Moab, UT 84532 Michael S. Johnson Assistant Attorney General Board of Oil, Gas and Mining 1594 West North Temple, Suite 300 Salt Lake City, UT 84116

United States Bureau of Land Management Moab Field Office 82 East Dogwood Moab, UT 84532

Mid-America Pipeline Company 1717 South Boulder Avenue Tulsa, OK 74121-1628

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Attn: John Weisheit
(No known address)
(sent via email to john@livingrivers.org)

United States Fish and Wildlife Service Attn: Larry Crist Utah Field Office 2369 West Orton Circle, Suite 50 West Valley City, UT 84119

Junta Chan

BEFORE THE DIVISION OF OIL, GAS AND MINING

DEPARTMENT OF NATURAL RESOURCES

STATE OF UTAH

IN THE MATTER OF THE APPLICATION OF WESTWATER FARMS, LLC FOR ADMINISTRATIV APPROVAL OF THE HARLEY DOME 1 SWD WELL LOCATED IN SECTIO 10, TOWNSHIP 19 SOUTH, RANGE 2 EAST, S.L.M., GRAND COUNTY, UTAH, AS A CLASS II INJECTION WELL	E) N) Docket No. 2010
LLC's (the "Petitioner") Motion to Conver	s Cause having fully considered Westwater Farms, t Informal Adjudicative Proceeding (the "Motion") and e, and good cause appearing, hereby enters it Order
granting the Motion as follows:	
	3.1 is hereby converted from an informal adjudicative
proceeding to a formal adjudicative procee	eding.
Issued this day of	, 2010.
	STATE OF UTAH DIVISION OF OIL, GAS AND MINING
	Presiding Officer

Attachment 6

Groundwater Discharge Permit-by-rule



Department of Environmental Quality

Richard W. Sprott Executive Director

DIVISION OF WATER QUALITY Walter L. Baker, P E Director Water Quality Board
Joe Piccolo, Chair
Paula Doughty, Vice-Chair
David F Echols
Merritt K Frey
Darrell H, Mensel
Leland J, Myers
Richard W, Sprott
Jay Ivan Olsen
Gregory L, Rowley
Steven P, Simpon
Daniel C, Sparr
Phil Wright
Walter L, Baker,
Executive Secretary

August 27, 2008

George Kast, Co-Manager Westwater Farms, LLC 100 West Hwy. 6th Harley Dome, Utah 84540

Dear Mr. Kast:

Subject: Ground Water Discharge Permit-By-Rule for Use of Treated Produced Water

The Division of Water Quality (DWQ) has received your submittal dated August 11, 2008 requesting ground water discharge permit-by-rule for the beneficial use of treated produced water for agricultural purposes at Harley Dome, Grand County, Utah. Permit-by-rule may be granted for a facility or operation if the applicant demonstrates that the discharge will have a *de minimis* actual or potential effect on ground water quality and will not cause ground water to exceed ground water quality standards or the applicable class total dissolved solids (TDS) limits as defined in UAC R317-6-3 of the Ground Water Quality Protection Rules.

Your submittal indicates that the expected effluent quality of the treated produced water will be <500 mg/l TDS and <10 mg/l total petroleum hydrocarbons. In addition, Westwater Farms will obtain a permit from the Department of Natural Resources Division of Oil, Gas, and Mining (DOGM) in accordance with Section 40-6-5(3)(d) and R649-9 for the management of produced water and the disposal of produced water treatment residuals. Assuming that the treated produced water will meet the expected effluent quality provided in your letter, the use of the treated produced water for irrigation will have a *de minimis* actual or potential effect on ground water quality and will not cause ground water to exceed ground water quality standards or the applicable class TDS limits. Therefore, your request for ground water discharge permit-by-rule is approved.

Because DOGM has been providing construction oversight for this operation, a Construction Permit will not be required by DWQ. However, to verify that the expected effluent quality of the treated produced water is achieved, Westwater Farms will need to obtain an Operating Permit from DWQ in the near future. Our Engineering Section is in the process of drafting rules for the Operating Permit Program and will contact you when they have been completed.

Page 2

While DWQ will not directly regulate this operation through a ground water discharge permit, please be aware that discharge of pollutants to ground water is illegal and you would be held responsible if the operation caused damage to beneficial uses of ground water. Accordingly, you should make every effort to prevent spills and discharges of pollutants such as oil, fuels, hydraulic fluid, or antifreeze to the ground or subsurface. If future knowledge or experience indicates that ground water quality is threatened by this operation, the Executive Secretary may require that you apply for a ground water discharge permit in accordance with UAC R317-6-6.2.C.

If you have any questions or comments about this letter, please contact me at rherbert@utah.gov or (801) 538-6038.

Sincerely,

Rob Herbert, P.G., Manager

Ground Water Protection Section

RFH:mf

Ce: Brad Hill, DOGM

Ed Macauley, DWO Engineering

Attachment 7

Letter Regarding Air Quality Permit



1089 Genesee Vista Road Golden, CO. 80401

Phone: 303-526-1231 FAX: 303-526-4801

11-19-2008

On November 19, 2008 I had a telephone conversation with Tim Dejuiles, Air Quality Department with the State of Utah.

I explained our project in Westwater, Utah to Tim Dejuiles regarding a permit from Air Quality. He clearly understood our intent regarding recycling of production water in a closed loop system.

After a five minute conversation, Mr. Dejuiles said a permit from Air Quality would not be required if our facility did not plan any open ponds. He said our facility would have to produce 500 pounds per year of a single contaminant, or combined contaminants totaling one ton per year. He said that gas stations emit much less than that and our facility would emit much less than a gas station.

I thanked him for his time and consideration and he said he was available if I needed follow-up information.

Jeff Dyke, Manager Westwater Farms, LLC



Attachment 6

Utah DWQ Referral Letter



JON M. HUNTSMAN, JR.

GARY HERBERT Lieutenant Governor

Department of Environmental Quality

Richard W. Sprott Executive Director

DIVISION OF WATER QUALITY Walter L. Baker, P.E. Director

Water Quality Board Joe Piccolo, Chair Paula Doughty, Vice-Chair David F Echols Merritt K Frey Darrell H. Mensel Leland J. Myers Richard W. Sprott Jay Ivan Olsen Gregory L. Rowley Steven P. Simpson Daniel C. Sparr Phil Wright Walter L. Baker. Executive Secretary

August 27, 2008

George Kast, Co-Manager Westwater Farms, LLC 100 West Hwy. 6th Harley Dome, Utah 84540

Dear Mr. Kast:

Ground Water Discharge Permit-By-Rule for Use of Treated Produced Water Subject:

The Division of Water Quality (DWQ) has received your submittal dated August 11, 2008 requesting ground water discharge permit-by-rule for the beneficial use of treated produced water for agricultural purposes at Harley Dome, Grand County, Utah. Permit-by-rule may be granted for a facility or operation if the applicant demonstrates that the discharge will have a de minimis actual or potential effect on ground water quality and will not cause ground water to exceed ground water quality standards or the applicable class total dissolved solids (TDS) limits as defined in UAC R317-6-3 of the Ground Water Quality Protection Rules.

Your submittal indicates that the expected effluent quality of the treated produced water will be <500 mg/l TDS and <10 mg/l total petroleum hydrocarbons. In addition, Westwater Farms will obtain a permit from the Department of Natural Resources Division of Oil, Gas, and Mining (DOGM) in accordance with Section 40-6-5(3)(d) and R649-9 for the management of produced water and the disposal of produced water treatment residuals. Assuming that the treated produced water will meet the expected effluent quality provided in your letter, the use of the treated produced water for irrigation will have a de minimis actual or potential effect on ground water quality and will not cause ground water to exceed ground water quality standards or the applicable class TDS limits. Therefore, your request for ground water discharge permit-by-rule is approved.

Because DOGM has been providing construction oversight for this operation, a Construction Permit will not be required by DWQ. However, to verify that the expected effluent quality of the treated produced water is achieved, Westwater Farms will need to obtain an Operating Permit from DWQ in the near future. Our Engineering Section is in the process of drafting rules for the Operating Permit Program and will contact you when they have been completed.

Page 2

While DWQ will not directly regulate this operation through a ground water discharge permit, please be aware that discharge of pollutants to ground water is illegal and you would be held responsible if the operation caused damage to beneficial uses of ground water. Accordingly, you should make every effort to prevent spills and discharges of pollutants such as oil, fuels, hydraulic fluid, or antifreeze to the ground or subsurface. If future knowledge or experience indicates that ground water quality is threatened by this operation, the Executive Secretary may require that you apply for a ground water discharge permit in accordance with UAC R317-6-6.2.C.

If you have any questions or comments about this letter, please contact me at rherbert@utah.gov or (801) 538-6038.

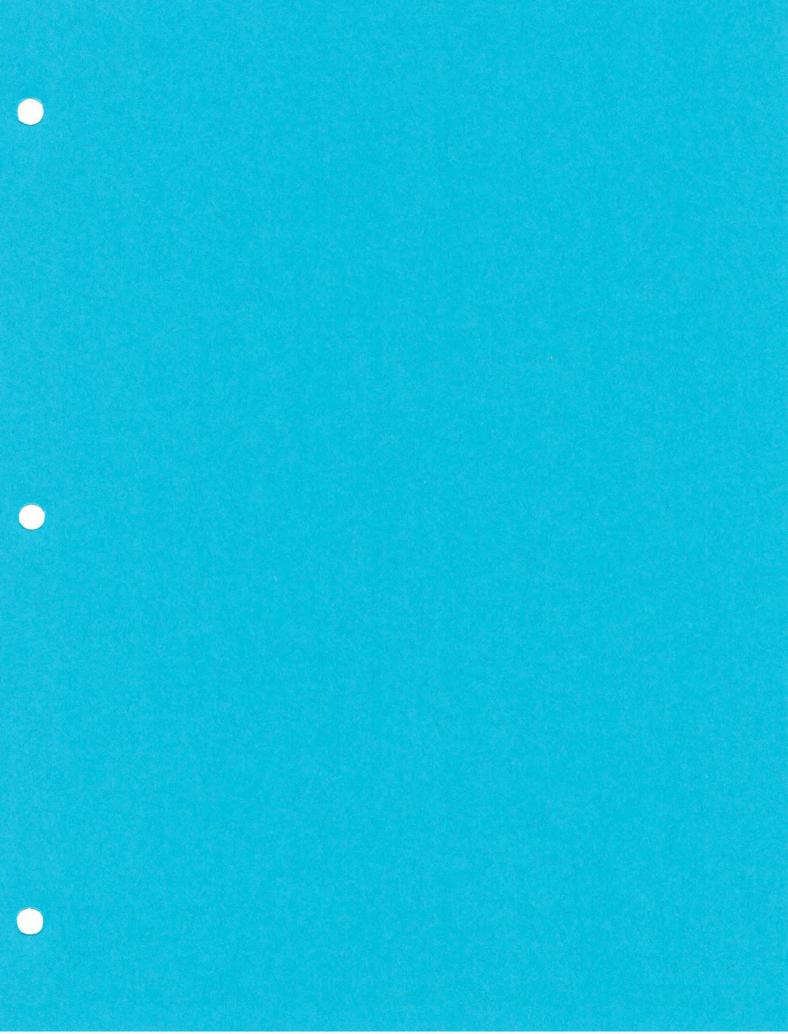
Robert F Herfut

Rob Herbert, P.G., Manager Ground Water Protection Section

RFH:mf

Cc: Brad Hill, DOGM

Ed Macauley, DWO Engineering







November 24, 2010

Mr. Mark Wright, County Engineer Ms. Kristine Killoy, County Planner Grand County Community Development 125 East Center Street Moab, Utah 84532

Subject: Report to Accompany the Conditional Use Permit Application

WestWater Farms Production Water Recycling Facility, 100 West State Highway 6, Westwater, Utah

Project No.: 4422.001(10)

Dear Ms. Killoy:

Stewart Environmental Consultants, LLC is pleased to provide the enclosed <u>Report to Accompany the Conditional Use Permit Application per Ordinance 490,2010 for WestWater Farms Production Water Recycling Facility, 100 West State Highway 6, Westwater, Utah.</u>

This report was written in accordance with Grand County Utah Ordinance 490,2010. If you have any questions or comments relative to this report, please contact us.

Sincerely,

STEWART ENVIRONMENTAL CONSULTANTS, LLC

Corrine A. Haybarker Project Engineer

cm Haybarker

Brad E Eaton, PE

Senior Project Manager

Enc.





Report to Accompany the Conditional Use Permit Application per Ordinance 490,2010

for

WestWater Farms Production Water Recycling Facility
100 West State Highway 6
Westwater, Utah

Prepared for:

WestWater Farms, LLC Cisco, Utah

Prepared by:

Stewart Environmental Consultants, LLC Consulting Engineers and Scientists Fort Collins, Colorado

November 2010

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Appendix A: Site Plan, Vicinity Map, Landscape Plan, Drainage Plan

Appendix B: Transportation Plan

Appendix C: WestWater Farms Production Water Recycling Facility Operations Plan

Appendix D: Wildlife Fencing Design Sheet

Appendix E: Correspondence Regarding Species of Concern

Appendix F: Water Supply and Sewage Disposal Plans Approval Letter
Appendix G: WestWater Farms Recycling Facility Fire Prevention Plan

Appendix H: <u>Drainage Report for the WestWater Farms Production Water Recycling Facility</u>

Appendix I: Waste Management Plan for the WestWater Farms Production Water Recycling Facility

Appendix J: WestWater Farms Recycling Facility Reclamation Plan

Appendix K: Collateral Bonds, Decommissioning, and Site Reclamation Cost Estimates

Appendix L: Utah DWQ Referral Letter

Appendix M: Affidavit of Notice to Property Owners
Appendix N: Pollution Technology Documentation
Appendix O: Contingency Plan (Health & Safety Plan)

1.0 INTRODUCTION

WestWater Farms, LLC is proposing to construct a produced water treatment plant called WestWater Farms Production Water Recycling Facility (WFPWRF). WestWater Farms will own and operate the WFPWRF, which will be located near the intersection of West State Highway 6 and Interstate 70 in Westwater, Utah. The WFPWRF will receive and treat production water from oil and gas wells located in Utah and Colorado. Drilling muds and tank bottom waste will not be accepted for treatment.

2.0 GENERAL REQUIREMENTS

According to Grand County Utah Ordinance 490,2010 (Ordinance 490), commercial production water disposal and recycling facilities must be approved by a conditional use permit pursuant to Section 9.11, "Conditional Use Permits," of the Grand County Land Use Code (LUC). Commercial production water disposal and recycling facilities shall comply with the general requirements discussed in this section of the LUC and detailed below.

2.1 Site Plan and Vicinity Map

A site plan was prepared in accordance with Section 9.17, "Site Plan Review," of the LUC and the conditional use permit application. The information below is included in the drawings in Appendix A.

- 1. Lots or plots
- 2. Subject land area acreage
- 3. Location and dimensions of structures and signs
- 4. Specific areas proposed for specific types of land use
- 5. Access ways, including points of ingress/egress
- 6. Drives, streets, and rights-of-way
- 7. Parking, loading, and refuse areas
- 8. Sidewalks and trails
- 9. Fences and walls
- 10. Location and type of outdoor lighting
- 11. Typical elevations of buildings
- 12. Landscaping and screening
- 13. Topography
- 14. Any areas with slopes in excess of 30 percent
- 15. Any areas in a natural drainage or the 100-year floodplain
- 16. Existing and proposed easements
- 17. Areas proposed for public dedication
- 18. Building footprint(s), water and sewer lines, easements, and drainage improvements in digital format; if available
- 19. Adjacent uses and predominant uses in the vicinity
- 20. Existing zoning designation within 100 feet of the exterior boundary of the parcel

Appendix A includes the site plan, vicinity map, landscape plan, and drainage plan.

2.2 Transportation Plan

The WestWater Farms Recycling Facility Transportation Plan, prepared in accordance with Ordinance 490, is included in Appendix B. The transportation plan contains the WestWater Farms Recycling Facility Transportation Study, a Road Maintenance Agreement with Grand County, and a road improvement cost estimate totaling \$166,128.00. The purpose of the Road Maintenance Agreement is to ensure that WestWater Farms provides maintenance of the county roads from the cattle guard on Harley Dome Road at the north right-of-way of Interstate 70 to the West Highway 6 to the north, and then west approximately 1/4 mile to the WFPWRF entrance. The agreement, included in Appendix B, will be executed once the conditional use permit is approved by Grand County.

2.3 Operation

2.3.1 Operations Plan

The WestWater Farms Production Water Recycling Facility Operations Plan, prepared in accordance with Ordinance 490, is included in Appendix C. The operations plan states that the WFPWRF will be fully operational and have all applicable county, state, and federal permits prior to accepting produced water and the County Engineer will issue an operational certification letter prior to WFPWRF receiving any production water. An operator will be on site at the times specified in the operations plan.

2.3.2 Site Visits and Documentation

Federal, state, and county officials will be allowed on the facility premises to conduct site visits; prior notification is not required. WestWater Farms will maintain federal, state, and county documents on site and make these documents available for federal, state, and county review.

2.3.3 Emergency Contact Information

WestWater Farms will post emergency contact information signs at the facility entrance and receiving areas.

2.3.4 Wildlife and Species of Concern

A design sheet for a wildlife friendly fence is included in Appendix D. This type of fence will be installed along the perimeter of the facility to keep wildlife and agriculture stock off the premises. The fence will have a top wire between 40 to 42 inches above the ground with at least 12 inches between the top two wires and at least 18 inches between the bottom wire or rail and the ground. The fence posts will be at 16.5-foot intervals.

WestWater Farms received a letter from the State of Utah Department of Natural Resources (UDNR), Division of Wildlife Resources in response to a WestWater Farms email requesting information on species of special concern proximal to the proposed WFPWRF area. The response letter states that the area has recent records of the occurrence of one species on the Utah Sensitive Species List; the vicinity has recent records of the occurrence of two species on the Utah Sensitive Species List and historical records of one species on the Utah Sensitive Species List. Appendix E includes both the request email and the response letter.

2.4 Water Supply, Sewage Disposal, and Fire Protection

WestWater Farms contacted the Southeastern Utah District Health Department regarding the water supply and sewage disposal plans for the facility. The Department has approved the plans and the approval letter is on file with Grand County. This letter demonstrates the water supply and sewage disposal plans are sufficient in terms of quality, quantity, and dependability for the facility. Appendix F contains the approval letter.

WestWater Farms, the Moab Valley Fire Prevention District, and Mutual Aid First Responder Fire Departments from Mack and Fruita, Colorado developed the <u>WestWater Farms Recycling Facility Fire Prevention Plan</u>. This plan demonstrates that fire protection is sufficient in terms of quality, quantity, and dependability for the facility. Appendix G contains the plan.

2.5 Drainage Study

Stewart Environmental prepared a <u>Drainage Report for the WestWater Farms</u> <u>Production Water Recycling Facility</u>. This study complies with Section 6.7, "Drainage," of the LUC and considers natural drainage and drainage during construction. Appendix H contains this study.

2.6 Surface Discharge

WFPWRF will not engage in any activity that requires production water to be used on the ground for any purpose including construction, dust control, or agricultural use without prior written approval from the Utah Division of Oil, Gas, and Mining (UDOGM), the Utah Division of Water Quality (UDWQ), and Grand County. All production water will be treated, and fluids will not be discharged onto the ground. This information is also discussed in the operations plan in Appendix C.

The WFPWRF has approval to sell the treated produced water for offsite use. Produced water for this facility is currently from the Piceance Basin. Under the following rules and regulations from the State of Colorado, this water has been termed non-tributary by the state. Under the direction of the Colorado State Engineer and the "Produced Non-tributary Ground Water Rules," 2 CCR 402-17, various areas have been classified by basin as non-tributary. This has been defined for the Piceance Basin.

If produced water originates in these designated basins, then the water can be used in any fashion. The wells from these basins need to be permitted by the State Engineer as water wells, except for the non-tributary basins. Therefore, WestWater Farms is not required to obtain permits for the oil/gas wells that are within these basins. As part of the operational plan, WestWater Farms will be matching the wells with the designated basins.

HB 1303 and SB 165 also provide for the recycling of any produced water, even if it is not from a designated basin, back to the basin. Therefore, it is WestWater Farms' plan to sell back the produced water to the energy companies as frac make-up water. This is allowed through both the law and regulations.

The third factor that allows for the beneficial use of produced water is the interstate commerce clause. The produced water originates in Colorado and is trucked to the WFPWRF site in Utah. This allows the produced water to become part of the interstate commerce between these two states. This results in the ability to sell this water back to the energy companies or on the open market.

Report to Accompany Conditional Use Permit Application WestWater Farms Production Water Recycling Facility – Westwater, Utah 4422.001(10)

WestWater Farms, LLC Page 3 of 8 Therefore, the beneficial use of this produced water is allowed due to:

- 1. It is non-tributary water by basin designation and therefore allowed for any beneficial use.
- 2. It can be utilized within the basin of origin as frac water under State of Colorado law.
- 3. It is part of the interstate commerce and therefore can be sold back as frac water or discharged for beneficial use from the facility for agriculture or municipal uses.

WestWater Farms is currently working with the UDWQ to obtain a permit to discharge treated process wastewater to waters of the State. Once the application is approved, WestWater Farms will provide copies to Grand County prior to commencing any discharge activity.

2.7 Waste Management Plan

The <u>Waste Management Plan</u> for the <u>WestWater Farms Production Water Recycling Facility</u>, included in Appendix I, describes the plans for handling and disposing of the expected wastes generated from facility operations.

2.8 Reclamation Plan

The WestWater Farms Recycling Facility Reclamation Plan, included in Appendix J, demonstrates that upon cessation of operations, the site will be restored to a condition as natural as practical or to the site's original or other beneficial condition as approved by the County Council and consistent with Section 6.9.9F, "Restoration," of the LUC. The reclamation plan includes the conversion and recycling of tanks and removal and disposal of remaining waste. If necessary, the WFPWRF site will be re-graded to the approximate original contour or approved beneficial condition, and erosion control and re-vegetation of disturbed areas will be addressed.

2.9 Bonding (Facility Closure and Site Remediation)

WestWater Farms is financially capable of constructing, operating, and properly closing the facility, including reclamation and any required post-closure monitoring. In the event of the cessation of WFPWRF operations, final reclamation will be accomplished, as stated in Section 2.8 of this report, within one year.

WestWater Farms has bonded for site reclamation and one class II injection well with the UDOGM. Road paving on Hay Road and State Highway 6 from the Interstate 70 right-of-way to the entrance to the facility will be bonded once the road cost estimate, located in Appendix B, is approved by Grand County. See Appendix K for two collateral bonds and the decommissioning and site reclamation cost estimate. The \$15,000 collateral bond is for the class II injection well and the \$10,000 collateral bond is to satisfy the site reclamation bond.

Sufficient security is posted based on a cost estimate prepared by a licensed engineer and approved by the County Engineer. The site reclamation cost estimate includes all costs associated with facility closure and site remediation. Estimates will be recalculated every five years and will account for the value of bonds held by the State of Utah for the Facility.

2.10 Referral Agency

The completed conditional use permit application will be referred to such agencies and persons as the Zoning Administrator deems appropriate, including, but not limited to, the Utah Division of Air Quality (UDAQ), UDWQ, and the UDOGM for review and comment.

WestWater Farms applied to UDOGM for a permit to operate the facility and will provide all engineering and operations information to them. WestWater Farms received a referral letter from the UDWQ regarding requests for groundwater discharge for treated produced water and its expected effluent quality. The UDWQ exempts WestWater Farms from having to obtain a construction permit, but does require an operating permit to be obtained. This letter is provided in Appendix L. WestWater Farms met with Grand County Road and Bridge Department, the Moab Valley Fire Prevention District, and Mutual Aid First Responder Fire Departments from Mack and Fruita, Colorado to assess and comply with all their needs.

2.11 Notification

The following property owners are located within a 1/2-mile radius of the proposed project site. An affidavit certifying that a copy of the conditional use permit application has been made available to said property owners is included in Appendix M.

- a. U.S. Department of Interior Bureau of Land Management Attn: Eric Jones
 82 Dogwood Avenue Moab, Utah 84532
- State of Utah
 School & Institutional Trust Lands Administration
 675 East 500 South, Suite 500
 Salt Lake City, Utah 84102-2818
- c. Mid-America Pipeline Company Thompson, Utah 84540

2.12 Operational Status

Grand County will be notified in writing at least 30 days prior to any change in ownership or operator status. Grand County will also be notified of any permit revisions, equipment upgrades or downgrades, or process changes integral to the operation of the facility.

2.13 Technical Review

WestWater Farms understands they may be required to reimburse the County for the cost of engaging additional expertise or consultants for technical review assistance prior to approval of applicable County permits and before commencement of the activity. WestWater Farms agrees to provide cash or equivalent security to guarantee that the costs of such consultants and expertise are borne by WestWater Farms.

Report to Accompany Conditional Use Permit Application WestWater Farms Production Water Recycling Facility – Westwater, Utah 4422.001(10)

WestWater Farms, LLC Page 5 of 8

2.14 Best Available Control Technology

WestWater Farms is using the best pollution control technology that is consistent with the highest standard currently in used within Grand County.

The WFPWRF is utilizing the most advanced system for the treatment of produced water. The treatment system follows the best pollution control technology by designing a totally closed system from unloading to treatment or injection. This initial treatment is for the removal of both emulsified and floating oil. This oil-water separation step allows the facility to capture any useable oil for sale. The oil-water separation step has a complete volatile organic compound (VOC) capture system. The sealed oil-water separators, 200,000 gallon skimming tank, and condensate tanks are all connected to a MRV 3 VOC recovery system. The MRV 3 system maintains 2 pounds of negative pressure with a mechanical exhaust to a holding bag. The VOCs are then compressed and stored in a LPGas tank for use in heating the buildings. The MRV 3 system is designed to remove and capture all VOCs to levels that are considered de minimis. The next step is an aeration step. This removes benzene, toluene, ethyl benzene, and xylene from the produced water. Again, this is captured by the VOC capture system. The next step is filtration through a walnut shell filter (WSF). This removes any larger organics like asphaltines or paraffins. The residual from the WSF is stabilized and taken to a non-hazardous waste landfill. This represents less than 1 percent of the overall flow of the system. The next step is the ceramic microfiltration process. The produced water is treated with membrane coagulants and then processed through the ceramic membranes. The pore size of these membranes is 0.1 microns. The solids from this process are stabilized and disposed of in a non-hazardous waste landfill. The produced water is then treated with activated carbon for the removal of any additional organics. The last step is for the removal of dissolved salts, using a combination of either ion exchange and reverse osmosis or nanofiltration and reverse osmosis. In either case, the system removes the dissolved salts and produces a brine byproduct, which will be injected after proper treatment to meet injection requirements.

In the future, WestWater Farms intends to work with New Sky Energy for the recovery of the brine solution. This process uses an electro-membrane process and separates the various anions and cations for recovery as an acid or caustic solution. This process will produce either a hydrochloric acid or bleach solution for the acid. The caustic solution is the formation of sodium carbonate.

This facility will provide for the recycling of produced water back to the energy companies or as augmentation water for agricultural or municipal uses. WestWater Farms also plans to use some of this water for an agricultural operation at the site for the growing of alfalfa.

Appendix N contains the technology documentation for these technologies.

2.15 Existing Facilities

WestWater Farms understands that existing facilities will not be deemed to be in noncompliance due to actions taken by adjacent landowners.

2.16 Fees

In addition to application fees, WestWater Farms will pay fees in accordance with the Grand County fee schedule as updated annually.

Report to Accompany Conditional Use Permit Application WestWater Farms Production Water Recycling Facility – Westwater, Utah 4422.001(10)

WestWater Farms, LLC Page 6 of 8

2.17 Permit Review

WestWater Farms will provide an annual statement of compliance to be reviewed by the County Council. Such statements will include a detailed and specific report on steps taken in the prior year to comply with applicable local, state, and federal requirements and laws and will be submitted to the County by January 1st of each year.

2.18 Permit Expiration

WestWater Farms understands that if the facility has not been in operation within one year of obtaining the conditional use permit and a request for extension has not been received and approved by the County Council, the conditional use permit will expire. Additionally, if the facility shuts down at any time for a period of one year and a request for extension has not been received and approved by the County Council, the conditional use permit will expire and site restoration must be completed by the property owner or bond holder.

2.19 Liability and Mitigation

WestWater Farms understands that they are legally liable for all environmental damage, including, but not limited to, health hazards resulting from the construction, operation, use, and maintenance of any production water disposal and recycling facility. If such damage occurs, the County, in addition to pursuing all other remedies available to it, may summarily require WestWater Farms to develop and implement, with due diligence, a mitigation plan, including requirements of state and federal agencies to remedy all such damage. Implementation of the plan will be required regardless of whether the county also revokes the permit.

2.20 Contingency Plan

To serve as the Contingency Plan, the <u>Health & Safety Plan</u> for the facility is included in Appendix O. This document outlines project personnel, individual responsibilities, anticipated hazards due to site work, appropriate personal protective equipment, steps to take in the event of an emergency, and other health and safety requirements necessary for this hazardous operation to be completed safely and in compliance with applicable regulations and client requirements. This document describes what actions shall be taken in the event of unintentional release and/or exposure, provides emergency contact information, and contains material safety data sheets for chemicals used on site.

Copies will be provided to the following service providers: sheriff's department, fire department(s), local hospital(s), and emergency medical services (EMS). The plan will be maintained on site and at the appropriate offices of the emergency service providers previously listed.

3.0 COMMERCIAL CLASS II INJECTION WELLS

In addition to complying with the general requirements discussed in Section 2.0 of this report, commercial class II wells for produced water disposal shall comply with the requirements of this section.

3.1 Location

The class II injection well is not located within the boundaries of the Valley Aquifer impact zone as defined in the Section 7.10.3, "Municipal and District Sewer Systems," Valley Aquifer Impact Zone map of the LUC or within any sole source

Report to Accompany Conditional Use Permit Application WestWater Farms Production Water Recycling Facility – Westwater, Utah 4422.001(10)

WestWater Farms, LLC Page 7 of 8 aquifer zone. The class II injection well has been located to ensure that Underground Sources of Drinking Water (USDW) and surface waters are not being endangered.

3.2 Underground Injection Control (UIC) Permit

WestWater Farms is in the process of obtaining a class II UIC permit from UDOGM for the Harley Dome 1 Well, and administrative approval is expected by the end of December 2010. WestWater Farms has filed a Request for Agency Action with UDOGM, with an agency hearing scheduled for December 8, 2010, in the hopes of resolving the remaining objectors' concerns.

In addition, it was stated in the last planning board meeting that the Halliburton drilling logs are sufficient for the submittal of the UIC permit application. The UIC permit will be submitted as a supplement to this CUP application immediately upon issuance.

3.3 Operation and Safety

The class II injection well will be completed, equipped, operated, and maintained in a manner that will prevent pollution and damage to any USDW or other resources, and will confine injected fluids to the target injection zone approved by UDOGM.

3.4 Monitoring

A sampling port will be provided post-treatment, prior to injection. WestWater Farms will provide continuous total dissolved solids (TDS) monitoring during pumping operations in 15-minute minimum intervals (with digital record copies of output) for the injection well in conjunction with daily manual water samples for purposes of comparison. WestWater Farms will submit quarterly reports providing TDS raw data and averages for the well, displayed in a graphic format with a text summary. Access to the sampling port and the entire facility will be provided to all regulatory agencies without prior notification.

4.0 SIGNATURES

Corrine A. Haybarker

Project Engineer

This report was reviewed by:

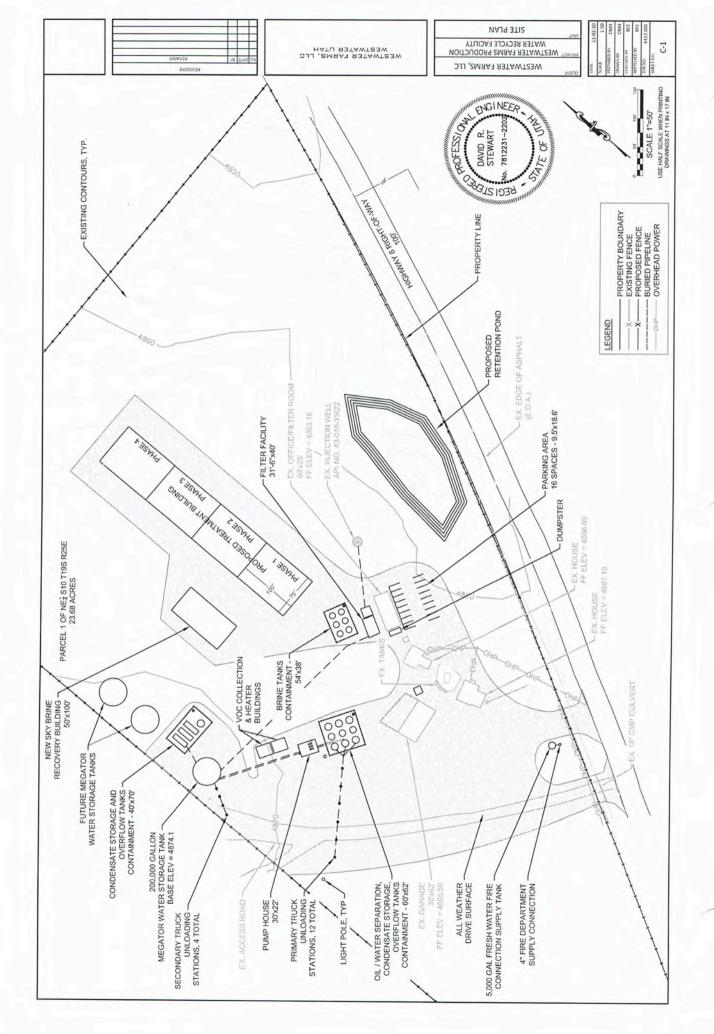
cm Haybaker

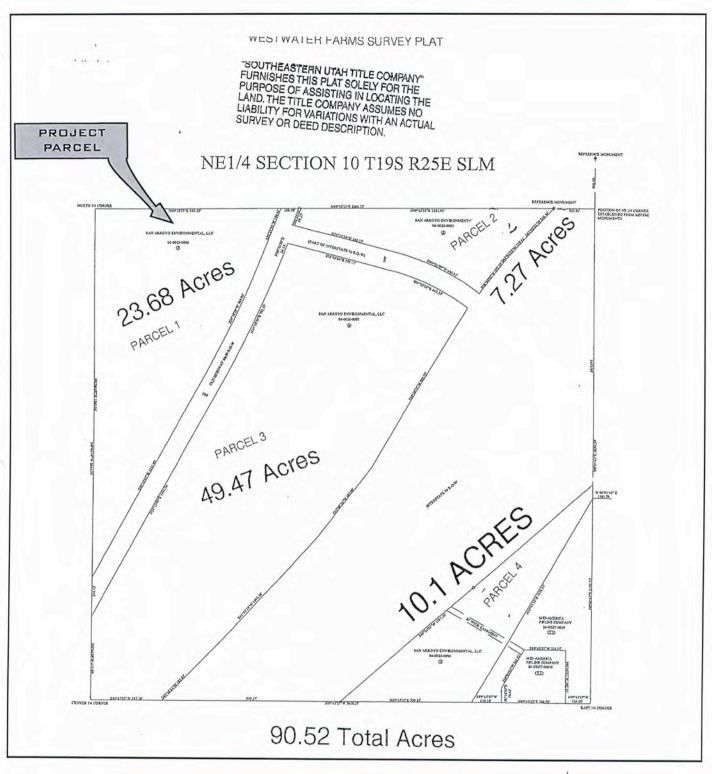
Brad E Eaton, PE

Senior Project Manager

Report to Accompany Conditional Use Permit Application WestWater Farms Production Water Recycling Facility – Westwater, Utah 4422.001(10) WestWater Farms, LLC Page 8 of 8

Appendix A
Site Plan, Vicinity Map, Landscape Plan, Drainage Plan





S22RCE: S22T2EASTERN 2TA2 TITLE C2MPAN2



SCALE: NTS

WestWater Farms, LLC West® ater, ② tah

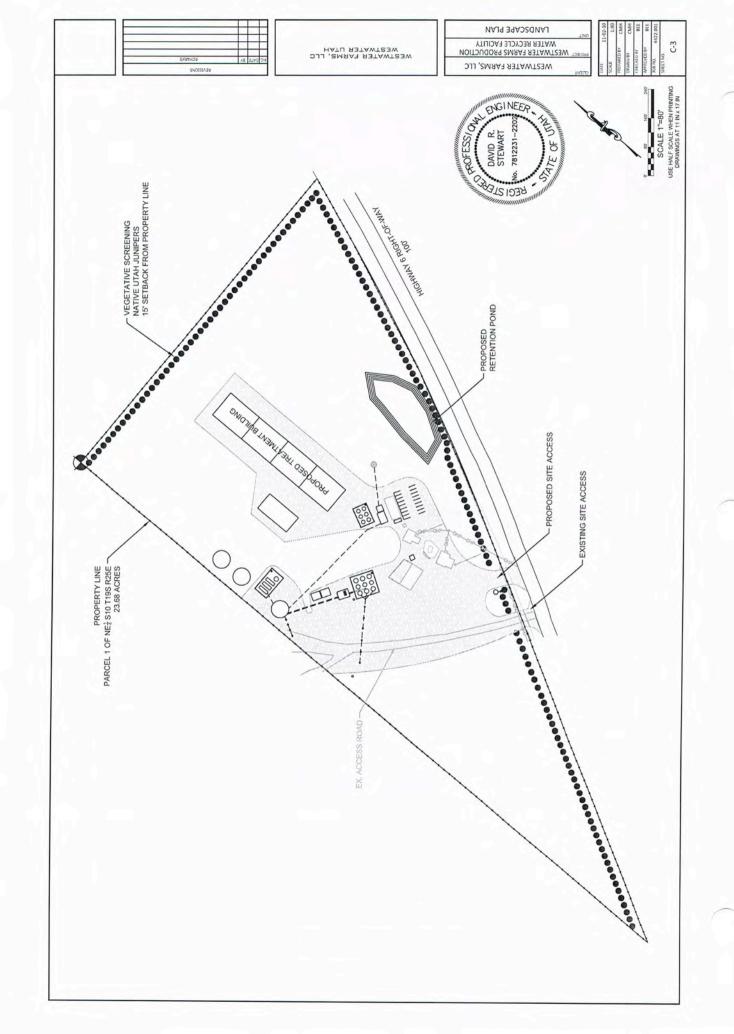
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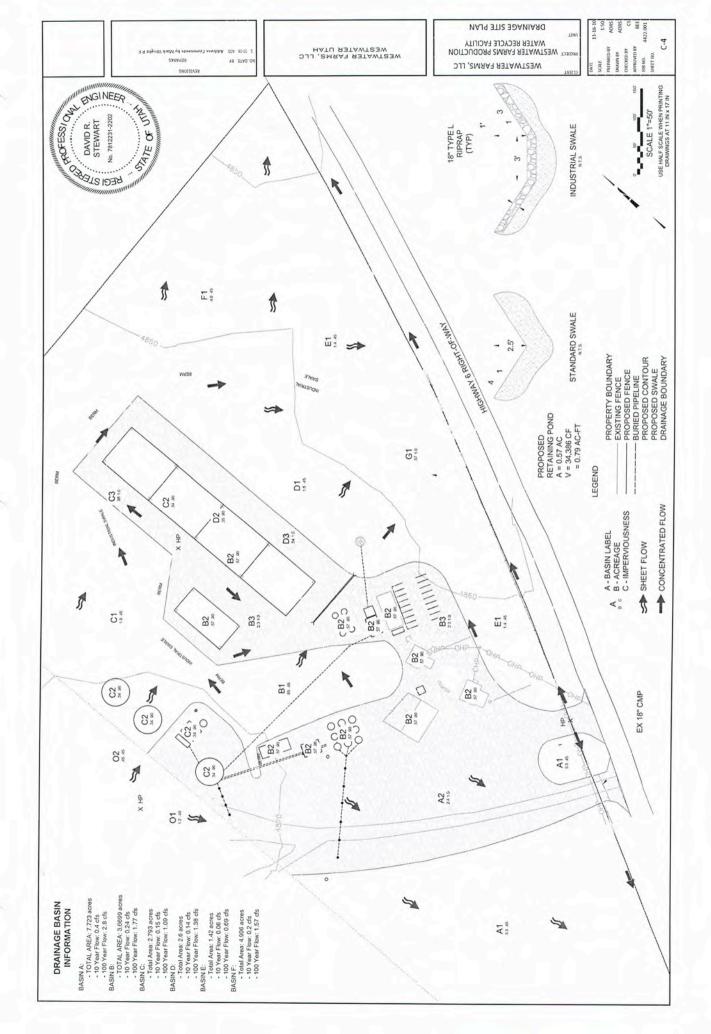
No@ember 2010

PROPERTY LOCATION

WestWater Farms Prod22tion Water Re2y23ng Fa23ty
100 West 2 igh2 ay 6
West2 ater, 2 tah

21CINIT2 MAP2 S2 R2 E2 PLAT





Appendix B Transportation Plan

TRANSPORATION PLAN

Westwater Farms Recycling Facility Management met with Grand County Engineer, Mark Wright and Grand County Road and Bridge Supervisor, Bill Jackson to review the transportation impacts to Grand County Roads.

Westwater Farms Recycling Facility agreed to execute a Road Maintenance Agreement with Grand County, Utah to provide maintenance of the county roads starting at the cattle guard on Harley Dome Road, County road 192, at the north Right-o-way of Interstate 70 then north to Highway 6, County road 193, and then west approximately a quarter mile the entrance of the Westwater Farms Recycling Facility. An entrance sign will be installed at this entrance and a stop sign at the exit.

During the first year the road will be patched and repair as needed and then in the second year repaved, if needed as determined by the Grand County Road and bridge Supervisor, utilizing additional base course, the addition of shoulders on each side of Grand County Road 192 and Grand County Road 193, geotextile fabric, 3" full depth asphalt placed in compacted lifts to Grand County, Utah specifications.

County Road 193 pavement ends west of the property approximately 1/8 of a mile and receives almost no other traffic.

Westwater Farms Recycling Facility will provide all onsite snow removal services and will plow the Grand County, Utah portion of Highway 6, county Road 193 and Harley Dome Road, County road 192, with Grand County, Utah's permission.

Westwater Farms will participate in the repair and upgrade of Grand County Road 193 West and Grand County Road 194, Bookcliff Road, to mitigate impacts from traffic to the Westwater Farms Recycling Facility as determined by the Grand County road and Bridge Supervisor.

TRANSPORTATION STUDY

- 1. Influent Water: Untreated Exploration and Production water from oil and gas wells.
- 2. Quantity: Approximately 12,000 barrels per day (114 truck loads)(based on current market conditions).
- 3. All loads received require a Non-Hazardous Waste Manifest executed by Producer and Transporter as the shipping document. Water description, quantity and dates are included.
- 4. Estimated 75% between 7:00 AM and 7:00 PM (85 truckloads)(seven per hour)
- 5. Maximum total dissolved solids: 14,000 parts per million.
 - a. There are no Utah State standards for influent E&P water.
 - b. This is an arbitrary standard by Westwater which could change as new technology is applied to the system.
 - c. Producer provides profile information on each well to pre-determine water quality.
- 6. All truck traffic is anticipated to come off I-70. Less than one percent of current anticipated business will come from the Bookcliffs area and even that should come off I-70. It would be possible to take County Road 193, but there would be a loss in travel time.
- 7. The Route: From I-70 Exit #227 (Westwater)
- a. 1/4 Mile North on County Road 192 (Hay Road)
- b. 1/4 Mile West on County Road 193 (Old Hwys 6&50)
- c. Right turn onto Facility Property approximately 500 feet to off-load stations
- d. Immediate loop and reverse route to I-70

ROAD IMPROVEMENT COST ESTIMATE

County Road 192 1140 LFT. x 32' - 0" wide	4,053 s.y.
County Road 193 1360 LFT. x 24' - 0" wide	3,627 s.y.
Total Paving	7,680 s.y.
Road Base: Class 6; 1,031 tons @ \$9.80	\$10,104.00
Geotextile: Terratex G.S. Fabric	\$5,625.00
3" Asphalt: @ 1,354 tons @ \$98.00 ton	\$132,692.00
Mobilization	\$1,926.00
Asphalt removal, grading, compacting, traffic control, stripping, signage	\$15,781.00
TOTAL ROAD IMPROVEMENTS	\$166,128.00

ROAD MAINTENANCE AGREEMENT

This ROAD MAINTANCE AGREEMENT ("Agreement") is made and entered into effective December____, 2010, by and between **GRAND COUNTY**, **UTAH**, 125 East Center Street, Moab, Utah 84532 ("County") and **WESTWATER FARMS**, **LLC**, 100 West Highway 6, Westwater, Utah 84515

RECITALS

- A. Westwater Farms has applied for a County Conditional Use Permit for the construction and operation of a Production Water Recycling Facility on private property located 1140 feet north of I-70 interchange #227 on Grand County Road 192.
- B. Under the terms of the Conditional Use Permit Westwater Farms is obligated to enter into a written agreement whereby Westwater Farms provides certain road maintenance for the County Road known as Hay Road, Grand County Road 192, from the I-70 interchange #227 north 1140 feet to Old Highway 6, Grand County Road 193, thence 1360 feet west to the entrance of Westwater Farms Recycling Facility.

NOW, THEREFORE, for and in consideration of the premises set forth above, the parties hereto mutually covenant and agree as follows:

- Westwater Farms shall provide road maintenance and snow removal on Hay Road Grand County Road 192, and Old Highway 6, Grand County Road 193 from I-70 north, then west to the Westwater Farms Recycling Facility entrance.
- 2. Westwater Farms shall repair and/or replace any damage to the existing Hay Road Grand County Road 192, and Old Highway 6, Grand County Road 193, infrastructure, including but limited to culverts and signage, from I-70 interchange #227 north and then west to the Westwater Farms Recycling Facility entrance.
- 3. Westwater Farms shall replace any noticeable loss of surface asphalt on Hay Road, Grand County Road 192, from I-70 interchange #227 north to Old Highway 6, Grand County Road 193, then west to the Westwater Farms Recycling Facility as determined from time to time by the Grand County Road Supervisor.
- 4. Westwater Farms shall maintain the Hay Road, Grand County Road 192, and Old Highway 6, Grand county road 193, from the I-70 interchange #227 north, and then west to the Westwater Farms Recycling Facility entrance.

- 5. At the approach to the Westwater Farms Recycling Facility Westwater Farms shall install and maintain a drainage culvert parallel to the Old Highway 6 Road, Grand County Road 193.
- 6. Upon the need to replace the Grand County Road 192, consisting of approximately 1,140 lineal feet x 32 feet in width and Grand County Road 193, consisting of approximately 1,360 lineal feet x 24 feet in width of paving as determined by the Grand County Road and Bridge Supervisor, at his sole and absolute discretion, after one year, Westwater Farms will repave Hay Road, Grand County Road 192 from the cattle guard at the I-70 Right-of-Way North to Old Highway 6, Grand County Road 193 then west on Old Highway 6, Grand County Road 193, to the entrance to Westwater Farms Recycling facility utilizing new 3" additional Class 6 Road Base, a Geotextile mat and 3" of new asphalt paving in accordance with the Grand County, Utah Road and Bridge specifications. In addition to repaving Grand County Road 192 and Grand County Road 193, Westwater Farms will add a 1 foot wide shoulder to each side of County Road 192 and will add a 2 feet wide shoulder to each side of County Road 193 utilizing Class 6 Road Base.
- This agreement shall remain in effect for as long as the Westwater Farms
 Recycling Facility is operating under the Conditional Use Permit issued by the
 County.
- 8. In the event of any dispute between Westwater Farms Recycling Facility and the Grand County Road Supervisor, either party hereto may request a hearing before the Grand County Council and the decision of the Council shall be final determination of the issue.
- 9. This Agreement incorporates all prior discussions and negotiations between the parties and may not be amended except in writing, duly executed by the parties.
- 10. This Agreement shall be construed and enforced under the laws of State of Utah and the codes of the County of Grand, Utah. Venue for any legal proceeding hereunder shall be Grand County, Utah.

IN WITNESS WHEREOF, the parties have executed this Agreement as of the date first set forth above.

"COUNTY"	GRAND COUNTY, UTAH	
	Ву:	
	Title:	

"WESTWATER FARMS"

WESTWATER FARMS, LLC A Utah Limited Liability Company

By: Form Warner

Title: Owner

Appendix C

WestWater Farms Production Water
Recycling Facility Operations Plan

WESTWATER FARMS PRODUCTION WATER RECYCLING FACILITY OPERATIONS PLAN March 2009

The intent of Westwater Farms is to receive exploration and production water from oil and gas wells in Utah and Colorado, treat the water for various contaminants, recycle water for on-site irrigation, recycle condensate and other constituents within the water when it makes economic sense, produce recycled water for off-site uses, dispose of the net water and contaminants according to guidelines determined by the US Environmental Protection Agency and the State of Utah in an on-site injection well and dispose of other contaminants and media at other approved off-site facilities. This is a for profit venture.

Westwater Farms currently owns the NE quarter section of land in section 10, township 19 south, range 25 east, SLM, Grand County, Utah. The property is bisected by Interstate 70, the old US highways 6 and 50 and Hay Road. After netting out the road right of ways Westwater Farms owns 90 acres which straddle I-70 and exit 227 which is a full diamond exit. There are no neighbors for several miles. The only privately owned land nearby is a natural gas pumping station contiguous to ten acres of the above land located on the south side of the interstate and away from the water treatment facility.

- a. The facility shall be fully operational and have all applicable county, state, and federal permits prior to accepting produced water. The facility shall acquire an operational certification letter issued by Grand County, Utah prior to receiving any production water. Fully operational is not to mean all future additions to the facility shall be operational on the first day of operation. The facility shall have all functions operational which would provide for meeting requirements of the permits and meet standards as required by the State of Utah and the federal government.
- b. An operator shall be on site for a minimum of one hour daily. An operator shall be on site during all receiving operations. Receiving and operating hours are planned for 24 hours per day, seven days per week. The facility may reduce either or both hours if the market conditions warrant a reduction.
- c. Federal, state, and county officials shall be allowed on the premises for the purpose of conducting site visits without prior notification.
- d. Federal, state, and county documents shall be maintained on site and made available for review of federal, state and county authorities.

- e. There will be no evaporation ponds. Production water will be off-loaded from trucks into enclosed tanks. There is presently a 200,000 gallon steel tank on site for this purpose.
- f. Any water spray systems will only spray treated water and the quality of such water shall conform to standards set by the State of Utah and the Federal government.
- g. No application of production water shall be used on the ground for any purpose including construction water or dust control without approval of a Utah Division of Water Quality surface discharge permit. All production water shall be treated. Only water recycled and meeting standards set by the State of Utah and the Federal government shall be used for other purposes.
- h. Fluids from the facility shall at no time contaminate waters of the U.S nor discharge without prior written consent from all applicable authorities.

The facility will be permitted to receive RCRA exempt wastewater from the above mentioned oil and gas wells. The producers and their transporters shall create a non-hazardous waste shipping manifest signed by both parties which describes the two parties, the wastewater, the quantity, and applicable dates. The shipping manifest shall be signed by Westwater Farms as acceptance of the production water. Westwater Farms will maintain profiles of the wastewater from each well either on-site or a support office acceptable to Grand County, the State of Utah and the Federal government. Each party as signers of the manifest shall receive at least one part copy of a multipart form.

Each truck shall then proceed to an off-loading area where the production water will be pumped into a holding tank. The water will proceed through a series of treatment systems and related piping and will not emerge from the system until acceptable for irrigation or reuse. Brine water and unused water will be directly re-injected into the well.

There will be no opportunity for humans or animals to see or come in contact with production water.

Appendix D
Wildlife Fencing Design Sheet



The Ideal wildlife friendly fence should (1) allow relatively free passage for animals to jump over and crawl under, and (2) be highly visible for both ungulates and birds. You can combine or tailor many of the ideas presented here for your specific situation.

Fences should be low enough for adult animals to jump, preferably 40" or less, and the top two wires should be no less than 12" apart, Deer and elk easily tangle their back legs if the top wires are closer together. The bottom wire or rail should be high enough for pronghorn, calves and fawns to crawl under, at least 18" from the ground, Increasing visibility using a top rail, high-visibility wire, flagging or other visual markers can help ungulates and birds. such as hawks, owls and swans, better navigate fences.

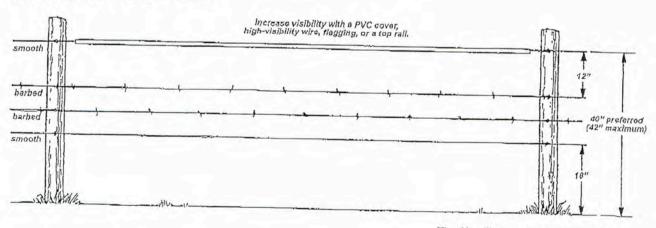
Wildlife Friendly Ideal

Wildlife friendly fences should be low enough for adult animals to jump, high enough for animals to crawl under, and minimize the chance of tangling. Montana Fish, Wildlife and Parks (FWP) recommends:

- A top wire or rail preferably no more than 40" above the ground, and absolutely no more than 42";
- At least 12" between the top two wires;
- At least 18" between the bottom wire or rail and the ground;
- Smooth wire or rail for the top, smooth wire on bottom.
- No vertical stays;
- Posts at 16.5-foot intervals:
- Gates, drop-downs, or other passages where wildlife concentrate and cross.

Using smooth wire – barbless wire, high-visibility tape or braid, or high-tensile electric wire – for the top and bottom strands will prevent snagging and injuries. In wildlife migration areas, drop-down fence, lay-down fence or crossings can be used for seasonal wildlife passage.

IDEAL WILDLIFE FRIENDLY FENCE



The friendliest fences are very visible and allow wild animals to easily jump over or slip under the wires or rails.

Appendix E

Correspondence Regarding Species of Concern

Corrine Haybarker

From: jjdyke@comcast.net

nt: Tuesday, September 21, 2010 3:37 PM

o: Corrine Haybarker

Subject: DOW Request

To Whom It May Concern

On August 27, 2009 I contacted the Division of Wildlife by phone to find out if there were any requirements or restrictions for the State of Utah concerning Westwater Farms intended construction of an oil and gas production water recycling/disposal plant in Grand County. I was asked to put my request in the form of an email and send it to Sarah Lindsey, Information Manager, Utah Natural Heritage Program.

Sarah sent a letter listing wildlife within a 1/2 mile radius of our plant.

I followed up with a telephone call to ask her if there was anything we needed to provide for at our location and she said no as long as there was no open water. She said our location had no record of migratory activity. She also suggested we follow DOW recommendations for friendly fencing.

Her letter and the guideline for friendly fencing found on the DOW website follow this page.

Jeff Dyke, Manager Westwater Farms



GARY R. HERBERT

Lieutenant Governo

State of Utah

DEPARTMENT OF NATURAL RESOURCES

MICHAEL R STYLER
Executive Director

Division of Wildlife Resources

JAMES F. KARPOWITZ
Division Director

August 31, 2009

Jeff Dyke Westwater Farms

Subject: Species of Concern Near the Proposed Water Recycling Plant, Grand County, Utah

Dear Jeff Dyke:

I am writing in response to your email dated August 27, 2009 regarding information on species of special concern proximal to the proposed production water recycling plant to be located in the Northeast ¼ of Section 10, Township 19 South, Range 25 East, SLB&M, in Grand County, Utah.

Within a ½-mile radius of the project area noted above, the Utah Division of Wildlife Resources (UDWR) has recent records of occurrence for ferruginous hawk. In addition, in the vicinity there are recent records of occurrence for burrowing owl and white-tailed prairie-dog, and historical records of occurrence for kit fox. All of the aforementioned species are included on the Utah Sensitive Species List.

The information provided in this letter is based on data existing in the Utah Division of Wildlife Resources' central database at the time of the request. It should not be regarded as a final statement on the occurrence of any species on or near the designated site, nor should it be considered a substitute for on-the-ground biological surveys. Moreover, because the Utah Division of Wildlife Resources' central database is continually updated, and because data requests are evaluated for the specific type of proposed action, any given response is only appropriate for its respective request.

In addition to the information you requested, other significant wildlife values might also be present on the designated site. Please contact UDWR's habitat manager for the southeastern region, Chris Wood, at (435) 613-3709 if you have any questions.

Please contact our office at (801) 538-4759 if you require further assistance.

Sincerely,

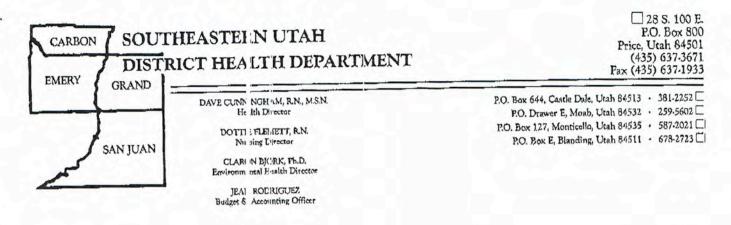
Sarah Lindsey Information Manager

Utah Natural Heritage Program

cc: Chris Wood, SERO



Appendix F
Water Supply and Sewage Disposal Plans Approval Letter



July 6, 2009

Westwater Farms Mr. Tom Warnes P. O. Box 23358 Silverthorne, CO 80498

Dear Mr. Warnes,

An inspection of the wastewater disposal system at 100 West Highway 6, Westwater, Utah 84515 by Jim Adamson of the Southeastern Utah District Health Department, on 24th day of June 2009, indicated that the system is at this time functioning properly and approved for continued use.

The Culinary water is provided to the property by a water hauling. Recommended procedures for hauling drinking water are attached.

If I may be of further assistance, please contact the Moab office.

Sincerely,

Jim Adamson

Licensed Environn ental Health Scientist

cc: Mr. Mark Wright, Grand County Engineer

SOUTHEASTI RN UTAH DISTIST HEALTH DEPARTMENT RECOMMENDED PROCEDURES FOR CULINARY WATER HAULING

WATER HAULERS'S CHECK LIST

1. Be certain the hauling equipment has not been used to haul toxic materials and the equipmen is made of safe materials.

2. The interior surfaces are clean and disinfected prior to use and periodically clear ed and disinfect thereafter.

- 3. The water is drawn from an approved public water system.
- 4. Each load of water is properly treated with chlorine.
- 5. Tank and equipment are labeled potable water.

EQUIPMENT

- 1. Water contact surfaces must be of non-toxic materials.
- 2. Water contact surfaces should be accessible for cleaning.
- 3. Tanks must perm t adequate flushing and draining.
- 4. Tanks must be ve ited with turned down vent 16 mesh.
- 5. Inlets and outlets shall minimize the entry of foreign materials during equipment storag, loading, hauling and transfers of potable water.
- 6. Pipes, hoses used for filling or distribution of water must be stored to avoid contamination an I flushed with potable water prior to each use.
- 7. Pumps shall prevent the introduction of lubricants or other contaminants in to the potable wa er.

DISINFECTION

Chlorine is common y used for disinfection of water. Chlorine concentration is measured as parts per million (ppm). Use fresh household bleach that contains 5.25 % or 6% Sodiu n Hypochlorite. Since different sources of water yield different chlorine demands, the amount of chlorine needed to achieve a free chlorine residual of 1.0 ppm may vary. The chlorine contact time must be at least 30 minutes. If a chlorine residual test kit is not available, 2.0 ppm should be used.

CLEANING AND DISINFECTION OF WATER CONTACT SURFACES AND WATER LOADS

Tank Disinfection: All dirt or other matter should be removed. After cleaning the tank it should be flushed and drained before disinfection.

A. Empty Tank: Chlorine solution of 200 ppm may be sprayed or swabbed, alle w a 30 minutes contact time.

B. Full tank – A ld enough chlorine to reach a chlorine concentration of 50 ppm. The so ution must remain in the tank for minimum of 24 hours.

C. Distribution pipes and fixtures: New, worked on or empty systems must be disinfected be for use with Chlorine concentration of 50 ppm for 24 hours or 200 ppm for 30 minutes contact time.

After disinfection drain and flush the tank before filling with potable water.

Chlorination of each lot d of water: Water drawn from a public supply must be treated with enough additional chlorine to increase the chlorine concentration to 1.0 ppm. The chlorine is to be added during the filling of the transport tank.

DISTRIBUTION

The distribution system must maintain a water pressure of 20 pounds per square inch to all plumbing fix tures.

Distribution systems that are new, have been empty and worked on should take a water sample or samples for bacteriologic analysis. Analysis should be done be a certified laboratory.

WJA July 1, 2009

Appendix G

WestWater Farms Recycling Facility Fire Prevention Plan

FIRE PREVENTION PLAN

Westwater Farms Management met with: Corky Brewer of Moab Valley Fire Prevention District along with Mutual Aid First Responder Fire Departments from Mack and Fruita, Colorado on site to formulate a Fire Prevention Plan.

The following Fire Prevention Plan components were agreed to:

- 1. **FIRE EXTINGUISHERS:** All buildings and treatment process areas will be equipped with a minimum 10 LBS. ABC Fire Extinguisher. The unloading area will be equipped with TWO 20 LBS ABC Fire Extinguishers.
- 2. **DETECTORS:** Smoke Detectors will be located in every room of every building on the ceilings. Carbon Monoxide Detectors will be located in every building with combustible heaters.
- 3. **SIGNAGE:** All buildings and treatment areas will be posted with NO SMOKING signs. Fire Extinguisher signs will be posted at all Fire Extinguishers.
- 4. **SUPPLEMENTAL WATER:** A 2,000 gallon cistern with a standpipe and pump with fire hose system will be located west of the Quonset hut for onsite Fire fighting. Westwater Farms will provide a 5,000 gallon buried tank with a standpipe near Highway 6 at the entrance to the facility. The fire water storage tanks will be available for all local Fire Departments for use on fires anywhere in the community.
- 5. **EMERGENCY NOTICATION:** In the event of fire or health emergency 911 would be called notifying the Moab Fire Protection District of the emergency situation. If there was a problem with 911 the Moab Valley Fire Protection District would be called at (435) 259.5557. After Moab Valley Fire Protection was contacted a follow call would be made to the Lower Valley Fire District and Rescue Squad at (970) 858.3133 to verify as a courtesy that they were notified under Mutual Aid Agreements.

Appendix H

<u>Drainage Report for the WestWater Farms</u> <u>Production Water Recycling Facility</u>





November 24, 2010

Mr. Mark Wright, PE County Engineer Ms. Kristine Killoy, County Planner Grand County Community Development 125 East Center Street Moab, Utah 84532

Subject:

Drainage Report

WestWater Farms Production Water Recycling Facility, 100 West Highway 6, Westwater, Utah

Project No.:

4422.001(10)

Dear Mr. Wright and Ms. Killoy:

On behalf of WestWater Farms, LLC, Stewart Environmental Consultants, LLC is providing the enclosed <u>Drainage Report for the WestWater Farms Production Water Recycling Facility, 100 West Highway 6, Westwater, Utah.</u> This report has been revised to include the items requested by Mark Wright in a phone discussion of November 15, 2010.

We appreciate the opportunity to provide these services to you. Please contact us with any questions.

Sincerely,

STEWART ENVIRONMENTAL CONSULTANTS, LLC

Brad Eaton, PE

Senior Project Manager

David R. Stewart, PhD, PE

President and CEO

cc: Mr. Tom Warnes, WestWater Farms, LLC

Enc.

4422.001(10)\westwater drainage RVD 24nov10.rpt





Drainage Report

for the

WestWater Farms Production Water Recycling Facility
100 West Highway 6
Westwater, Utah



Prepared for:

WestWater Farms, LLC Cisco, Utah

Prepared by:

Stewart Environmental Consultants, LLC Consulting Engineers and Scientists Fort Collins, Colorado

November 2010

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1.0	INTRODUCTION	1
	1.1 Location	1
	1.2 Proposed Development	1
2.0	HISTORIC DRAINAGE	1
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FIGURES

Figure 1:

Vicinity Map

Figure 2:

Survey Plat

Figure 3:

Drainage Plan

APPENDICES

Appendix A:

10-and 100-Year Return Period Calculations, Tables, and Graphs

1.0 INTRODUCTION

WestWater Farms, LLC is proposing to build and operate the WestWater Farms Production Water Recycling Facility (WFPWRF), to be located within Grand County, Utah. The development of this land, owned by WestWater Farms, LLC, will increase the imperviousness of the parcel; therefore, this drainage report shall be utilized for the design of drainage features implemented in handling the developed stormwater runoff generated by this facility. This report provides proper drainage calculations and figures as accepted by the Urban Drainage and Flood Control District Criteria Manual (UDCM), revised April 2008.

1.1 Location

The proposed WFPWRF will be located in the northeast 1/4 of Section 10, Township 19 South, Range 25 East. The property is accessed from Interstate 70 and the adjacent old Route 6 as shown on Figure 1, Vicinity Map. The surrounding land is owned by the Bureau of Land Management (BLM).

1.2 Proposed Development

The land where the proposed development is to take place is currently zoned as agricultural. Once the WFPWRF is permitted, built, and operational, the land will be considered light industrial use. The improvements to the site at full buildout will increase imperviousness from approximately 45 percent to approximately 62 percent for a total increase of approximately 17 percent.

2.0 HISTORIC DRAINAGE

2.1 Description of Property

The WestWater Farms Survey Plat (Figure 2) contains four parcels of land totaling 90.52 acres as follows.

- Parcel 1 23.68 acres
- Parcel 2 7.27 acres
- Parcel 3 49.47 acres
- Parcel 4 10.1 acres

The parcel considered in this drainage report is Parcel 1. There are scarce native Utah grasses, shrubs, and scrub trees present that are common to undeveloped Grand County lots. There are no trees of any value, and there are no major drainage ways on this site. A retention pond will be located on the East boundary of the parcel, as shown in Figure 3, Drainage Plan.

The soil present at the site belong to hydrologic soil Group D. Soils in Group D have a very slow infiltration rate and a slow rate of water transmission. They consist chiefly of clays that have a high shrink-swell potential, soils that have a permanent high water table, solids that have a clay-pan or clay layer at or near the surface, and soils that are shallow over nearly impervious material.

Historically, the north portion of the site drains overland to the northeast, where it is picked up by a roadside ditch on the west side of old Route 6 and drained to the north. The south portion of the site, the portion from the north edge of the access drive south, sheet flows to the southeast where it is picked up by the roadside ditch on the west side of old Route 6 and drained to the south. The remaining majority of the site sheet flows to the east, where it

concentrates in the roadside ditch on the west side of old Route 6 and drained to the north to combine with the flows from the north portion of the site.

2.2 Overall Basin Description

Parcel 1 is located on a land formation named Harley Dome. This land formation forces most of the water off site to the northeast corner. A small amount of drainage from west of the parcel will cause minor overland flow onto the property, although most flows will be directed away from the property due to the high point of Harley Dome being just west of the site. The area is not located within a 100-year flood plain as designated by the Federal Emergency Management Agency (FEMA). No drainage reports prior to this one have been completed for land on or near the current site. Refer to Figures 1, 2, and 3 for complete information of the onsite drainage.

3.0 DESIGN CRITERIA

3.1 List References

Natural Resource Conservation Service (NRCS) data is not available for Grand County; therefore, the project was analyzed using the UDCM. This design manual was used due to a lack of design standards information for the site. Please note that Grand County, Utah does not use a current standard model; therefore, UDCM is appropriate for all drainage calculations. The UDCM is highly accredited as an acceptable model for drainage modeling/design and was discussed with Grand County Engineer, Mark Wright, PE, for this plan.

3.2 Hydrologic Criteria

UDCM utilizes the Rational Method to determine stormwater runoff flows and velocities. The calculations associated with this method determined the volume needed for the retention pond to be located on the east part of the parcel. The Rational Method was used to determine flows for the 100-year storm and 10-year storm event as designated by Grand County, Utah. See Appendix A for the 10- and 100-year return period calculations, tables, and graphs.

3.3 Hydraulic Criteria

Drainage within the site will include open channels, culvert, and a retention pond. The open channels located within the site will direct flows from storm events around proposed structures, diverting flow into the proposed retention pond. The retention pond will be designed using UDCM best management practices (BMPs). There is and existing culvert on the southern drive that is to be used to convey water under the access road within sub-basin A and south along the road side ditch along the west side of old Route 6.

4.0 DRAINAGE PLAN

4.1 General Concept

Parcel 1 will be developed to mimic historical drainage patterns with a retention pond to capture, at a minimum, the extra flow created by the developed imperviousness. This will address the possible impact to offsite basins from the additional developed runoff. As stated above, some flow from the BLM land southwest of the site will convey partial flow through the site as historically accepted. Drainage from offsite basins will not be hindered by any new infrastructure.

Drainage Report
WestWater Farms Production Water Recycling Facility – Westwater, Utah
4422.001(10)

WestWater Farms, LLC Page 2 of 3 The north portion of the site drains overland to the northeast where it is picked up by a roadside ditch on the west side of old Route 6 and drained to the north (Basin F). The south portion of the site, the portion from the north side of the access drive south, sheet flows to the southeast where it is picked up the roadside ditch on the west side of old Route 6 and drained to the south (Basin A). The remaining majority of the site (Basins B, C, and D) will be routed via swales to the proposed retaining pond (Basin G). Undisturbed Basin E drains east and directly to the roadside ditch along old Route 6 and north from there.

4.2 Specific Details

The current soil type is classified as soil type D, which indicates that the soil will neither hold much water nor allow much water to penetrate. This currently yields a respectively a high runoff volume during large or long storm events. The design provides for the proposed retention pond to retain storm water runoff. The retention pond will use native soils to line the pond as this will allow for little to no infiltration and hold water to be evaporated. This retention pond is designed with respect to the UDCM BMP methods for retention basins with no drain.

The additional developed runoff from the site in the event of the 10 year storm is 0.41 cfs and 4.63 cfs for the 100 year storm. Using UDCM, the required volume that must be provided for the retention pond is 0.47 acre-ft. Per our design a total of 0.79 acre-ft will be provided with a 2 ft freeboard and a total of 1.81 acre-ft before the retention pond would reach capacity and overflow. Typical factor of safety in volume design is 10%, our design provides an additional 285% of extra storage over the required capture volume. Additionally, when taking into consideration the additional drainage of 4.63 cfs for the 100 yr storm event it would take 12.1 hours to fill the pond to maximum capacity which is significantly larger than the required design of a 1 hr, 100 yr storm event. A periodic check of the retention basin is required to maintain proper storage and drainage of storm events.

5.0 CONCLUSIONS

5.1 Compliance with Standards

WestWater Farms, LLC will conform to standards put forth by Grand County, the State of Utah, and other governing entities overseeing the WFPWRF. For standards not put forth by the State of Utah, but used within the BMPs, the UDCM shall be considered and implemented, if applicable.

5.2 Summary of Concept

The existing site will be preserved and protected as much as possible to mitigate any possible issues from a large storm event. The site will be graded to ensure proper drainage as historical flow has occurred, as well as to retain extra runoff due to the increased, developed imperviousness to the site. This will mitigate any ill effects to all adjacent properties.

6.0 REFERENCES

Urban Drainage and Flood Control District. Urban Storm Drainage Criteria Manual. June 2001, Revised April 2008.

Figures



November 2010

WestWater Farms Production Water Recycle Facility 100 West Highway 6 Westwater, Utah

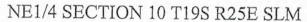
FIGURE 1 VICINITY MAP

4422.001(10)

SOURCE: GOOGLE MAP DATA @2010 9 Colorado Utah 9 PROJECT

WEST WATER FARMS SURVEY PLAT

"SOUTHEASTERN UTAH TITLE COMPANY"
FURNISHES THIS PLAT SOLELY FOR THE
PURPOSE OF ASSISTING IN LOCATING THE
LAND, THE TITLE COMPANY ASSUMES NO
LIABILITY FOR VARIATIONS WITH AN ACTUAL
SURVEY OR DEED DESCRIPTION.



PARCEL 3

AD AT ACTOS

MINISTRUCTURE

90.52 Total Acres

SE URCE: SE UTE EASTERN UTAE TITLE CE MPANE



SCALE: NTS

WestWater Farms, LLC West2 ater, Utah

4422.0012102

No@ember 2010

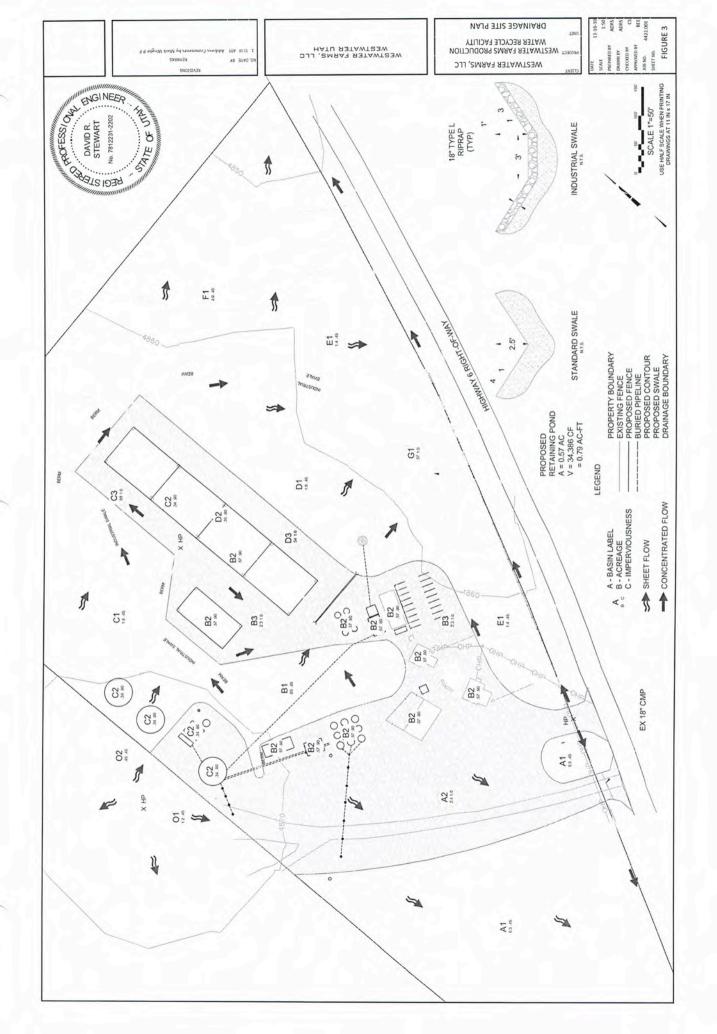
PROPERTY LOCATION

WestWater Farms Prod (2)tion Water Re(2)(2)ing Fa(2)(3)ty

100 West (2) igh(2) ay 6

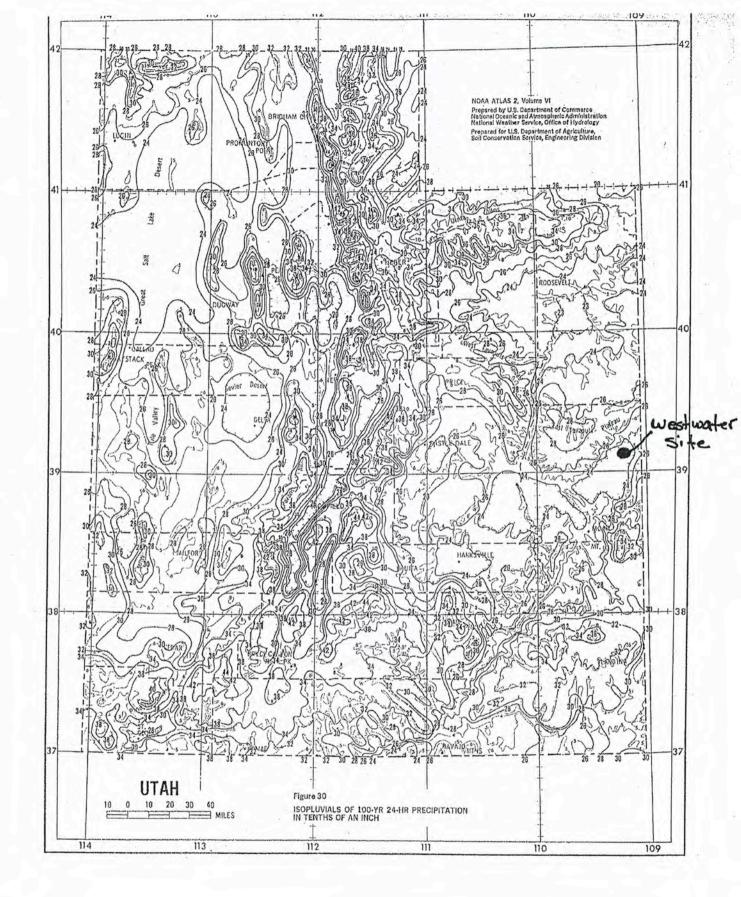
West(2) ater, Utah

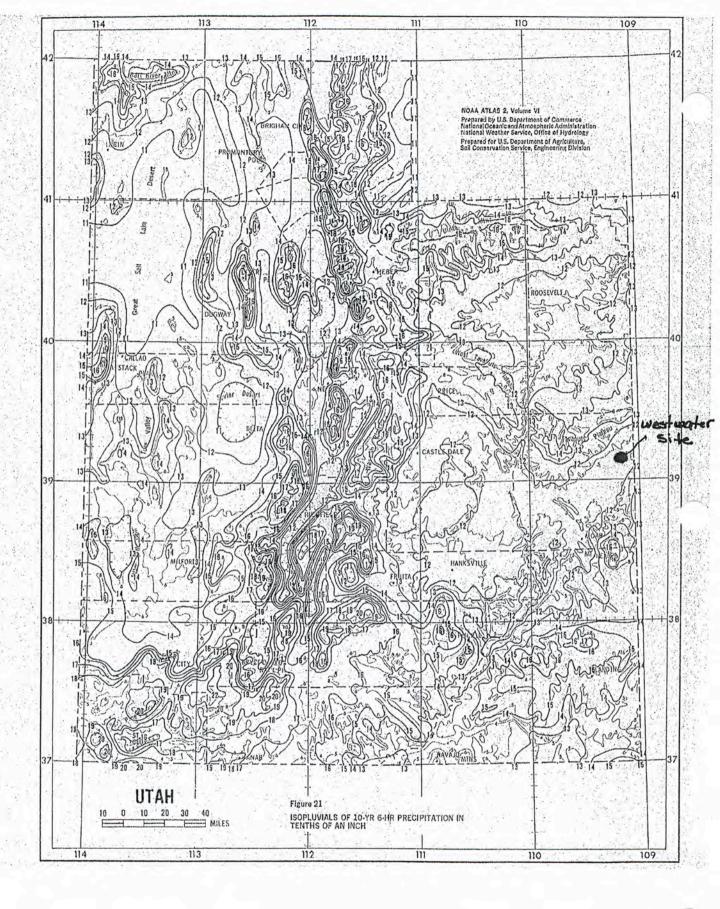
FIGURE 2 SURTET PLAT



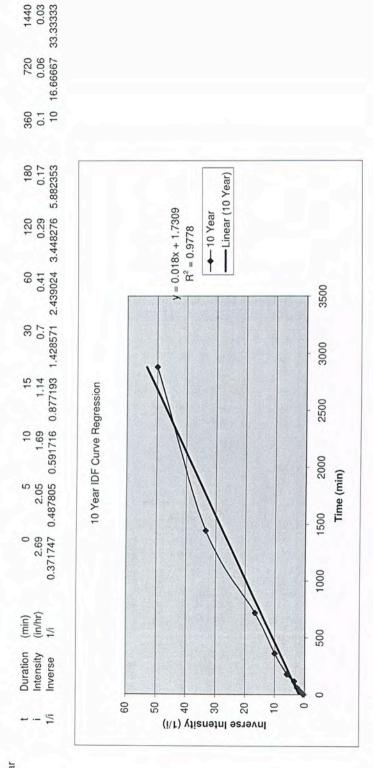
Appendix A

10- and 100-Year Return Period Calculations, Tables, and Graphs





2880 0.02 50



Can be expressed in linear form as A model of the form $i = \frac{A}{(t+B)}$

Therefore the regression above yields

 $\frac{1}{i} = 0.0173t + .1771$

Which Means that

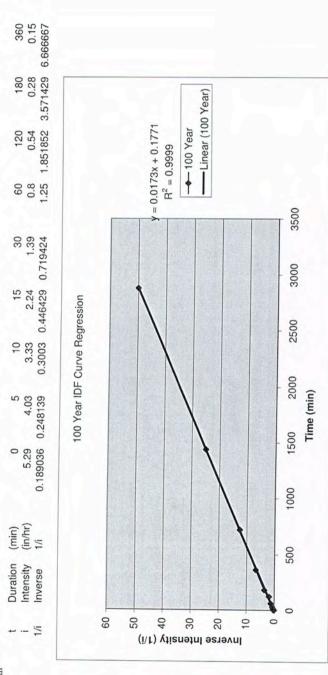
 $i = \frac{55.56}{(t + 96.23)}$ A = 55.55556 B = 96.22722 Thus the rainfall formula is

0.9778 with a correlation coefficient of:

0.02

1440 0.04 25

720 0.08 12.5



 $\frac{1}{100} = 0.0173t + .1771$ Therefore the regression above yields Can be expressed in linear form as A model of the form $i = \frac{dt}{(t+B)}$

Which Means that

A = 57.80347 B = 10.23699

 $i = \frac{57.8}{(t+10.24)}$ 0.9999 Thus the rainfall formula is

with a correlation coefficient of:

						Best Fit	1	1
ၓျ	-	-	1	-	-	-		-
27	38.22807018	-9.660493827	96.2272222	48.56725146	33.03488372	10.23699422		36.10565466
5	71.31650264	55.11463845	79.36507937	62.88121738	50.999592	41.58522893		60.21037646
اه	38.22807018	-9.660493827	96.2272222	48.56725146	33.03488372	10.23699422		36.10565466
A	29.23976608	30.86419753	55.5555556	58.47953216	58.13953488	57.80346821		48.34700907
Regression R	0.9993	0.9733	0.9778	0.9978	0.9985	0.9999		0.9911
Event Type	2 year	5 year	10 year	25 year	50 year	100 year		Average

List of Variables

A = C = C1, C2, and C3 = C5 = I = ID =	watershed area in acres runoff coefficient coefficients in IDF formula 5-yr runoff coefficient rainfall intensity in inches/hour user defined identification number
L =	flow length in ft
S =	slope for flow length in ft/ft
P1 =	one hour precipitation value in inches
Tc =	time of concentration in minutes
Td =	design rainfall duration in minutes
Tf =	flow time in minutes
Tr =	return period in years
Qp =	peak runoff rate in cfs
V =	flow velocity in ft/second

Runoff Coefficient vs. Watershed Imperviousness

Based on Runoff Coefficient estimating equation published by Urbonas, et.al. (1990) & WEF (1998)

Basic equation for NRCS Soil Types C & D:

 $C_{CD} = K_{CD} + (0.858*i^3 - 0.786*i^2 + 0.774*i + 0.04)$

Basic equation for NRCS Soil Type A:

 $C_A = K_A + (1.31 \text{ i}^3 - 1.44 \text{ i}^2 + 1.135 \text{ i} - 0.12)$ in which use values for $C_A > 0$

in which: $i = I_a/100$, imperviousness ratio

I a = watershed imperviousness in percent

CA = Runoff Coefficient for NRCS Soil Type A

 K_A = Correction factor for C_A when the storm return period is greater than 2-years

 C_{CD} = Runoff Coefficient for NRCS Soil Types C and D

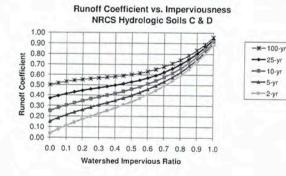
 K_{CD} = Correction factor for C_{CD} when the storm return period is greater than 2-years

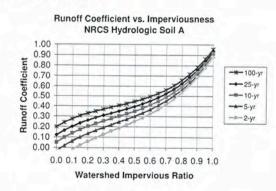
		V	alues of Correction	Factors K CD& K	A	
NRCS			Storm Ret	turn Period		
Soil Types	2-yr	5-yr	10-yr	25-yr	50-yr	100-ут
C&D	0.00	[-0.10*i+0.11]	[-0.18*i+0.21]	[-0.28*i+0.33]	[-0.33*i+0.40]	[-0.39*i+0.46]
A	0.00	[-0.08*i+0.09]	[-0.14*/+0.17]	[-0.19*i+0.24]	[-0.22*i+0.28]	[-0.25*i+0.32]

7.1			Values of I	Runoff Coefficient	C _{CD}			Values	of Runoff C	Coefficient C	A	
Imperv.	Type C and D NRCS Hydrologic Soil Groups					Type A NRCS Hydrologic Soils Group						
Ratio (i)	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr
0.00	0.04	0.15	0.25	0.37	0.44	0.50	-0.12	-0.03	0.05	0.12	0.16	0.20
0.05	0.08	0.18	0.28	0.39	0.46	0.52	-0.07	0.02	0.10	0.16	0.20	0.24
0.10	0.11	0.21	0.30	0.41	0.48	0.53	-0.02	0.06	0.14	0.20	0.24	0.28
0.15	0.14	0.24	0.32	0.43	0.49	0.54	0.02	0.10	0.17	0.23	0.27	0.30
0.20	0.17	0.26	0.34	0.44	0.50	0.55	0.06	0.13	0.20	0.26	0.30	0.33
0.25	0.20	0.28	0.36	0.46	0.52	0.56	0.09	0.16	0.23	0.29	0.32	0.35
0.30	0.22	0.30	0.38	0.47	0.53	0.57	0.13	0.19	0.25	0.31	0.34	0.37
0.35	0.25	0.33	0.40	0.48	0.54	0.57	0.16	0.22	0.28	0.33	0.36	0.39
0.40	0.28	0.35	0.42	0.50	0.55	0.58	0.19	0.25	0.30	0.35	0.38	0.41
0.45	0.31	0.37	0.44	0.51	0.56	0.59	0.22	0.27	0.33	0.37	0.40	0.43
0.50	0.34	0.40	0.46	0.53	0.57	0.60	0.25	0.30	0.35	0.40	0.42	0.45
0.55	0.37	0.43	0.48	0.55	0.59	0.62	0.29	0.33	0.38	0.42	0.45	0.47
0.60	0.41	0.46	0.51	0.57	0.61	0.63	0.33	0.37	0.41	0.45	0.47	0.50
0.65	0.45	0.49	0.54	0.59	0.63	0.65	0.37	0.41	0.45	0.49	0.51	0.53
0.70	0.49	0.53	0.57	0.62	0.66	0.68	0.42	0.45	0.49	0.53	0.54	0.56
0.75	0.54	0.58	0.62	0.66	0.69	0.71	0.47	0.50	0.54	0.57	0.59	0.61
0.80	0.60	0.63	0.66	0.70	0.73	0.74	0.54	0.56	0.60	0.63	0.64	0.66
0.85	0.66	0.68	0.71	0.75	0.78	0.79	0.61	0.63	0.66	0.69	0.70	0.72
0.90	0.73	0.75	0.77	0.80	0.83	0.83	0.69	0.71	0.73	0.76	0.77	0.79
0.95	0.80	0.82	0.84	0.87	0.89	0.89	0.78	0.80	0.82	0.84	0.85	0.86
1.00	0.89	0.90	0.92	0.94	0.96	0.96	0.89	0.90	0.92	0.94	0.95	0.96

For Type B Soils, use the average of coefficients C_{CD} and C_A .

When the Runoff Coefficient in above table is < 0, use 0. When compositing the Runoff Coefficient for different soil types, use the table values above regardless if they are < 0.





I. One-hr Precipitation Values for Metro Denver Area

Return period in years	2	5	10	50	100
Depth in inches	0.93	1.35	1.61	2.20	2.60

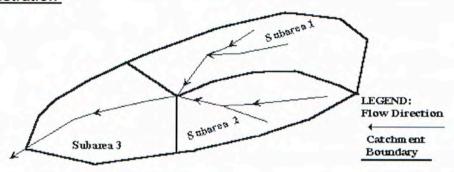
II. Recommended Runoff Coefficients for Metro Denver

Land Use or Surface Characteristics	Percent Imper viousness
Business:	
Commercial areas	95
Neighborhood areas	85
Residential:	
Single-family	
Multiunit (detached)	60
Multiunit (attached)	75
Half-acre lot or larger	
Apartments	80
Industrial:	
Light areas	80
Heavy areas	90
Parks, cemeteries:	5
Playgrounds:	10
Schools:	50
Railroad yard areas:	15
Undeveloped areas:	
Historical Flow Analysis	2
Greenbelts, agricultural	
Off-site flow analysis	45
(when land use not defined)	
Streets:	
Paved	100
Gravel (packed)	40
Driveways and sidewalks:	90
Roofs:	90
Lawns, sandy soil	0
Lawns, clayey soil	0

^{*}Refer to Figures RO-3 through RO-5 in Runoff Chapter of USDCM.

Project Title:	Westwater Farms LLC	
Catchment ID:	H1	

Illustration



Instructions: For each catchment subarea, enter values for A and C.

Subarea	Area	Runoff	Product	
ID	acres	Coeff.		
	Α	C*	CA	
input	input	input	output	
1	6.88	0.44	3.03	
2	0.84	0.42	0.35	
Sum:	7.72	Sum:	3.38	

 $\label{eq:Area-Weighted Runoff Coefficient (sum CA/sum A) = } \underline{\qquad 0.44} \\ \text{*See sheet "Design Info" for inperviousness-based runoff coefficient values.}$

Project Title:	Westwater Farms LLC	
Catchment ID:	H1	

I. Catchment Hydrologic Data

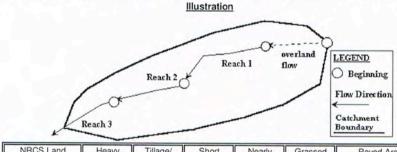
Catchment ID = H1		
Area =	7.72	Acres
Percent Imperviousness =	45.00	%
NRCS Soil Type =	D	A, B, C, or D

II. Rainfall Information I (inch/hr) = C1 $^{+}$ P1 /(C2 + Td)^C3

Design Storm Return Period, Tr =	10 years	(input return period for design storm)
C1 =	79.30	(input the value of C1)
C2=	96.20	(input the value of C2)
C3=	1.000	(input the value of C3)
P1=	0.12 inches	(input one-hr precipitationsee Sheet "Design Info")

III. Analysis of Flow Time (Time of Concentration) for a Catchment

Runoff Coefficient, C =	0.44
Overide Runoff Coefficient, C =	0.44 (enter an overide C value if desired, or leave blank to accept calculated C.)
5-yr. Runoff Coefficient, C-5 =	0.37
Overide 5-yr. Runoff Coefficient, C =	0.37 (enter an overide C-5 value if desired, or leave blank to accept calculated C-5.)



NRCS Land Type	Heavy Meadow	Tillage/ Field	Short Pasture/ Lawns	Nearly Bare Ground	Grassed Swales/ Waterways	Paved Areas & Shallow Paved Swales (Sheet Flow)
Conveyance	2.5	5	7	10	15	20

Calculations:

Reach	Slope	Length	5-yr	NRCS	Flow	Flow
ID	S	L	Runoff	Convey-	Velocity	Time
11	500		Coeff	ance	V	Tf
	ft/ft	ft	C-5		fps	minutes
A	input	input	output	input	output	output
Overland			0.37	N/A	0.00	0.00
1	0.0150	800		7.00	0.86	15.55
2	0.0170	640		7.00	0.91	11.69
3						
4						
5						
	Sum	1,440		Con	nputed Tc =	27.24
				Re	egional Tc =	18.00
				User-E	ntered Tc =	22.00

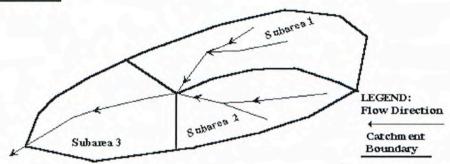
IV. Peak Runoff Prediction

Rainfall Intensity at Computed Tc, I =	0.08 inch/hr	Peak Flowrate, Qp =	0.26 cfs
Rainfall Intensity at Regional Tc, I =	0.08 inch/hr	Peak Flowrate, Qp =	0.28 cfs
Rainfall Intensity at User-Defined Tc, I =	0.08 inch/hr	Peak Flowrate, Qp =	0.27 cfs

Calculated values for Tc & Op are based on overide values entered for C & C-5.

Project Title:	Westwater Farms LLC	
Catchment ID:	H2	

Illustration



Instructions: For each catchment subarea, enter values for A and C.

Subarea	Area	Runoff	Product
ID	acres	Coeff.	
	Α	C*	CA
input	input	input	output
1	10.71	0.44	4.71
2	0.29	0.42	0.12
3	0.05	0.77	0.04
	1		
Sum:	11.05	Sum:	4.87

Area-Weighted Runoff Coefficient (sum CA/sum A) = _____0.44
*See sheet "Design Info" for inperviousness-based runoff coefficient values.

Project Title:	Westwater Farms LLC	
Catchment ID:	H2	

I. Catchment Hydrologic Data

II. Rainfall Information I (inch/hr) = C1 * P1 /(C2 + Td)^C3

Design Storm Return Period, Tr = 10 years (input return period for design storm) (input the value of C1) (input the value of C2) (input the value of C3) (input one-hr precipitation--see Sheet "Design Info")

III. Analysis of Flow Time (Time of Concentration) for a Catchment

Runoff Coefficient, C = 0.44
Overide Runoff Coefficient, C = 0.44 (enter an overide C value if desired, or leave blank to accept calculated C.)
5-yr. Runoff Coefficient, C-5 = 0.37
Overide 5-yr. Runoff Coefficient, C = 0.37 (enter an overide C-5 value if desired, or leave blank to accept calculated C-5.)

Reach 2 Reach 1 Reach 2 Reach 3 Reach 3 Reach 3 Reach 3

NRCS Land Type	Heavy Meadow	Tillage/ Field	Short Pasture/ Lawns	Nearly Bare Ground	Grassed Swales/ Waterways	Paved Areas & Shallow Paved Swales (Sheet Flow)
Conveyance	2.5	5	7	10	15	20

Calculations:

Reach	Slope	Length	5-yr	NRCS	Flow	Flow
ID	S	L	Runoff	Convey-	Velocity	Time
67.4	1000	7. 1	Coeff	ance	V	Tf
	ft/ft	ft	C-5		fps	minutes
	input	input	output	input	output	output
Overland			0.37	N/A	0.00	0.00
1	0.0224	980		7.00	1.05	15.57
2				7.00		
3						
4						
5						
	Sum	980		Con	nputed Tc =	15.57
				Re	egional Tc =	15.44
				User-E	ntered Tc =	17.67

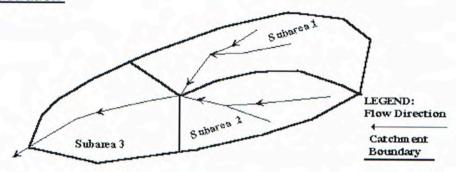
IV. Peak Runoff Prediction

Rainfall Intensity at Computed Tc, I = 0.09 inch/hr Peak Flowrate, Qp = 0.41 cfs Rainfall Intensity at Regional Tc, I = 0.09 inch/hr Peak Flowrate, Qp = 0.42 cfs Rainfall Intensity at User-Defined Tc, I = 0.08 inch/hr Peak Flowrate, Qp = 0.41 cfs

Calculated values for Tc & Op are based on overide values entered for C & C-5.

Project Title:	Westwater Farms LLC	
Catchment ID:	H3	

Illustration



Instructions: For each catchment subarea, enter values for A and C.

Subarea	Area	Runoff	Product
ID	acres	Coeff.	166 250
	Α	C*	CA
input	input	input	output
1	4.91	0.44	2.16
			, -
Sum:	4.91	Sum:	2.16

 $\label{eq:Area-Weighted Runoff Coefficient (sum CA/sum A) = } \underline{0.44}$ *See sheet "Design Info" for inperviousness-based runoff coefficient values.

Project Title:	Westwater Farms LLC	
Catchment ID:	H3	

I. Catchment Hydrologic Data

Catchment ID = H3		
Area =	4.91	Acres
Percent Imperviousness =	45.00	%
NRCS Soil Type =	D	A, B, C, or D

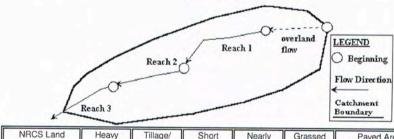
II. Rainfall Information I (inch/hr) = C1 * P1 /(C2 + Td)^C3

Design Storm Return Period, Tr =	10 years	(input return period for design storm)
C1 =	79.30	(input the value of C1)
C2=	96.20	(input the value of C2)
C3=	1.000	(input the value of C3)
P1=	0.12 inches	(input one-hr precipitationsee Sheet "Design Info")

III. Analysis of Flow Time (Time of Concentration) for a Catchment

Runoff Coefficient, C =	0.44
Overide Runoff Coefficient, C =	0.44 (enter an overide C value if desired, or leave blank to accept calculated C.)
5-yr. Runoff Coefficient, C-5 =	0.37
Overide 5-yr. Runoff Coefficient, C =	0.37 (enter an overide C-5 value if desired, or leave blank to accept calculated C-5.)

Illustration



NRCS Land Type	Heavy Meadow	Tillage/ Field	Short Pasture/ Lawns	Nearly Bare Ground	Grassed Swales/ Waterways	Paved Areas & Shallow Paved Swales (Sheet Flow)
Conveyance	2.5	5	7	10	15	20

Calculations:

Reach	Slope	Length	5-yr	NRCS	Flow	Flow
ID	S	L	Runoff	Convey-	Velocity	Time
11			Coeff	ance	V	Tf
	ft/ft	ft	C-5		fps	minutes
	input	input	output	input	output	output
Overland			0.37	N/A	0.00	0.00
1	0.0181	990		7.00	0.94	17.52
2						
3						
4						
5						
	Sum	990		Con	puted Tc =	17.52
				Re	egional Tc =	15.50
				User-E	ntered Tc =	16.00

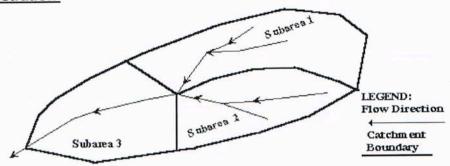
IV. Peak Runoff Prediction

Rainfall Intensity at Computed Tc, I =	0.08 inch/hr	Peak Flowrate, Qp =	0.18 cfs
Rainfall Intensity at Regional Tc, I =	0.09 inch/hr	Peak Flowrate, Qp =	0.18 cfs
Rainfall Intensity at User-Defined Tc, I =	0.08 inch/hr	Peak Flowrate, Qp =	0.18 cfs

Calculated values for Tc & Qp are based on overide values entered for C & C-5.

Project Title:	Westwater Farms LLC		
Catchment ID:	H1		

Illustration



Instructions: For each catchment subarea, enter values for A and C.

Subarea	Area	Runoff	Product
ID	acres	Coeff.	
	Α	C*	CA
input	input	input	output
1	6.88	0.59	4.06
2	0.84	0.58	0.49
Sum:	7.72	Sum:	4.55

 $\label{eq:Area-Weighted Runoff Coefficient (sum CA/sum A) = } \underline{0.59}$ *See sheet "Design Info" for inperviousness-based runoff coefficient values.

Project Title:	Westwater Farms LLC	
Catchment ID:	H1	

I. Catchment Hydrologic Data

 Catchment ID = H1

 Area =
 8.68
 Acres

 Percent Imperviousness =
 45.00
 %

 NRCS Soil Type =
 D
 A, B, C, or D

II. Rainfall Information I (inch/hr) = C1 * P1 /(C2 + Td)^C3

Design Storm Return Period, Tr = 100 years (input return period for design storm)

C1 = 41.58 (input return period for design storm)

(input the value of C1)
(input the value of C2)
(input the value of C3)

P1 = 0.24 inches (input one-hr precipitation--see Sheet "Design Info")

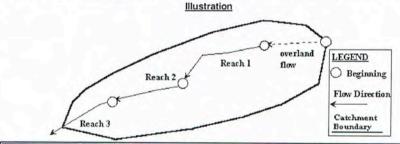
III. Analysis of Flow Time (Time of Concentration) for a Catchment

Runoff Coefficient, C = 0.57

Overide Runoff Coefficient, C = 0.59 (enter an overide C value if desired, or leave blank to accept calculated C.)

5-yr. Runoff Coefficient, C-5 = 0.32

Overide 5-yr. Runoff Coefficient, C = 0.37 (enter an overide C-5 value if desired, or leave blank to accept calculated C-5.)



NRCS Land Type	Heavy Meadow	Tillage/ Field	Short Pasture/ Lawns	Nearly Bare Ground	Grassed Swales/ Waterways	Paved Areas & Shallow Paved Swales (Sheet Flow)
Conveyance	2.5	5	7	10	15	20

Calculations:

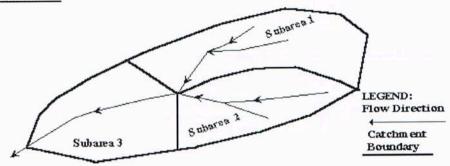
Reach	Slope	Length	5-yr	NRCS	Flow	Flow
ID	S	L	Runoff	Convey-	Velocity	Time
			Coeff	ance	V	Tf
	ft/ft	ft	C-5		fps	minutes
No. No. of	input	input	output	input	output	output
Overland			0.37	N/A	0.00	0.00
1	0.0320	245		7.00	1.25	3.26
2	0.0170	900		7.00	0.91	16.43
3						
4						
5						
	Sum	1,145		Con	puted Tc =	19.70
				Re	egional Tc =	16.36
				User-E	ntered Tc =	17.00

IV. Peak Runoff Prediction

Rainfall Intensity at Computed Tc, I =	0.33 inch/hr	Peak Flowrate, Qp =	1.70 cfs
Rainfall Intensity at Regional Tc, I =	0.38 inch/hr	Peak Flowrate, Qp =	1.92 cfs
Rainfall Intensity at User-Defined Tc, I =	0.37 inch/hr	Peak Flowrate, Qp =	1.87 cfs

Project Title:	Westwater Farms LLC	
Catchment ID:	H2	45.4

Illustration



Instructions: For each catchment subarea, enter values for A and C.

Subarea	Area	Runoff	Product
ID	acres	Coeff.	
	Α	C*	CA
input	input	input	output
1	10.71	0.59	6.32
2	0.29	0.58	0.17
3	0.05	0.83	0.04
			_
Sum:	11.05	Sum:	6.53

 $\label{eq:Area-Weighted Runoff Coefficient (sum CA/sum A) = } \underline{0.59}$ *See sheet "Design Info" for inperviousness-based runoff coefficient values.

Project Title:	Westwater Farms LLC	
Catchment ID:	H2	

I. Catchment Hydrologic Data

 Catchment ID = H2

 Area =
 6.56
 Acres

 Percent Imperviousness =
 45.00
 %

 NRCS Soil Type =
 D A, B, C, or D

II. Rainfall Information I (inch/hr) = C1 * P1 /(C2 + Td)^C3

Design Storm Return Period, Tr = 100 years (input return period for design storm) (input the value of C1) (input the value of C2) (input the value of C3) (input one-hr precipitation--see Sheet "Design Info")

III. Analysis of Flow Time (Time of Concentration) for a Catchment

Runoff Coefficient, C = 0.57

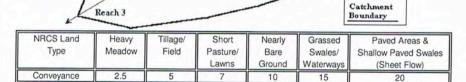
Overide Runoff Coefficient, C = 0.59 (enter an overide C value if desired, or leave blank to accept calculated C.)

5-yr. Runoff Coefficient, C-5 = 0.31

Overide 5-yr. Runoff Coefficient, C = 0.37 (enter an overide C-5 value if desired, or leave blank to accept calculated C-5.)

Illustration

Reach 1 flow | LEGEND | Beginning



Calculations:

Reach	Slope	Length	5-yr	NRCS	Flow	Flow
ID	S	L	Runoff	Convey-	Velocity	Time
CAMPA			Coeff	ance	V	Tf
	ft/ft	ft	C-5		fps	minutes
	input	input	output	input	output	output
Overland			0.37	N/A	0.00	0.00
1	0.0222	900		7.00	1.04	14.37
2						
3						
4						
5						
	Sum	900		Con	puted Tc =	14.37
				Re	gional Tc =	15.00
				User-E	ntered Tc =	14.70

IV. Peak Runoff Prediction

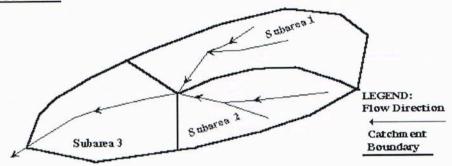
Rainfall Intensity at Computed Tc, I =	0.41 inch/hr
Rainfall Intensity at Regional Tc, I =	0.40 inch/hr
Rainfall Intensity at User-Defined Tc, I =	0.40 inch/hr

Peak Flowrate, Qp =	1.57 cfs
Peak Flowrate, Qp =	1.53 cfs
Peak Flowrate, Qp =	1.55 cfs

Flow Direction

Project Title:	Westwater Farms LLC	
Catchment ID:	H3	

Illustration



Instructions: For each catchment subarea, enter values for A and C.

Subarea	Area	Runoff	Product
ID	acres	Coeff.	
	Α	C*	CA
input	input	input	output
1	4.91	0.59	2.90
			_
Sum:	4.91	Sum:	2.90

 $\label{eq:Area-Weighted Runoff Coefficient (sum CA/sum A) = } \underline{0.59}$ *See sheet "Design Info" for inperviousness-based runoff coefficient values.

Project Title:	Westwater Farms LLC	
Catchment ID:	H3	

I. Catchment Hydrologic Data

Catchment ID = H3

Area = 4.91 Acres

Percent Imperviousness = 45.00 %

NRCS Soil Type = D A, B, C, or D

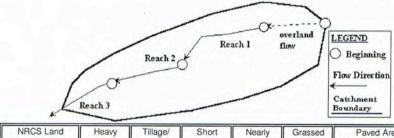
II. Rainfall Information I (inch/hr) = C1 * P1 /(C2 + Td)^C3

Design Storm Return Period, Tr = 100 years (input return period for design storm) (input the value of C1) (input the value of C2) (input the value of C3) (input one-hr precipitation--see Sheet "Design Info")

III. Analysis of Flow Time (Time of Concentration) for a Catchment

Runoff Coefficient, C = 0.57
Overide Runoff Coefficient, C = 0.59 (enter an overide C value if desired, or leave blank to accept calculated C.)
5-yr. Runoff Coefficient, C-5 = 0.30
Overide 5-yr. Runoff Coefficient, C = 0.37 (enter an overide C-5 value if desired, or leave blank to accept calculated C-5.)

Illustration



NRCS Land Type	Heavy Meadow	Tillage/ Field	Short Pasture/ Lawns	Nearly Bare Ground	Grassed Swales/ Waterways	Paved Areas & Shallow Paved Swales (Sheet Flow)
Conveyance	2.5	5	7	10	15	20

Calculations:

Reach	Slope	Length	5-yr	NRCS	Flow	Flow
ID	S	L	Runoff	Convey-	Velocity	Time
. · V	6.0		Coeff	ance	V	Tf
9.	ft/ft	ft	C-5		fps	minutes
× 1	input	input	output	input	output	output
Overland			0.37	N/A	0.00	0.00
1	0.0811	990		7.00	1.99	8.28
2						
3						
4						
5						
	Sum	990		Con	puted Tc =	8.28
				Re	egional Tc =	15.50

User-Entered Tc =

IV. Peak Runoff Prediction

Rainfall Intensity at Computed Tc, I =	0.54 inch/hr	Peak Flowrate, Qp =	1.56 cfs
Rainfall Intensity at Regional Tc, I =	0.39 inch/hr	Peak Flowrate, Qp =	1.12 cfs
Rainfall Intensity at User-Defined Tc, I =	0.43 inch/hr	Peak Flowrate, Qp =	1.24 cfs

Project Title:	Westwater Farms LLC		
Catchment ID:	WWFWRTP - Basin O1		

Instructions: For each catchment subarea, enter values for A and C.

Subarea	Area	Runoff	Product	Intensity	Flow
ID	acres	Coeff.			
	Α	C*	CA	1	Q=CIA
input	input	input	output	input	output
1	1.18	0.44	0.52	0.12	0.06
Sum:	1.18	Sum:	0.52		0.06

Project Title:	Westwater Farms LLC	
Catchment ID:	01	

I. Catchment Hydrologic Data

Catchment ID = O1

Area = 1.18 Acres

Percent Imperviousness = 45.00 %

NRCS Soil Type = D A, B, C, or D

II. Rainfall Information I (inch/hr) = C1 * P1 /(C2 + Td)^C3

Design Storm Return Period, Tr = 10 years (input return period for design storm)

C1 = 79.30 (input the value of C1)

C2 = 96.20 (input the value of C2)

C3 = 1.000 (input the value of C3)

P1 = 0.12 inches (input return period for design storm)

(input the value of C2)

(input the value of C3)

(input one-hr precipitation--see Sheet "Design Info")

III. Analysis of Flow Time (Time of Concentration) for a Catchment

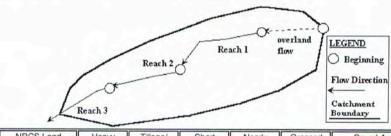
Runoff Coefficient, C = 0.23

Overide Runoff Coefficient, C = 0.44 (enter an overide C value if desired, or leave blank to accept calculated C.)

5-yr. Runoff Coefficient, C-5 = 0.31

Overide 5-yr. Runoff Coefficient, C = 0.37 (enter an overide C-5 value if desired, or leave blank to accept calculated C-5.)

Illustration



NRCS Land Type	Heavy Meadow	Tillage/ Field	Short Pasture/ Lawns	Nearly Bare Ground	Grassed Swales/ Waterways	Paved Areas & Shallow Paved Swales (Sheet Flow)
Conveyance	2.5	5	7	10	15	20

Calculations:

Reach	Slope	Length	5-yr	NRCS	Flow	Flow
ID	S	L	Runoff	Convey-	Velocity	Time
1000	4 1		Coeff	ance	V	Tf
	ft/ft	ft	C-5		fps	minutes
	input	input	output	input	output	output
Overland			0.37	N/A	0.00	0.00
1	0.0242	330		7.00	1.09	5.05
2	0.0097	620		7.00	0.69	15.01
3						
4						
5						
	Sum	950		Con	puted Tc =	20.05
				Re	egional Tc =	15.28
				User-E	ntered Tc =	17.00

IV. Peak Runoff Prediction

Rainfall Intensity at Computed Tc, I =	0.08 inch/hr	Peak Flowrate, Qp =	0.04 cfs
Rainfall Intensity at Regional Tc, I =	0.09 inch/hr	Peak Flowrate, Qp =	0.04 cfs
Rainfall Intensity at User-Defined Tc, I =	0.08 inch/hr	Peak Flowrate, Qp =	0.04 cfs

Calculated values for Tc & Op are based on overide values entered for C & C-5.

Project Title:	Westwater Farms LLC	
Catchment ID:	WWFWRTP - Basin O2	

Instructions: For each catchment subarea, enter values for A and C.

Subarea	Area	Runoff	Product	Intensity	Flow
ID	acres	Coeff.			
	Α	C*	CA		Q=CIA
input	input	input	output	input	output
1	0.45	0.44	0.20	0.12	0.02
Sum:	0.45	Sum:	0.20		0.02

 $\label{eq:Area-Weighted Runoff Coefficient (sum CA/sum A) = } \underline{\qquad 0.44} \\ \text{*See sheet "Design Info" for inperviousness-based runoff coefficient values.}$

Project Title:	Westwater Farms LLC	
Catchment ID:	O2	

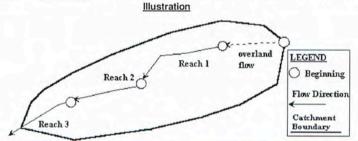
I. Catchment Hydrologic Data

II. Rainfall Information I (inch/hr) = C1 * P1 /(C2 + Td)^C3

Design Storm Return Period, Tr = 10 years (input return period for design storm) (input the value of C1) (input the value of C2) (input the value of C2) (input the value of C3) (input the value of C3) (input the value of C3) (input one-hr precipitation--see Sheet "Design Info")

III. Analysis of Flow Time (Time of Concentration) for a Catchment

Runoff Coefficient, C = 0.23
Overide Runoff Coefficient, C = 0.44 (enter an overide C value if desired, or leave blank to accept calculated C.)
5-yr. Runoff Coefficient, C-5 = 0.31
Overide 5-yr. Runoff Coefficient, C = 0.37 (enter an overide C-5 value if desired, or leave blank to accept calculated C-5.)



NRCS Land Type	Heavy Meadow	Tillage/ Field	Short Pasture/ Lawns	Nearly Bare Ground	Grassed Swales/ Waterways	Paved Areas & Shallow Paved Swales (Sheet Flow)
Conveyance	2.5	5	7	10	15	20

Calculations:

Reach	Slope	Length	5-yr	NRCS	Flow	Flow
ID	S	L	Runoff	Convey-	Velocity	Time
1 * 1 H			Coeff	ance	V	Tf
771	ft/ft	ft	C-5		fps	minutes
1.126	input	input	output	input	output	output
Overland			0.37	N/A	0.00	0.00
1	0.0105	190		7.00	0.72	4.41
2	0.0145	275		7.00	0.84	5.43
3						
4						
5						
	Sum	465		Con	puted Tc =	9.84
				Re	egional Tc =	12.58
				User-F	ntered Tc =	11.00

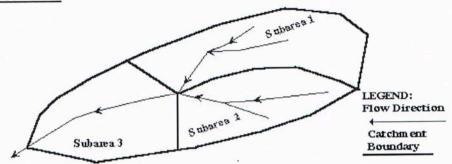
IV. Peak Runoff Prediction

Rainfall Intensity at Computed Tc, I =	0.09 inch/hr	Peak Flowrate, Qp =	0.02 cfs
Rainfall Intensity at Regional Tc, I =	0.09 inch/hr	Peak Flowrate, Qp =	0.02 cfs
Rainfall Intensity at User-Defined Tc, I =	0.09 inch/hr	Peak Flowrate, Qp =	0.02 cfs
Calaulated values for To 0 Co.	the format of the state of the		

Calculated values for Tc & Qp are based on overide values entered for C & C-5.

Project Title:	Westwater Farms LLC	
Catchment ID:	A	

Illustration



Instructions: For each catchment subarea, enter values for A and C.

Subarea	Area	Runoff	Product
ID	acres	Coeff.	
	Α	C*	CA
input	input	input	output
1	5.31	0.44	2.34
2	2.41	0.92	2.22
Sum:	7.72	Sum:	4.55

Area-Weighted Runoff Coefficient (sum CA/sum A) = _____0.59 *See sheet "Design Info" for inperviousness-based runoff coefficient values.

Project Title: Westwater Farms LLC
Catchment ID: A

I. Catchment Hydrologic Data

Catchment ID = A

Area = 7.72 Acres

Percent Imperviousness = 72.00 %

NRCS Soil Type = D A, B, C, or D

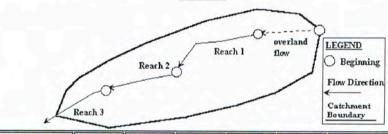
II. Rainfall Information I (inch/hr) = C1 * P1 /(C2 + Td)^C3

Design Storm Return Period, Tr = 10 years (input return period for design storm) (input the value of C1) (input the value of C2) (input the value of C3) (input one-hr precipitation--see Sheet "Design Info")

III. Analysis of Flow Time (Time of Concentration) for a Catchment

Runoff Coefficient, C = 0.59
Overide Runoff Coefficient, C = 0.59 (enter an overide C value if desired, or leave blank to accept calculated C.)
5-yr. Runoff Coefficient, C-5 = 0.55
Overide 5-yr. Runoff Coefficient, C = 0.55 (enter an overide C-5 value if desired, or leave blank to accept calculated C-5.)

| Illustration | Illustration | Illustration | Illustration | Illustration | Illustration | Illustration | Illustration | Illustration | Illustration | Illustration | Illustration | Illustration | Illustration | Illustration | Illustration | Illustration | Illustration | Illustration | Illustration | Illustration | Illustration | Illustration | Illustration | Illustration | Illustration | Illustration | Illustration | Illustration | Illustration | Illustration | Illustration | Illustration | Illustration | Illustration | Illustration | Illustration | Illustration | Illustration | Illustration | Illustration | Illustration | Illustration | Illustration | Illustration | Illustration | Illustration | Illustration | Illustration | Illustration | Illustration | Illustration | Illustration | Illustration | Illustration | Illustration | Illustration | Illustration | Illustration | Illustration | Illustration | Illustration | Illustration | Illustration | Illustration | Illustration | Illustration | Illustration | Illustration | Illustration | Illustration | Illustration | Illustration | Illustration | Illustration | Illustration | Illustration | Illustration | Illustration | Illustration | Illustration | Illustration | Illustration | Illustration | Illustration | Illustration | Illustration | Illustration | Illustration | Illustration | Illustration | Illustration | Illustration | Illustration | Illustration | Illustration | Illustration | Illustration | Illustration | Illustration | Illustration | Illustration | Illustration | Illustration | Illustration | Illustration | Illustration | Illustration | Illustration | Illustration | Illustration | Illustration | Illustration | Illustration | Illustration | Illustration



NRCS Land Type	Heavy Meadow	Tillage/ Field	Short Pasture/ Lawns	Nearly Bare Ground	Grassed Swales/ Waterways	Paved Areas & Shallow Paved Swales (Sheet Flow)
Conveyance	2.5	5	7	10	15	20

Calculations:

Reach	Slope	Length	5-yr	NRCS	Flow	Flow
ID	S	L	Runoff	Convey-	Velocity	Time
	1 2 - 1		Coeff	ance	V	Tf
	ft/ft	ft	C-5		fps	minutes
	input	input	output	input	output	output
Overland			0.55	N/A	0.00	0.00
1	0.0150	800		15.00	1.84	7.26
2	0.0170	640		15.00	1.96	5.45
3						
4						
5						
	Sum	1,440		Con	nputed Tc =	12.71
				Re	egional Tc =	18.00
				User-E	ntered Tc =	15.00

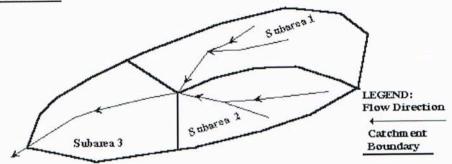
IV. Peak Runoff Prediction

Rainfall Intensity at Computed Tc, I =	0.09 inch/hr	Peak Flowrate, Qp =	0.40 cfs
Rainfall Intensity at Regional Tc, I =	0.08 inch/hr	Peak Flowrate, Qp =	0.38 cfs
Rainfall Intensity at User-Defined Tc, I =	0.09 inch/hr	Peak Flowrate, Qp =	0.39 cfs
Coloulated values for To 0 Co			

Calculated values for Tc & Qp are based on overide values entered for C & C-5.

Project Title:	Westwater Farms LLC	
Catchment ID:	В	

Illustration



Instructions: For each catchment subarea, enter values for A and C.

Subarea	Area	Runoff	Product
ID	acres	Coeff.	
	Α	C*	CA
input	input	input	output
1	0.85	0.44	0.37
2	0.57	0.77	0.44
3	2.25	0.92	2.07
Sum:	3.67	Sum:	2.88

 $\label{eq:Area-Weighted Runoff Coefficient (sum CA/sum A) = } \underline{\qquad 0.79}$ *See sheet "Design Info" for inperviousness-based runoff coefficient values.

Project Title:	Westwater Farms LLC	
Catchment ID:	В	

I. Catchment Hydrologic Data

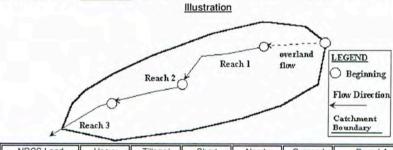
Catchment ID = B		
Area =	3.67	Acres
Percent Imperviousness =	91.00	%
NRCS Soil Type =	D	A, B, C, or D

II. Rainfall Information I (inch/hr) = C1 * P1 /(C2 + Td)^C3

Design Storm Return Period, Tr =	10 years	(input return period for design storm)
C1 =	79.30	(input the value of C1)
C2=	96.20	(input the value of C2)
C3=	1.000	(input the value of C3)
P1=	0.12 inches	(input one-hr precipitationsee Sheet "Design Info")

III. Analysis of Flow Time (Time of Concentration) for a Catchment

Runoff Coefficient, C =	0.79
Overide Runoff Coefficient, C =	0.79 (enter an overide C value if desired, or leave blank to accept calculated C.)
5-yr. Runoff Coefficient, C-5 =	0.76
Overide 5-yr. Runoff Coefficient, C =	0.77 (enter an overide C-5 value if desired, or leave blank to accept calculated C-5.)



NRCS Land Type	Heavy Meadow	Tillage/ Field	Short Pasture/ Lawns	Nearly Bare Ground	Grassed Swales/ Waterways	Paved Areas & Shallow Paved Swales (Sheet Flow)
Conveyance	2.5	5	7	10	15	20

Calculations:

Reach	Slope	Length	5-yr	NRCS	Flow	Flow
ID	S	L	Runoff	Convey-	Velocity	Time
		77.7	Coeff	ance	V	Tf
1.8	ft/ft	ft	C-5	1	fps	minutes
	input	input	output	input	output	output
Overland			0.77	N/A	0.00	0.00
1	0.0104	576		15.00	1.53	6.28
2						
3						
4						
5						
	Sum	576		Con	puted Tc =	6.28
				Re	egional Tc =	13.20
				User-E	ntered Tc =	15.50

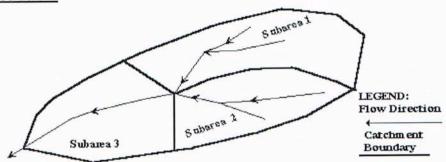
IV. Peak Runoff Prediction

Rainfall Intensity at Computed Tc, I =	0.09 inch/hr	Peak Flowrate, Qp =	0.27 cfs
Rainfall Intensity at Regional Tc, I =	0.09 inch/hr	Peak Flowrate, Qp =	0.25 cfs
Rainfall Intensity at User-Defined Tc, I =	0.09 inch/hr	Peak Flowrate, Qp =	0.25 cfs
Calculated values for To 8 Co.			

Calculated values for Tc & Op are based on overide values entered for C & C-5.

Project Title:	Westwater Farms LLC	
Catchment ID:	С	

Illustration



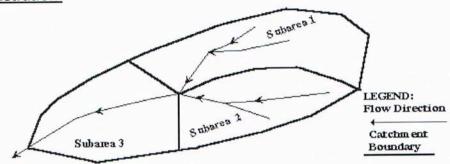
Instructions: For each catchment subarea, enter values for A and C.

Subarea	Area	Runoff	Product
ID	acres	Coeff.	
	Α	C*	CA
input	input	input	output
1	1.89	0.44	0.83
2	0.34	0.77	0.26
3	0.56	0.92	0.52
Sum:	2.79	Sum:	1.61

 $\label{eq:Area-Weighted Runoff Coefficient (sum CA/sum A) = } \underline{0.58}$ *See sheet "Design Info" for inperviousness-based runoff coefficient values.

Project Title:	Westwater Farms LLC	
Catchment ID:	D	

Illustration



Instructions: For each catchment subarea, enter values for A and C.

Subarea	Area	Runoff	Product
ID	acres	Coeff.	
	Α	C*	CA
input	input	input	output
1	1.71	0.44	0.75
2	0.35	0.77	0.27
3	0.54	0.92	0.50
Sum:	2.60	Sum:	1.52

Area-Weighted Runoff Coefficient (sum CA/sum A) = _____0.58 *See sheet "Design Info" for inperviousness-based runoff coefficient values.

Project Title:	Westwater Farms LLC	
Catchment ID:	D	10

I. Catchment Hydrologic Data

Catchment ID = D		
Area =	2.60	Acres
Percent Imperviousness =	74.00	%
NRCS Soil Type =	D	A, B, C, or D

II. Rainfall Information I (inch/hr) = C1 * P1 /(C2 + Td)^C3

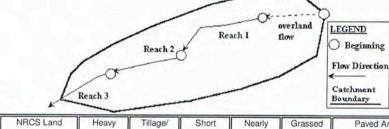
Design Storm Return Period, Tr = 10 years (input return period for design storm) 79.30 (input the value of C1) 96.20 C2= (input the value of C2) 1.000 (input the value of C3) 0.12 inches (input one-hr precipitation--see Sheet "Design Info")

III. Analysis of Flow Time (Time of Concentration) for a Catchment

Runoff Coefficient, C = 0.61 Overide Runoff Coefficient, C = 0.58 (enter an overide C value if desired, or leave blank to accept calculated C.) 5-yr. Runoff Coefficient, C-5 = 0.57 Overide 5-yr. Runoff Coefficient, C = 0.57 (enter an overide C-5 value if desired, or leave blank to accept calculated C-5.)

Illustration

overland



NRCS Land Type	Heavy Meadow	Tillage/ Field	Short Pasture/ Lawns	Nearly Bare Ground	Grassed Swales/ Waterways	Paved Areas & Shallow Paved Swales (Sheet Flow)
Conveyance	2.5	5	7	10	15	20

Calculations:

Reach	Slope	Length	5-yr	NRCS	Flow	Flow
ID	S	L	Runoff	Convey-	Velocity	Time
), Yerell		1 4 4 1	Coeff	ance	V	Tf
	ft/ft	ft	C-5		fps	minutes
	input	input	output	input	output	output
Overland			0.57	N/A	0.00	0.00
1	0.0343	350		15.00	2.78	2.10
2						
3						
4						
5						
	Sum	350		Con	puted Tc =	2.10
				Re	egional Tc =	11.94
				User-E	ntered Tc =	

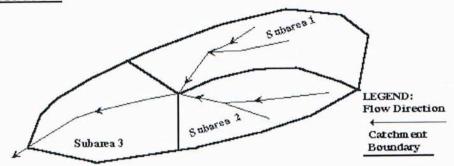
IV. Peak Runoff Prediction

Rainfall Intensity at Computed Tc, I =	0.10 inch/hr	Peak Flowrate, Qp =	0.15 cfs
Rainfall Intensity at Regional Tc, I =	0.09 inch/hr	Peak Flowrate, Qp =	0.13 cfs
Rainfall Intensity at User-Defined Tc, I =	inch/hr	Peak Flowrate, Qp = #	VALUE! cfs
Calculated values for To 2 On	ava bassal on susulda ustru		

& Qp are based on overide values entered for C & C-5.

Project Title:	Westwater Farms LLC	
Catchment ID:	E	

Illustration



Instructions: For each catchment subarea, enter values for A and C.

Subarea	Area	Runoff	Product
ID	acres	Coeff.	
	Α	C*	CA
input	input	input	output
1	1.42	0.44	0.62
Sum:	1.42	Sum:	0.62

Area-Weighted Runoff Coefficient (sum CA/sum A) = ____0.44 *See sheet "Design Info" for inperviousness-based runoff coefficient values.

Project Title:	Westwater Farms LLC	
Catchment ID:	E	

I. Catchment Hydrologic Data

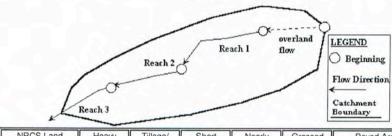
Catchment ID = E		
Area =	1.42	Acres
Percent Imperviousness =	45.00	%
NRCS Soil Type =	D	A, B, C, or D

II. Rainfall Information I (inch/hr) = C1 * P1 /(C2 + Td)^C3

Design Storm Return Period, Tr =	10 years	(input return period for design storm)
C1 =	79.30	(input the value of C1)
C2=	96.20	(input the value of C2)
C3=	1.000	(input the value of C3)
P1=	0.12 inches	(input one-hr precipitationsee Sheet "Design Info")

III. Analysis of Flow Time (Time of Concentration) for a Catchment

Runoff Coefficient, C =	0.44
Overide Runoff Coefficient, C =	0.44 (enter an overide C value if desired, or leave blank to accept calculated C.)
5-yr. Runoff Coefficient, C-5 =	0.37
Overide 5-yr. Runoff Coefficient, C =	0.37 (enter an overide C-5 value if desired, or leave blank to accept calculated C-5.)
	Illustration



NRCS Land Type	Heavy Meadow	Tillage/ Field	Short Pasture/ Lawns	Nearly Bare Ground	Grassed Swales/ Waterways	Paved Areas & Shallow Paved Swales (Sheet Flow)
Conveyance	2.5	5	7	10	15	20

Calculations:

Reach	Slope	Length	5-yr	NRCS	Flow	Flow
ID	S	L	Runoff	Convey-	Velocity	Time
777			Coeff	ance	V	Tf
	ft/ft	ft	C-5		fps	minutes
	input	input	output	input	output	output
Overland			0.37	N/A	0.00	0.00
1	0.0370	270		15.00	2.89	1.56
2			1			
3						
4						
5					T V	
	Sum	270		Con	nputed Tc =	1.56
					egional Tc =	11.50
				User-E	ntered Tc =	

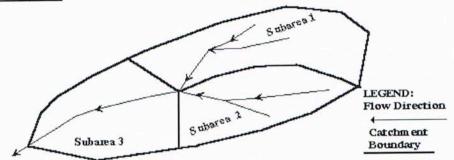
IV. Peak Runoff Prediction

Rainfall Intensity at Computed Tc, I =	0.10 inch/hr	Peak Flowrate, Qp =	0.06 cfs
Rainfall Intensity at Regional Tc, I =	0.09 inch/hr	Peak Flowrate, Qp =	0.06 cfs
Rainfall Intensity at User-Defined Tc, I =	inch/hr	Peak Flowrate, Qp =	#VALUE! cfs
Coloulated colour for T o C	and the second s		

Calculated values for Tc & Qp are based on overide values entered for C & C-5.

Project Title:	Westwater Farms LLC	
Catchment ID:	F	

Illustration



Instructions: For each catchment subarea, enter values for A and C.

Subarea	Area	Runoff	Product
ID	acres	Coeff.	
	Α	C*	CA
input	input	input	output
1	4.91	0.44	2.16
Sum:	4.91	Sum:	2.16

Area-Weighted Runoff Coefficient (sum CA/sum A) = _____0.44 *See sheet "Design Info" for inperviousness-based runoff coefficient values.

Project Title:	Westwater Farms LLC	
Catchment ID:	F	

I. Catchment Hydrologic Data

Catchment ID = F		
Area =	4.91	Acres
Percent Imperviousness =	45.00	%
NRCS Soil Type =	D	A, B, C, or D

II. Rainfall Information I (inch/hr) = C1 * P1 /(C2 + Td)^C3

Design Storm Return Period, Tr =	10 years	(input return period for design storm)
C1 =	79.30	(input the value of C1)
C2=	96.20	(input the value of C2)
C3=	1.000	(input the value of C3)
P1=	0.12 inches	(input one-hr precipitationsee Sheet "Design Info")

III. Analysis of Flow Time (Time of Concentration) for a Catchment

Runoff Coefficient, C = 0.44
Overide Runoff Coefficient, C = 0.44 (enter an overide C value if desired, or leave blank to accept calculated C.)
5-yr. Runoff Coefficient, C-5 = 0.37
Overide 5-yr. Runoff Coefficient, C = 0.37 (enter an overide C-5 value if desired, or leave blank to accept calculated C-5.)

Illustration

Reach 2 Overland Seginning Reach 2 Flow Direction

Catchment

Boundary

NRCS Land Type	Heavy Meadow	Tillage/ Field	Short Pasture/ Lawns	Nearly Bare Ground	Grassed Swales/ Waterways	Paved Areas & Shallow Paved Swales (Sheet Flow)
Conveyance	2.5	5	7	10	15	20

Calculations:

Reach 3

Reach	Slope	Length	5-yr	NRCS	Flow	Flow
ID	S	L	Runoff	Convey-	Velocity	Time
			Coeff	ance	V	Tf
	ft/ft	ft	C-5		fps	minutes
1. 1. 1. 1. 1.	input	input	output	input	output	output
Overland			0.37	N/A	0.00	0.00
1	0.0181	990		15.00	2.02	8.18
2						
3						
4						
5						
	Sum	990		Con	puted Tc =	8.18
				Re	egional Tc =	15.50
				User-E	ntered Tc =	12.00

IV. Peak Runoff Prediction

Rainfall Intensity at Computed Tc, I =	0.09 inch/hr	Peak Flowrate, Qp =	0.20 cfs
Rainfall Intensity at Regional Tc, I =	0.09 inch/hr	Peak Flowrate, Qp =	0.18 cfs
Rainfall Intensity at User-Defined Tc, I =	0.09 inch/hr	Peak Flowrate, Qp =	0.19 cfs
Calculated values for To 9 On a	na banad an availda ast		

Calculated values for Tc & Qp are based on overide values entered for C & C-5.

Project Title:	Westwater Farms LLC	
Catchment ID:	G	

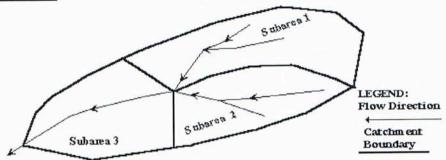
Instructions: For each catchment subarea, enter values for A and C.

Subarea	Area	Runoff	Product	Intensity	Flow
ID	acres	Coeff.			
	Α	C*	CA	ı	Q=CIA
input	input	input	output	input	output
1	0.57	0.92	0.52	0.12	0.06
			1		
Sum:	0.57	Sum:	0.52		0.06

 $\label{eq:Area-Weighted Runoff Coefficient (sum CA/sum A) = } \underline{0.92}$ *See sheet "Design Info" for inperviousness-based runoff coefficient values.

Project Title:	Westwater Farms LLC	
Catchment ID:	A	

Illustration



Instructions: For each catchment subarea, enter values for A and C.

Subarea	Area	Runoff	Product
ID	acres	Coeff.	
	Α	C*	CA
input	input	input	output
1	5.31	0.59	3.13
2	2.41	0.96	2.31
Sum:	7.72	Sum:	5.45

Area-Weighted Runoff Coefficient (sum CA/sum A) = _____0.71 *See sheet "Design Info" for inperviousness-based runoff coefficient values.

Project Title:	Westwater Farms LLC	
Catchment ID:	A	

I. Catchment Hydrologic Data

Catchment ID = A		
Area =	7.72	Acres
Percent Imperviousness =	72.00	%
NRCS Soil Type =	D	A, B, C, or D

II. Rainfall Information I (inch/hr) = C1 * P1 /(C2 + Td)^C3

Design Storm Return Period, Tr = 100 years (input return period for design storm)

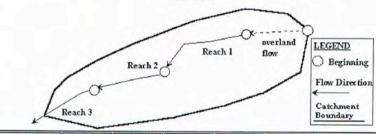
C1 = 41.58 (input return period for design storm)

(input the value of C1)
(input the value of C2)
(input the value of C3)
(input the value of C3)
(input one-hr precipitation--see Sheet "Design Info")

III. Analysis of Flow Time (Time of Concentration) for a Catchment

Runoff Coefficient, C = 0.69
Overide Runoff Coefficient, C = 0.71 (enter an overide C value if desired, or leave blank to accept calculated C.)
5-yr. Runoff Coefficient, C-5 = 0.55
Overide 5-yr. Runoff Coefficient, C = 0.55 (enter an overide C-5 value if desired, or leave blank to accept calculated C-5.)

| Illustration |



NRCS Land Type	Heavy Meadow	Tillage/ Field	Short Pasture/ Lawns	Nearly Bare Ground	Grassed Swales/ Waterways	Paved Areas & Shallow Paved Swales (Sheet Flow)
Conveyance	2.5	5	7	10	15	20

Calculations:

Reach	Slope	Length	5-yr	NRCS	Flow	Flow
ID	S	L	Runoff	Convey-	Velocity	Time
100 8			Coeff	ance	V	Tf
7. 7.8	ft/ft	ft	C-5		fps	minutes
Jan Mary St.	input	input	output	input	output	output
Overland			0.55	N/A	0.00	0.00
1	0.0320	245		15.00	2.68	1.52
2	0.0170	900		15.00	1.96	7.67
3						
4						
5						
	Sum	1,145	. 1 ° N	Con	puted Tc =	9.19
				Re	gional Tc =	16.36
				Hser-F	ntered To -	12.00

IV. Peak Runoff Prediction

Rainfall Intensity at Computed Tc, I =	0.51 inch/hr	Peak Flowrate, Qp =	2.80 cfs
Rainfall Intensity at Regional Tc, I =	0.38 inch/hr	Peak Flowrate, Qp =	2.04 cfs
Rainfall Intensity at User-Defined Tc, I =	0.45 inch/hr	Peak Flowrate, Qp =	2.44 cfs
Calculated values for Tc & Qp a	re based on overide value	ues entered for C & C-5.	

Project Title:	Westwater Farms LLC	
Catchment ID:	В	

I. Catchment Hydrologic Data

Catchment ID = B Area = _ 3.67 Acres 91.00 % Percent Imperviousness = NRCS Soil Type = DA, B, C, or D

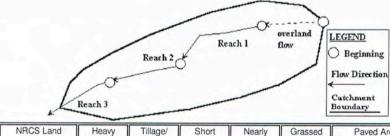
II. Rainfall Information I (inch/hr) = C1 * P1 /(C2 + Td)^C3

Design Storm Return Period, Tr = (input return period for design storm) 100 years 41.58 (input the value of C1) (input the value of C2) C2= 10.24 1.000 (input the value of C3) 0.24 inches (input one-hr precipitation--see Sheet "Design Info")

III. Analysis of Flow Time (Time of Concentration) for a Catchment

Runoff Coefficient, C = 0.85 Overide Runoff Coefficient, C = 0.85 (enter an overide C value if desired, or leave blank to accept calculated C.) 5-yr. Runoff Coefficient, C-5 = 0.76 Overide 5-yr. Runoff Coefficient, C = 0.77 (enter an overide C-5 value if desired, or leave blank to accept calculated C-5.)

Illustration



NRCS Land Type	Heavy Meadow	Tillage/ Field	Short Pasture/ Lawns	Nearly Bare Ground	Grassed Swales/ Waterways	Paved Areas & Shallow Paved Swales (Sheet Flow)
Conveyance	2.5	5	7	10	15	20

Calculations:

Reach	Slope	Length	5-yr	NRCS	Flow	Flow
ID	S	L	Runoff	Convey-	Velocity	Time
1.34			Coeff	ance	V	Tf
	ft/ft	ft	C-5		fps	minutes
	input	input	output	input	output	output
Overland			0.77	N/A	0.00	0.00
1	0.0104	576		15.00	1.53	6.28
2						
3					10 10001	
4						
5						
	Sum	576	_	Con	nputed Tc =	6.28
					egional Tc =	13.20

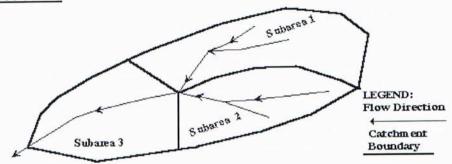
IV. Peak Runoff Prediction

Rainfall Intensity at Computed Tc, I = Peak Flowrate, Qp = _ 0.60 inch/hr Peak Flowrate, Qp = 1.33 cfs Peak Flowrate, Qp = #VALUE! cfs Rainfall Intensity at Regional Tc, I = Rainfall Intensity at User-Defined Tc, I = 0.43 inch/hr inch/hr

Calculated values for Tc & Op are based on overide values entered for C & C-5.

Project Title:	Westwater Farms LLC	
Catchment ID:	С	

Illustration



Instructions: For each catchment subarea, enter values for A and C.

Subarea	Area	Runoff	Product	
ID	ID acres Coeff.	Coeff.		
	Α	C*	CA	
input	input	input	output	
1	1.89	0.59	1.12	
2	0.34	0.83	0.28	
3	0.56	0.96	0.54	
Sum:	2.79	Sum:	1.93	

 $\label{eq:Area-Weighted Runoff Coefficient (sum CA/sum A) = 0.69} $$ *See sheet "Design Info" for inperviousness-based runoff coefficient values.$

Project Title:	Westwater Farms LLC
Catchment ID:	С

I. Catchment Hydrologic Data

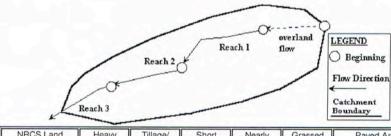
II. Rainfall Information I (inch/hr) = C1 * P1 /(C2 + Td)^C3

Design Storm Return Period, Tr = 100 years (input return period for design storm) (input the value of C1) (input the value of C2) (input the value of C3) (input one-hr precipitation--see Sheet "Design Info")

III. Analysis of Flow Time (Time of Concentration) for a Catchment

Runoff Coefficient, C = 0.69
Overide Runoff Coefficient, C = 0.69 (enter an overide C value if desired, or leave blank to accept calculated C.)
5-yr. Runoff Coefficient, C-5 = 0.55
Overide 5-yr. Runoff Coefficient, C = 0.55 (enter an overide C-5 value if desired, or leave blank to accept calculated C-5.)

Illustration



NRCS Land Type	Heavy Meadow	Tillage/ Field	Short Pasture/ Lawns	Nearly Bare Ground	Grassed Swales/ Waterways	Paved Areas & Shallow Paved Swales (Sheet Flow)
Conveyance	2.5	5	7	10	15	20

Calculations:

Reach	Slope	Length	5-yr	NRCS	Flow	Flow
ID	S	L	Runoff	Convey-	Velocity	Time
1			Coeff	ance	V	Tf
	ft/ft	ft	C-5		fps	minutes
	input	input	output	input	output	output
Overland			0.55	N/A	0.00	0.00
1	0.0077	260		15.00	1.32	3.29
2	0.0172	290		15.00	1.97	2.46
3	0.0177	113		15.00	2.00	0.94
4	0.2730	220		15.00	7.84	0.47
5						
	Sum	883		Con	nputed Tc =	7.16
				Re	egional Tc =	14.91
				Hoor E	ptored To	10.00

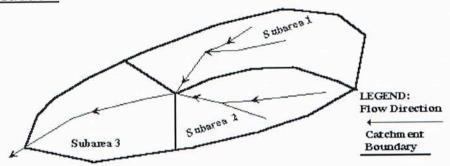
IV. Peak Runoff Prediction

Rainfall Intensity at Computed Tc, I =	0.57 inch/hr	Peak Flowrate, Qp =	1.11 cfs
Rainfall Intensity at Regional Tc, I =	0.40 inch/hr	Peak Flowrate, Qp =	0.77 cfs
Rainfall Intensity at User-Defined Tc, I =	0.45 inch/hr	Peak Flowrate, Qp =	0.87 cfs

Calculated values for Tc & Op are based on overide values entered for C & C-5.

Project Title:	Westwater Farms LLC	
Catchment ID:	D	

Illustration



Instructions: For each catchment subarea, enter values for A and C.

Subarea	Area	Runoff	Product	
ID	acres	Coeff.		
	Α	C*	CA	
input	input	input	output	
1	1.71	0.59	1.01	
2	0.35	0.83	0.29	
3	0.54	0.96	0.52	
Sum:	2.60	Sum:	1.82	

Area-Weighted Runoff Coefficient (sum CA/sum A) = _____0.70
*See sheet "Design Info" for inperviousness-based runoff coefficient values.

Project Title:	Westwater Farms LLC	
Catchment ID:	D	

I. Catchment Hydrologic Data

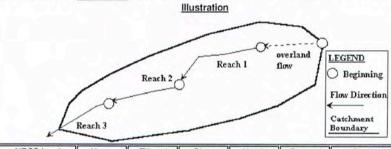
Catchment ID = D		
Area =	2.60	Acres
Percent Imperviousness =	74.00	%
NRCS Soil Type =	D	A, B, C, or D

II. Rainfall Information I (inch/hr) = C1 * P1 /(C2 + Td)^C3

Design Storm Return Period, Tr =	100 years	(input return period for design storm)
C1 =	41.58	(input the value of C1)
C2=	10.24	(input the value of C2)
C3=	1.000	(input the value of C3)
P1=	0.24 inches	(input one-hr precipitationsee Sheet "Design Info")

III. Analysis of Flow Time (Time of Concentration) for a Catchment

Runoff Coefficient, C =	0.70
Overide Runoff Coefficient, C =	0.70 (enter an overide C value if desired, or leave blank to accept calculated C.)
5-yr. Runoff Coefficient, C-5 =	0.57
Overide 5-yr. Runoff Coefficient, C =	0.57 (enter an overide C-5 value if desired, or leave blank to accept calculated C-5.)



NRCS Land Type	Heavy Meadow	Tillage/ Field	Short Pasture/ Lawns	Nearly Bare Ground	Grassed Swales/ Waterways	Paved Areas & Shallow Paved Swales (Sheet Flow)
Conveyance	2.5	5	7	10	15	20

Calculations:

Reach	Slope	Length	5-yr	NRCS	Flow	Flow
ID	S	L	Runoff	Convey-	Velocity	Time
	100		Coeff	ance	V	Tf
	ft/ft	ft	C-5		fps	minutes
3. 1.	input	input	output	input	output	output
Overland	- Control		0.57	N/A	0.00	0.00
1	0.0343	350		15.00	2.78	2.10
2						
3						
4						
5						
	Sum	350		Con	nputed Tc =	2.10
				Re	egional Tc =	11.94
				User-E	ntered Tc =	

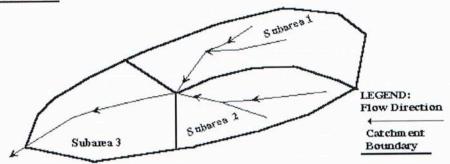
IV. Peak Runoff Prediction

Rainfall Intensity at Computed Tc, I =	0.81 inch/hr	Peak Flowrate, Qp =	1.47 cfs
Rainfall Intensity at Regional Tc, I =	0.45 inch/hr	Peak Flowrate, Qp =	0.82 cfs
Rainfall Intensity at User-Defined Tc, I =	inch/hr	Peak Flowrate, Qp = #\	/ALUE! cfs

Calculated values for Tc & Op are based on overide values entered for C & C-5.

Project Title:	Westwater Farms LLC		
Catchment ID:	E		

Illustration



Instructions: For each catchment subarea, enter values for A and C.

Subarea	Area	Runoff	Product	
ID	acres	Coeff.		
	Α	C*	CA	
input	input	input	output	
1	1.42	0.59	0.84	
Sum:	1.42	Sum:	0.84	

Area-Weighted Runoff Coefficient (sum CA/sum A) = 0.59
*See sheet "Design Info" for inperviousness-based runoff coefficient values.

Project Title:	Westwater Farms LLC		
Catchment ID:	E		

I. Catchment Hydrologic Data

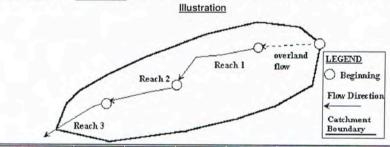
Catchment ID = E	
Area =	1.42 Acres
Percent Imperviousness =	45.00 %
NRCS Soil Type =	D A, B, C, or [

II. Rainfall Information I (inch/hr) = C1 * P1 /(C2 + Td)^C3

Design Storm Return Period, Tr =	100 years	(input return period for design storm)
C1 =	41.58	(input the value of C1)
C2=	10.24	(input the value of C2)
C3=	1.000	(input the value of C3)
P1=	0.24 inches	(input one-hr precipitationsee Sheet "Design Info")

III. Analysis of Flow Time (Time of Concentration) for a Catchment

Runoff Coefficient, C =	0.59
Overide Runoff Coefficient, C =	0.59 (enter an overide C value if desired, or leave blank to accept calculated C.)
5-yr. Runoff Coefficient, C-5 =	0.37
Overide 5-yr. Runoff Coefficient, C =	0.37 (enter an overide C-5 value if desired, or leave blank to accept calculated C-5.)



NRCS Land Type	Heavy Meadow	Tillage/ Field	Short Pasture/ Lawns	Nearly Bare Ground	Grassed Swales/ Waterways	Paved Areas & Shallow Paved Swales (Sheet Flow)
Conveyance	2.5	5	7	10	15	20

Calculations:

Reach	Slope	Length	5-yr	NRCS	Flow	Flow
ID	S	L	Runoff	Convey-	Velocity	Time
	TO NO.		Coeff	ance	V	Tf
	ft/ft	ft	C-5		fps	minutes
	input	input	output	input	output	output
Overland			0.37	N/A	0.00	0.00
1	0.0370	270		15.00	2.89	1.56
2						
3						
4						
5						
	Sum	270		Com	puted Tc =	1.56
				Re	gional Tc =	11.50
				User-E	ntered Tc =	7.00

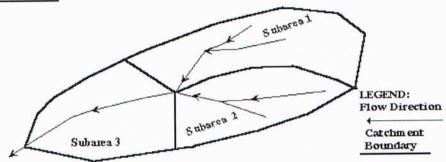
IV. Peak Runoff Prediction

Rainfall Intensity at Computed Tc, I =	0.85 inch/hr	Peak Flowrate, Qp =	0.71 cfs
Rainfall Intensity at Regional Tc, I =	0.46 inch/hr	Peak Flowrate, Qp =	0.38 cfs
Rainfall Intensity at User-Defined Tc, I =	0.58 inch/hr	Peak Flowrate, Qp =	0.48 cfs
Coloulated values for To 0 On a	ne been all an arm tite of the		

Calculated values for Tc & Qp are based on overide values entered for C & C-5.

Project Title:	Westwater Farms LLC		
Catchment ID:	F		

Illustration



Instructions: For each catchment subarea, enter values for A and C.

Subarea	Area	Runoff	Product
ID	acres	Coeff.	
	Α	C*	CA
input	input	input	output
1	4.91	0.59	2.90
			11
Sum:	4.91	Sum:	2.90

Area-Weighted Runoff Coefficient (sum CA/sum A) = _____0.59 *See sheet "Design Info" for inperviousness-based runoff coefficient values.

Project Title:	Westwater Farms LLC	
Catchment ID:	First Section 1	

I. Catchment Hydrologic Data

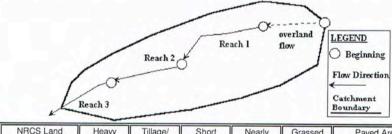
Catchment ID = F		
Area =	4.91	Acres
Percent Imperviousness =	45.00	%
NRCS Soil Type =	D	A, B, C, or D

II. Rainfall Information I (inch/hr) = C1 * P1 /(C2 + Td)^C3

Design Storm Return Period, Tr =	100 years	(input return period for design storm)
C1 =	41.58	(input the value of C1)
C2=	10.24	(input the value of C2)
C3=	1.000	(input the value of C3)
P1=	0.24 inches	(input one-hr precipitationsee Sheet "Design Info")

III. Analysis of Flow Time (Time of Concentration) for a Catchment

Runoff Coefficient, C =	0.59
Overide Runoff Coefficient, C =	0.59 (enter an overide C value if desired, or leave blank to accept calculated C.)
5-yr. Runoff Coefficient, C-5 =	0.37
Overide 5-yr. Runoff Coefficient, C =	0.37 (enter an overide C-5 value if desired, or leave blank to accept calculated C-5.)
	Illustration



NRCS Land Type	Heavy Meadow	Tillage/ Field	Short Pasture/ Lawns	Nearly Bare Ground	Grassed Swales/ Waterways	Paved Areas & Shallow Paved Swales (Sheet Flow)
Conveyance	2.5	5	7	10	15	20

Calculations:

Reach	Slope	Length	5-yr	NRCS	Flow	Flow
ID	S	L	Runoff	Convey-	Velocity	Time
			Coeff	ance	V	Tf
6	ft/ft	ft	C-5		fps	minutes
	input	input	output	input	output	output
Overland			0.37	N/A	0.00	0.00
1	0.0181	990		15.00	2.02	8.18
2						
3						
4						
5						
	Sum	990		Con	nputed Tc =	8.18
				Re	egional Tc =	15.50
				User-E	ntered Tc =	12.00

IV. Peak Runoff Prediction

Rainfall Intensity at Computed Tc, I =	0.54 inch/hr	Peak Flowrate, Qp =	1.57 cfs
Rainfall Intensity at Regional Tc, I =	0.39 inch/hr	Peak Flowrate, Qp =	1.12 cfs
Rainfall Intensity at User-Defined Tc, I =	0.45 inch/hr	Peak Flowrate, Qp =	1.30 cfs
Coloulated values for Ta 9 Or a	as been done and the de		

Calculated values for Tc & Qp are based on overide values entered for C & C-5.

Project Title:	Westwater Farms LLC	
Catchment ID:	G	
Catchinent ib.		

Instructions: For each catchment subarea, enter values for A and C.

Subarea	Area	Runoff	Product	Intensity	Flow
ID	acres	Coeff.			
	Α	C*	CA	1	Q=CIA
input	input	input	output	input	output
1	0.57	0.96	0.55	0.24	0.13
Sum:	0.57	Sum:	0.55		0.13

 $\label{eq:Area-Weighted Runoff Coefficient (sum CA/sum A) = } \underline{\qquad 0.96}$ *See sheet "Design Info" for inperviousness-based runoff coefficient values.

10 Year Delta for Westwater Site

(cfs)	Delta	0.12	0.27					0.02			0.41
(cfs)	Future Flow	0.40	0.27	0.15	0.15	90.0	90.0	0.20	0.04	0.02	Total
	Proposed Basin	A	В	0	D	Ш	G	Ь	01	02	
(cfs)	Historical Flow	0.28 A	0.42 B					0.18 F	0.04 01	0.02 02	
	Historical Basin	H1	H2					H3	01	02	

100 Year Delta for Westwater Site

	0110			
	(cfs)		(cfs)	(cfs)
Historical Basin	Historical Flow	Proposed Basin	Future Flow	Delta
H1	1.92 A	А	2.80	0.88
H2	1.57 B	В	1.89	3.74
		O	1.11	
		D	1.47	
		Ш	0.71	
		5	0.13	
H3	1.56	Ш	1.57	0.01
01	0.27	01	0.27	
02	0.13 02	02	0.13	
			Total	4.63

Design Procedure Form: Retention Pond (RP) - Sedimentation Facility

(Sheet 1 of 3)

Designer:

Andrew Stewart

Company:

Stewart Environmental Consultants

Date:

November 24, 2010

Project:

Westwater Farms, LLC

Location:

Westwater Utah

1. Basin Storage Volume

A) Tributary Area's Imperviousness Ratio (i = $I_a/100$)

B) Contributing Watershed Area (Area)

C) Water Quality Capture Volume (WQCV) $(WQCV = 0.8 * (0.91 * I^3 - 1.19 * I^2 + 0.78 * I))$ D) Design Volume: Vol = (WQCV / 12) * Area

$$I_a = 75.17$$
 % $i = 0.75$

Proposed Retention Pond Volume

 $V_{Trapazodal Method} = d \times (A_{elev1} + A_{elev2}) / 2$

Description	Bottom of Retention Pond		Top of Provided Volume		Top of 2' Freeboard
Total Volume (ac-ft)		0.37	0.79	1.27	1.81
Total Volume Total Volume (ft³) (ac-ft)	State of the State	16024	34386	55216	78640
Volume (ac-ft)		0.37	0.42	0.48	0.54
Volume (ft ³)		16024	18363	20830	23425
₽Œ		1	1	-	-
Area (ft²)	14886	17161	19564	22095	24754
Contour Elev.	4854	4855	4856	4857	4858

Appendix I

Waste Management Plan for the WestWater
Farms Production Water Recycling Facility





Waste Management Plan

for the

WestWater Farms Production Water Recycling Facility
100 West State Highway 6
Westwater, Utah

Prepared for:

WestWater Farms, LLC Cisco, Colorado

Prepared by:

Stewart Environmental Consultants, LLC Consulting Engineers and Scientists Fort Collins, Colorado

November 2010

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	1.2 Purpose	1
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	3.2 Walnut Shell Filter and Backwash Holding Tank	2
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	3.5 CMF Clean-In-Place (CIP) Skid	2
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APPENDICES

Appendix A: Waste Material Disposition Worksheet

1.0 INTRODUCTION

1.1 Authorization

In September 2010, Produced Water Development authorized Stewart Environmental Consultants, LLC to prepare this Waste Management Plan for the management, control and disposition of generated waste materials in accordance with the building requirements of Grand County, Utah.

1.2 Purpose

The goal for this plan is to ensure that waste generated, as practicable, will be recycled, re-used, or otherwise diverted from direct disposal. To accomplish this goal Produced Water Development intends to recycle and reuse as many types of generated wastes as possible.

This Waste Management Plan specifies the procedure for the management, control and disposition of generated waste streams from the WestWater Farms Production Water Recycle Facility (WFPWRF) located in Westwater, Utah. The following is a list of the different categories of materials that may be generated during the project:

- a. Recyclable Materials
- b. Waste/Refuse Materials
- Reusable Materials

The procedures for the management, control and disposition of these items are described in subsequent sections of this plan.

2.0 SITE LOCATION

WestWater Farms, LLC is proposing to construct the WFPWRF. WestWater Farms will own and operate the WFPWRF, which will be located near the intersection of West State Highway 6 and Interstate 70 in Westwater, Utah. The WFPWRF will receive and treat production water from oil and gas wells located in Utah and Colorado.

3.0 PROCESS WASTE MANAGEMENT

WFPWRF is dedicated to maintaining a set of guidelines to control the amount of waste produced and disposed. Most individual processes in the overall proprietary produced water treatment process create a waste stream and in some cases a sub waste stream. Waste streams, classifications, amounts and disposal methods are dependant on the process and recourses available at the site and are outlined below.

3.1 Aeration Tank

The aeration tank will produce three waste streams and no sub-waste streams. These streams are: empty chemical drums, skimmed oil and sludge bottoms.

Through the aeration process approximately 7 empty chemical drums will be produced monthly, 100 gallons of skimmed oil and 200 gallons of sludge bottoms will be produced annually.

Empty drums are classified as solid waste but are recyclable so they will be on site for pick up and recycling/reuse by the vendor. The skimmed oil is a recoverable product and will be held for pick up by a local vendor for transport to their local sales tank. Sludge bottoms are classified as hazardous materials, however since our process tank will only be cleaned once every 5 years, all sludge bottoms in the aeration process are considered 'in process' materials and will be circulated in the process tank until cleaning. Upon cleaning of the tank, the sludge bottoms will be properly classified and properly disposed or recycled.

3.2 Walnut Shell Filter and Backwash Holding Tank

The walnut shell filter and backwash holding tank will produce three waste streams and four sub-waste streams. The waste streams are: empty chemical drums and totes, empty walnut shell bags and backwash water. The sub-waste streams from the backwash water are: bag filters, skimmed oil, sludge bottoms and water.

Through the walnut filter and backwash holding tank process approximately one empty chemical tote will be produced each month, six empty walnut shell bags will be produced each quarter and 9,000 gallons of backwash water are produced each day. From the 9,000 gallons of backwash water approximately five bag filters and 9,000 gallons of water will be produced daily and 100 gallons of skimmed oil and 1,000 gallons of sludge bottoms will be produced annually. Empty drums and totes are classified as solid waste but are recyclable so they will be on site for pick up and recycling/reuse by the vendor. Empty walnut shell bags are classified as solid waste and will be transported to the local landfill via solid waste dumpster.

Backwash water sub waste will be disposed according to classification. Bag filters will be classified as either solid or hazardous waste depending on waste characteristics. Solid waste filters will be disposed via the local landfill and hazardous waste filters will be disposed via a selected hazardous waste vendor. The skimmed oil is a recoverable product and will be held for pick up by a local vendor for transport to their local sales tank. Sludge bottoms are classified as hazardous materials, however since our process tank will only be cleaned once every 5 years, all sludge bottoms in the backwash process are considered 'in process' materials and will be circulated in the backwash tank until cleaning. Upon cleaning of the tank, the sludge bottoms will be properly classified and properly disposed or recycled. The 9,000 gallons of residual water will either be recirculated through the systems or injected into the onsite injection well.

3.3 Reaction Tank

The reaction tank will only produce ten empty chemical totes per month and no sub-waste streams. Empty drums and totes are classified as solid waste but are recyclable so they will be on site for pick up and recycling/reuse by the vendor.

3.4 Ceramic Micro Filtration (CMF) Skid

The CMF Skid will produce two waste streams and no sub-waste streams. These streams are: pneumatic condensate and sludge bleed. Approximately two gallons of pneumatic condensate and 6,480 gallons of sludge bleed will be produced daily. Both are classified solid wastes. The pneumatic condensate will be returned into the system and the sludge bleed will be fed into the filter press for further processing.

3.5 CMF Clean-In-Place (CIP) Skid

The CMF CIP Skid will produce two waste streams and no sub-waste streams. These waste streams are spent CIP Solution and empty chemical drums and totes. Approximately 2,000 gallons of spent CIP solution will be produced daily and ten empty chemical totes per month. The spent CIP Solution will be recycled back into the Clean-In-Place Neutralization

Waste Management Plan WestWater Farms Production Water Recycling Facility – Westwater, Utah 5001.010(4)

WestWater Farms, LLC Page 2 of 4 (CIPN) Skid for reused and while the empty drums and totes are classified as solid waste but are recyclable so they will be on site for pick up and recycling/reuse by the vendor.

3.6 Clean-In-Place Neutralization (CIPN) Skid

The CIPN skid will produce two waste streams and no sub-waste streams. These waste streams are neutralized CIP Solution and empty chemical drums and totes. Approximately 3,000 gallons of neutralized CIP solution will be produced daily and ten empty chemical totes per month. The neutralized CIP Solution will be recycled back into the sludge tank for reuse. The empty drums and totes are classified as solid waste but are recyclable so they will be on site for pick up and recycling/reuse by the vendor.

3.7 Sludge Tank and Filter Press

The sludge tank and filter press will produce approximately 10 cubic feet of filter cake waste per day. This waste will be classified as either a solid or hazardous waste depending on the waste characteristics. Solid waste filter cake will be disposed via the local landfill and hazardous waste filter cake will be disposed via a selected hazardous waste vendor.

3.8 Activated Carbon Columns and Feed Tank

The activated carbon columns and feed tank will produce three waste streams and one sub-waste streams. The waste streams are: empty chemical totes, spent carbon and backwash water. Bag filters are the only sub-waste stream produced from the backwash water.

Through activated carbon columns and feed tank process approximately ten empty chemical totes, 6,000 pounds of spent carbon and 10,000 gallons of backwash water will be produced per month. From the 10,000 gallons of backwash water approximately ten bag filters will be produced monthly.

The empty totes are classified as solid waste but are recyclable so they will be on site for pick up and recycling/reuse by the vendor. Spent carbon could be classified as a solid waste or a hazardous waste and characterization will be required. Once it is characterized it will be managed as a recyclable material and will be collected and stored in a local tank for pick up by the vendor. Backwash water will be recycled back into the system. Bag filters will be classified as either solid or hazardous waste depending on waste characteristics. Solid waste filters will be disposed via the local landfill and hazardous waste filters will be disposed via a selected hazardous waste vendor.

3.9 Ion Exchange (IX) System

The IX system will produce three waste streams and no sub-waste streams. These waste streams are spent IX resin, empty chemical drums or totes, and a regeneration brine solution. Approximately 2,000 pounds of spent resin will be produced annually, two empty chemical totes per month, and 25,000 gallons of regeneration brine solution daily. The spent resin could be classified as a solid waste or a hazardous waste and characterization will be required. Once it is characterized it will be managed and properly disposed, while the empty drums and totes are classified as solid waste but are recyclable so they will be on site for pick up and recycling/reuse by the vendor. The regeneration brine could either reprocessed or injected for disposal.

3.10 RO Skids and Feed Tank

The RO skids and feed tank will only produce ten empty chemical totes per month and no sub-waste streams. Empty drums and totes are classified as solid waste but are recyclable so they will be on site for pick up and recycling/reuse by the vendor.

3.11 RO CIP Skid

The RO CIP Skid will produce three waste streams and no sub-waste streams. These waste streams are spent CIP Solution, empty chemical drums or totes, and a brine solution. Approximately 1,000 gallons of spent CIP solution will be produced daily, ten empty chemical totes per month and 97,200 gallons of RO brine solution daily. The spent CIP Solution will be recycled back into the CIPN Skid for reused and while the empty drums and totes are classified as solid waste but are recyclable so they will be on site for pick up and recycling/reuse by the vendor.

4.0 LICENSES, PERMITS, FEES, AND TAXES

All subcontractors working on the project will be required to maintain and be responsible for all fees, licenses, permits, and taxes needed to comply with Federal, State, and Local Regulations and requirements for services they provide.

5.0 RECYCLABLE MATERIALS

All material for recycling will be placed in designated containers, which will be labeled clearly and according to types of material. Materials will be stored and handled in accordance with applicable regulations and in a manner acceptable to the recycler. Recycled material containers will be hauled on an as needed basis.

6.0 EMPTY CONTAINERS

A container that held any chemical or hazardous material, except a substance identified as an acute hazardous waste, is defined as an empty container if both of following criteria are met:

- 1. All material has been removed that can be removed using the practices commonly employed to remove material from that type of container, such as pumping, pouring, or aspirating, and
- 2. No more than 3% by weight of the total capacity of the container remains in the container.

Containers that meet above criteria may be placed in the appropriate recycling container (i.e., roll-off, hopper, basket) or area and each container will be marked with words "Empty Container".

7.0 DOCUMENTATION

A record of each disposition activity (manifests, permits, landfill receipts, weights, weight tickets, and any other receipts) will be maintained at the site office by the operator. Haulers of refuse and recyclable/reusable materials must provide weight documentation for all shipments from the project site. If the empty weight of a vehicle is known, only its full weight must be determined. If methods other than weighing are used, the proposed method of generating the weight must be approved (for example: density X volume estimation).

Original and returned copies of special and hazardous waste manifest will be processed and managed per specific regulatory requirements.

Waste Management Plan WestWater Farms Production Water Recycling Facility – Westwater, Utah 5001.010(4)

WestWater Farms, LLC Page 4 of 4

Appendix A
Waste Material Disposition Worksheet

WASTE MATERIAL DISPOSITION WORKSHEET

Process	Waste Stream	Sub-Waste Stream	Estimated Volume	Units	Frequency	Potential Waste Type	Disposal Method	Transportation	Collection	Comment
	Skimmed oil	N.A.	100		-	Recoverable product		Local	In local tank	Transport locally to sale tank
	Empty chemical drums/totes	N.A.	7	7 drums		Solid Waste	Return to vender	By vender	Held on site for	
Aeration Tank	Sludge/Bottoms	N.A.	200	gal	annual	Hazardous	Fuel/Incineration	Bulk	In local tank	Estimate cleaning tank once every 5+ years
Walnut Shell Filter &	Backwash water	N.A.	000'6	-	daily				N.A.	
Tank		Skimmed oil	100	gal	annual	Recoverable product		Local	In local tank	
		Bag filters	5	each	daily	Solid Waste/Hazardous	Fuel/Incineration	Depends on	In dumoster	
		Sludge/Bottoms	1,000	gal	annual	Hazardous	Fuel/Incineration	Bulk	In local tank	
		Water	000'6	gal	daily	Solid Waste	Injection	Local	Z.A.	
	Empty Bags	N.A.	9	bags	quarterly	Solid Waste	Landfill	Local	In dumpster	
	Empty chemical drums/totes	N.A.		tote	monthly	Recyclable	Return to vender	By vender	Held on site for	
Reaction Tank	Empty chemical drums/totes	N.A.	10	tote	monthly	Recyclable	Dotters to suppose	Disconder	Held on site for	
	Pneumatic	Y.A.		-	Monthly	Solid Wash	Security to verifice	by vender	pickup	
CMF Skid	Sludge bleed	Z.A.	6 480 gal	le c	daily	Solid Waste	To Either Deag	None	Y.A.	
	Spent CIP Solution	A.Z.	2 000	200	Apily	Downlable	TO NOT THE PROPERTY OF THE PRO	Morie	C.	
CMF CIP Skid	Empty chemical drums/totes		See Reaction	_		o constant	DING MILITARY	None	Held on site for	
	Neutralized CIP		=						pickup	
	Solution	N.A.	3000	gal	daily	Recyclable	To Sludge tank	None	N.A.	
CIPN Skid	Empty chemical drums/totes	N.A.	See Reaction Tank	y					Held on site for	
Sludge Tank & Filter Press	Filter cake	N.A.	10	SU ff	daily	Solid Waste/Hazardous	l andfill TBD	Commoroial	o dimension	
Activated Carbon	Spent carbon	N.A.	6,000		monthly	Recyclable	Return to vender	Commercial	In local tank	
Columns & reed Lank	Backwash water	N.A.	10,000	gal	monthly	Recyclable	Return to system	None	NA	
		Bag filters	10		monthly	Solid Waste	Landfill	Commercial	In dumpster	
	Empty chemical drums/totes	N.A.	See Reaction Tank						N.A.	
	Spent Resin	N.A.	2,000	lbs	annually	Solid Waste Hazardous Waste	l andfill TBD	Commorcial	duct lead of	
	Empty chemical drums/totes	N.A.	See Reaction Tank						N A N	
IX System	Regeneration Brine	N.A.	25,000	dal	daily	Solid Waste Recoverable Product	Injection Well	ocoly		
RO Skids & Feed Tank	Empty chemical drums/totes	N.A.	See Reaction Tank							
	Spent CIP Solution	N.A.	1000	lea	daily	Recyclable	FINS NOIC OF			
	Empty chemical drums/totes	N.A.	See Reaction Tank	_					C < Z	
RO CIP Skid	RO Brine		97,200	gal	daily	Solid Waste	Injection Well	None	N.A.	

Appendix J

WestWater Farms Recycling Facility Reclamation Plan

WESTWATER FARMS RECYCLING FACILITY

RECLAMATION PLAN

Westwater Farms Recycling Facility is expected to be in operation for 40 years or longer due to the need to treat the natural gas production water from the huge Uintah and Piceance Basins shale deposits. As the natural gas wells are depleted volumes of production water increase dramatically.

Once the facility is no longer needed, tanks and buildings will be converted and recycled for agricultural use. Minimum reclamation will be required, other than equipment removal.

Appendix K

Collateral Bonds, Decommissioning, and Site Reclamation Cost Estimates

FO	RA	1 4	n
1.0	170	41 .48	L

STATE OF UTAH DEPARTMENT OF NATURAL RESOURCES DIVISION OF OIL, GAS AND MINING
COLLATERAL BOND
EXPLORATION AND PRODUCTION WASTE DISPOSAL FACILITY
LAI LOIGHTON. M.D. T.
KNOW ALL MEN BY THESE PRESENTS:
That (operator name) Westwater Farms LLC as Principal, which is do authorized and qualified to do business in the State of Utah, is held and firmly bound unto the State of Utah in the sum of:
Ten Thousand and no/100 tawful money of the United States by virtue of the following financial instruments (cash account; negotiable bonds of the United States, a state or municipality; or negotiable certificate of deposit):
Negotiable Certificate of Deposit
payable to the Director of the Division of Oil, Gas and Mining, as agent of the State of Utah, for the use and benefit of the State of Utah for the faithful payment of which we, as the authorized, undersigned officers of the Principal, bind ourselves, our heirs, executors, administrators a successors, jointly and severally by these presents.
THE CONDITION OF THIS OBLIGATION IS SUCH THAT, WHEREAS the Principal is or will be engaged in the construction and/or operation as waste disposal facility in the State of Utah, for the purpose of disposal of exploration and production wastes for the following described facility and land;
Facility: Westwater Farms LLC Section: 10 Township: 19s Range: 25e
County: Grand , Utah
NOW, THEREFORE, if the Principal shall comply with all the provisions of the laws of the State of Utah and the rules, orders and requirems of the Board of Oil, Gas and Mining of the State of Utah, including, but not limited to the proper maintenance and operation of the above its facility in such a manner as not to cause pollution of the waters of the state or other adverse environmental impacts, and upon abandonmenthe facility and the proper dosure of the facility site, then this obligation is void; otherwise, the same shall be and remain in full force and effective the state of the facility and the proper dosure of the facility site, then this obligation is void; otherwise, the same shall be and remain in full force and effective the facility and the proper dosure of the facility site, then this obligation is void; otherwise, the same shall be and remain in full force and effective the facility and the proper dosure of the facility site, then this obligation is void; otherwise, the same shall be and remain in full force and effective the facility and the proper dosure of the facility site, then this obligation is void; otherwise, the same shall be and remain in full force and effective the facility and the proper dosure of the facility site, then this obligation is void; otherwise, the same shall be and remain in full force and effective the facility and the proper dosure of the facility site, then this obligation is void; otherwise, the same shall be and remain in full force and effective the facility and the proper dosure of the facility site, then this obligation is void; otherwise, the same shall be and operation of the facility and the proper dosure of the facility site, then the facility and the proper dosure of the facility site, then the facility and the proper dosure of the facility site, then the facility is a facility of the facility and the proper dosure of the facility site, then the facility is a facility of the faci
17 day of November, 2009.
(Corporate Charles Sept 20, 201)
Attestes: Date: 1/-17-09 Westwater Farms LLC
Principal (company name)
By Paul Jeffrey Dyke Manager/Member Name (prits) Title Stinglishe

STATE OF UTAH

FORM 4B

DEPARTMENT OF NATURAL RESOURCES DIVISION OF OIL, GAS AND MINING				
COLLATERAL BOND				
KNOW ALL MEN BY THESE PRESENTS:				
	as Principal the State of Utah, are held and firmly bound unto the State of Utah in the sum of:			
Fifteen Thousand and no/100 Iswall money of the United States by virtue of the follow or municipality, or negotiable certificate of deposit – see	dollars (\$ \$15,000.00 ring financial instruments (cash account, negotiable bonds of the United States, a statut R649-3-1):			
Negotiable Certificate of Deposit				
payable to the Director of the Division of Oil, Gas and Maithful payment of which we bind ourselves, our heirs,	dining, as agent of the State of Utsh, for the use and benefit of the State of Utsh for the executors, edministrators and successors, jointly and severally by these presents.			
to tremplate bas palpaula has pattered and abandonment of	IAT, WHEREAS the Principal is or will be engaged in the drilling, redrilling, deepening a well or wells and restoring the well site or sites in the State of Utah for the purposes of fluids in connection therewith for the following described land or well:			
Blanket Bond; To cover all wells	drilled in the State of Utah			
	5			
	Township: 19s Range: 25e			
County: Grand	l, Uṭah			
regulrements of the Board of Oil, Gas and Mining of the S	ill comply with all the provisions of the laws of the State of Utah and the rules, orders and State of Utah, including, but not limited to the proper plugging and abandonment of well- erwise, the same shall be and remain in full force and effect.			
IN TESTIMONY WHEREOF, said Principal has hereunit officers and its corporate or notary seal to be affixed this				
(Corporate of Wally Seal New York ALOS NOTARY PUBLIC OF COLORS				
Attestee:Attestee:	Westwater Farms LLC			
Ву	Principal (company name) Paul Jeffrey Dyke Manager/Member			
	Nagra (prigt)			
7	Signature			

PLANT DECOMMISSIONING

AND SITE RECLAMATION

WESTWATER FARMS RECYCLING FACILITY

COST ESTIMATE

Tank Removal			
Labor-welders	70 hours	\$65/hr	\$7,800
Boom truck	24 hours	\$65/hr	\$1,560
Mobilization			\$720
Project Management			\$400
General Conditions			\$880
Sub-Total			\$11,360
Less Salvage			\$4,000
Total Tank Removal			\$7,360
Removal of Buildings, Con	ncrete, Piping		\$3,280
Regrading and Natural Gra	ss Seeding		\$3,840
TOTAL RECLAMATION	V COST		\$14,480

Appendix L

Utah DWQ Referral Letter



JON M. HUNTSMAN, JR. Governor

> GARY HERBERT Lieutenant Governor

Department of Environmental Quality

Richard W. Sprott Executive Director

DIVISION OF WATER QUALITY Walter L. Baker, P.E. Director

Water Quality Board Jue Piccolo, Chair Paula Doughty, Vice-Chair David F Echols Merritt K Frey Darrell H. Mensel Leland J. Myers Richard W. Sprott Jay Ivan Olsen Gregory L. Rowley Steven P. Simpson Daniel C. Snarr Phil Wright Walter L. Baker. Executive Secretary

August 27, 2008

George Kast, Co-Manager Westwater Farms, LLC 100 West Hwy. 6th Harley Dome, Utah 84540

Dear Mr. Kast:

Ground Water Discharge Permit-By-Rule for Use of Treated Produced Water Subject:

The Division of Water Quality (DWQ) has received your submittal dated August 11, 2008 requesting ground water discharge permit-by-rule for the beneficial use of treated produced water for agricultural purposes at Harley Dome, Grand County, Utah. Permit-by-rule may be granted for a facility or operation if the applicant demonstrates that the discharge will have a de minimis actual or potential effect on ground water quality and will not cause ground water to exceed ground water quality standards or the applicable class total dissolved solids (TDS) limits as defined in UAC R317-6-3 of the Ground Water Quality Protection Rules.

Your submittal indicates that the expected effluent quality of the treated produced water will be <500 mg/l TDS and <10 mg/l total petroleum hydrocarbons. In addition, Westwater Farms will obtain a permit from the Department of Natural Resources Division of Oil, Gas, and Mining (DOGM) in accordance with Section 40-6-5(3)(d) and R649-9 for the management of produced water and the disposal of produced water treatment residuals. Assuming that the treated produced water will meet the expected effluent quality provided in your letter, the use of the treated produced water for irrigation will have a de minimis actual or potential effect on ground water quality and will not cause ground water to exceed ground water quality standards or the applicable class TDS limits. Therefore, your request for ground water discharge permit-by-rule is approved.

Because DOGM has been providing construction oversight for this operation, a Construction Permit will not be required by DWQ. However, to verify that the expected effluent quality of the treated produced water is achieved, Westwater Farms will need to obtain an Operating Permit from DWQ in the near future. Our Engineering Section is in the process of drafting rules for the Operating Permit Program and will contact you when they have been completed.

While DWQ will not directly regulate this operation through a ground water discharge permit, please be aware that discharge of pollutants to ground water is illegal and you would be held responsible if the operation caused damage to beneficial uses of ground water. Accordingly, you should make every effort to prevent spills and discharges of pollutants such as oil, fuels, hydraulic fluid, or antifreeze to the ground or subsurface. If future knowledge or experience indicates that ground water quality is threatened by this operation, the Executive Secretary may require that you apply for a ground water discharge permit in accordance with UAC R317-6-6.2.C.

If you have any questions or comments about this letter, please contact me at rherbert@utah.gov or (801) 538-6038.

Sincerely,

Rob Herbert, P.G., Manager

Ground Water Protection Section

RFH:mf

Ce: Brad Hill, DOGM

Ed Macauley, DWO Engineering

Appendix M

Affidavit of Notice to Property Owners

WESTWATER FARMS RECYCLING FACILITY

AFFIDAVIT

The conditional Use Permit Submittal has been available to all property owners since the posting of Notice of Public hearing on August 1, 2009 for a public hearing on August 26, 2009.

Affidavit Signed:

Tom Warnes

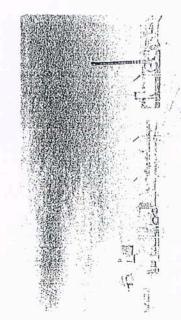
Manager, Westwater Farms, LLC

%/2///0 Date

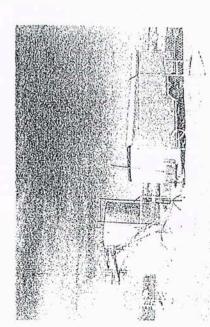
Appendix N

Pollution Technology Documentation

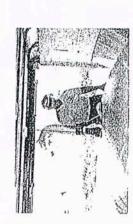
Economic Environmental Services

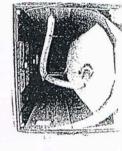


MV has a patent pending on a unique, low cost, apor Recovery Unit specifically designed-and field oven-for oilfield applications to capture both the plar-driven tank vapors and the flash vapors associed with condensate addition to production tank.

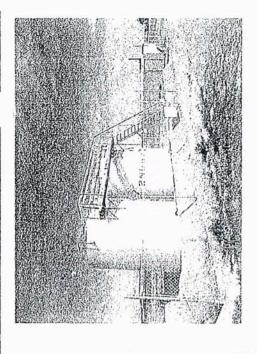


The V3RU (VARIABLE VOLUME VAPOR RECOVERY UNIT) is unique in that it operate on a VARIABLE VOLUME BUT CONSTANT PRESSURE approach as compared to competitor systems that operate at a variable pressure/constant volume. Vapors, as generated, are captured in the variable volume storage unit, compressed and injected into the sales line. Any liquid or condensed condensate is trapped within the variable column storage unit and recoverd for future sale. Thus freezing and/or compressor damage due to liquid addition to the compressor is avoided.





The V3RU maintains a very slight (~1 inch) back pressure on the production tank thus allowing the pumper to open the thief hatch and check fluid level, or alternately to draw down the tank during transfer to tanker for sale of condensate/oil WITHOUT THE INTRODUCTION OF ANY AIR (OXYGEN, O2) INTO THE PRODUCTION TANK(S).



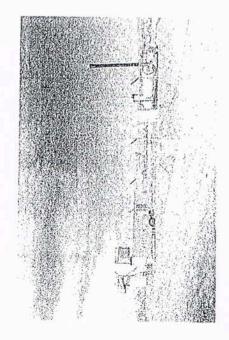
Field applications have shown the MV V3RU system to be safe, reliable, low maintenance, and compliant with the regulatory emissions requirements of Rule 7 in Colorado

The V3RU purchase and installation costs are generally recovered in about 3 years. In addition the purchaser may benefit from greenhouse gas capture and reuse as a seller of greenhouse gas credits.

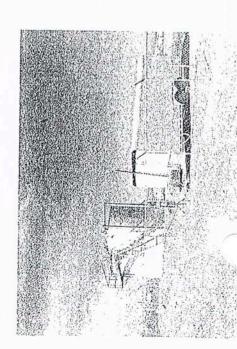
Applications

Oilfields
Pipelines
Tank Batteries
Well Production Tanks
Compressor Stations

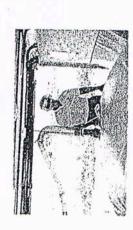
Economic Environmental Services

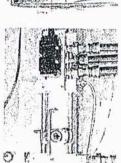


MV has a patent pending on a unique, low cost, Vapor Recovery Unit specifically designed-and field proven-for oilfield applications to capture both the solar-driven tank vapors and the flash vapors associated with condensate addition to production tank.



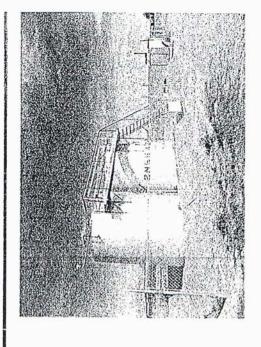
The V3RU (VARIABLE VOLUME VAPOR RECOVERY UNIT) is unique in that it operate on a VARIABLE VOLUME BUT CONSTANT PRESSURE approach as compared to competitor systems that operate at a variable pressure/constant volume. Vapors, as generated, are captured in the variable volume storage unit, compressed and injected into the sales line. Any liquid or condensed condensate is trapped within the variable column storage unit and recoverd for future sale. Thus freezing and/or compressor damage due to liquid addition to the compressor is avoided.







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Applications

Oilfields
Pipelines
Tank Batteries
Well Production Tanks

PATENT PENDING

Recovery Unit Variable Volume Vapor A3KN

Economic Environmental Services



Economic Environmental Solutions 1511 Washington Avenue Golden, Colorado 80401

Economic Environmental Solutions (MVEES)

Golden, Colorado 80401 Phone: 303-277-1625 Fax: 303-277-9724 Strategic Env'

mental & Energy Resources, Inc. 511 Washington Avenue mtarri@aol.com

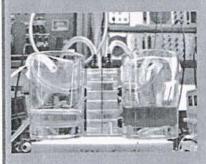
AND GAUGING OR WHEN DRAINING PRODUCTION TANK CAPTURES ANY LIQUID (WATER OR CONDENSATE) FOR CAN BE SIZED TO ACCOMMODATE ANY TANK BATTERY FUTURE DISPOSAL OR RESALE (as appropriate) - AND CAPTURE AND RESALE OF FUGITAVE TANK VAPORS PRODUCTION TANKS WHEN OPENING THIEF HATCH OILFIELD PROVEN COMPRESSOR TECHNOLOGY (at POSSIBLE GREENHOUSE CREDITS FOR PRODUCER NO ELECTRICITY REQUIRED - INTRINSICALLY SAFE RETURN OFF CAPITAL FROM SALE OF CAPTURED VERY LOW MAINTENANCE COSTS (no oil changes) SIMPLE. UNIT OPERATIONS BASED ON FAMILIAR PREVENTS AIR/OXYGEN INTRODUCTION INTO OR INDIVIDUAL WELL PRODUCTION TANK ADVANTAGES OF THE V3RU interstate gas piepline pumping stations) PROTECTS THE COMPRESSOR UNIQUE PATENT PENDING LOW CAPTIAL COSTS

OILFIELD OPS

00 00

10

New Sky Prototype



A simple, scalable electrochemical cell converts salt water to form acid (R), base (L), hydrogen and oxygen.

Captured CO₂



CO₂ can be captured directly from the air or flue gas streams. Here, a slurry of sodium carbonate salt captured from a CO₂-filled balloon deposits on the bottom of the flask.

Management Team

Deane Little, PhD CEO/CSO

Mike Ashford, MA EVP, Business Development

Joe Kosmoski, PhD Chief Technology Officer

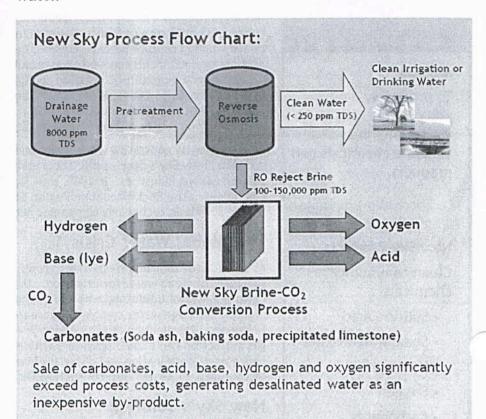
Scott Kothlow, CPA Financial Advisor, CFO

Science Advisory Board

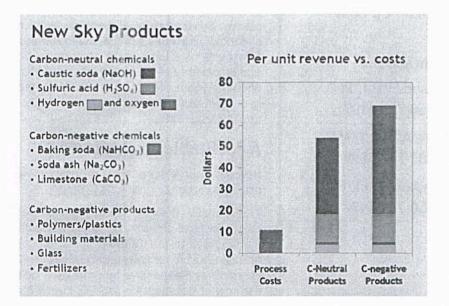
New Sky's Science Advisory Board includes three members of the National Academy of Engineering and other top international experts in electrochemistry, engineering, and climate/carbon policy.

How Our Desalination Process Works:

New Sky uses reverse osmosis and New Sky's proprietary salt conversion process to profitably treat high-salinity drainage water.



New Sky produces products for the multi-billion dollar chemical and fertilizer markets and has a profitable business model:





Mission

To profitably capture and convert CO₂ and waste salts into valuable chemicals and products.

New Sky Products

Clean commodity chemicals

- Sulfuric Acid
- Sodium Hydroxide
- Hydrogen
- Oxygen
- Carbonates

Headquarters

4511 47th Street Boulder CO 80301

Contacts:

Deane Little, PhD

650-793-1107

Mike Ashford, MA

• 503-757-8899

Joe Kosmoski, PhD

• 650-759-5497

www.newskyenergy.com

New Sky's award-winning clean manufacturing process profitably converts brackish water and CO₂ into clean water and clean chemicals widely used in agriculture and industry.

Company Overview

New Sky Energy is a carbon-negative manufacturing company. We capture and convert CO_2 into clean chemicals used in modern industries and agriculture. Our award-winning capture process, covered by nine US and international patent applications, efficiently converts waste salts into a variety of useful chemical products, including sulfuric acid and sodium hydroxide. In a second step, sodium hydroxide captures CO_2 from the air or flue gas to create baking soda, soda ash and precipitated calcium carbonate (PCC), which are widely used in glass manufacturing, water softening, and building materials.

By permanently converting waste brine and CO₂ into useful carbon-negative products, New Sky's process profitably eliminates two major waste streams that plague modern industries. In 2009, New Sky Energy placed first among 65 companies in the Rocky Mountain Region Clean Tech Open, and finished fourth among 300 clean technology companies nationally.

The Global Water Crisis

As demand for food and fresh water grows, most farmers face rising costs and shortages of clean water for irrigation. The problem is particularly severe in the Central Valley of California, where demand for fresh water and rising levels of brackish drainage water combine to threaten vast areas of once productive farmland. Desalination of salty drainage water or produced water from oil or gas extraction wells could provide a critically needed new water source, but the high cost of desalination and disposal of large waste brine streams have discouraged implementation of such water treatment projects.

New Sky's Solution

New Sky Energy has developed a cost effective water treatment strategy that provides clean water for irrigation and converts waste brine into useful clean chemicals that pay for the treatment process. The New Sky process combines state-of-the-art desalination technologies with New Sky's award-winning salt-CO₂ conversion process. The net outputs are clean water at very low cost and clean chemicals, many of which are used by farmers, food processors and packing plants. By converting waste brine from the desalination process into valuable chemicals, New Sky's process cuts the cost of water treatment to levels that are affordable on a large scale. Additional benefits include reduced CO₂ emissions and creation of clean manufacturing jobs in regions of historically high unemployment. New Sky's technology makes sulfuric acid, caustic soda, hydrogen, oxygen and, in a second stage, traps ambient or flue gas CO₂ to make useful carbonates.

A Profitable Business Model

New Sky Energy's process is profitable without tax incentives, subsidies or any price on carbon.

Traditionally, desalination of brackish water for irrigation has been prohibitively costly because clean water could not command a sufficiently high price in the marketplace to justify the process. In contrast, New Sky's process "mines" drainage water for salts and flue gas or air for ${\rm CO_2}$, creating clean water and clean air as inexpensive by-products. Sale of these chemicals more than covers the cost of desalination and ${\rm CO_2}$ capture, creating a breakthrough clean manufacturing strategy that profitably eliminates major waste streams.

Appendix O

Contingency Plan (<u>Health & Safety Plan</u>)





Health and Safety Plan

for

WestWater Farms Production Water Recycling Facility 100 West State Highway 6 Westwater, Utah

Prepared for:

WestWater Farms, LLC Cisco, Utah

Prepared by:

Stewart Environmental Consultants, LLC Consulting Engineers and Scientists Fort Collins, Colorado

November 2010

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APPENDICES

Appendix A: Visitor Safety Declaration
Appendix B: Health and Safety Plan Form
Appendix C: Material Safety Data Sheets

1.0 ORGANIZATIONAL STRUCTURE

The organizational structure of the Health and Safety Plan (HASP) for this site provides the following site-specific information:

- The general supervisor who has the responsibility and authority to direct all hazardous waste cleanup operations
- The site safety and health officer who has the responsibility and authority to develop and implement this HASP and verify compliance
- Other personnel needed for cleanup operations and emergency response and their general functions and responsibilities
- The lines of authority, responsibility, and communication for health and safety functions

This chapter is reviewed and updated as necessary to reflect the current organizational structure at this site.

1.1 Roles and Responsibilities

All personnel and visitors on this site must comply with the requirements of this HASP. The specific responsibilities and authority of management, health and safety, and other personnel on this site are detailed in the following paragraphs.

1.1.1 Project Manager (PM)

The PM for this site is Mr. Brad E. Eaton, PE, Engineering Division Manager at Stewart Environmental Consultants, LLC.

The PM has responsibility and authority to direct all work operations. The PM coordinates health and safety functions with the SSHO, and bears ultimate responsibility for the proper implementation of this HASP. The specific duties of the PM are:

- Preparing and coordinating the site work plan
- Providing site supervisor(s) with work assignments and overseeing their performance
- Coordinating health and safety efforts with the SSHO
- Ensuring effective emergency response through coordination with the emergency response coordinator (ERC)
- Serving as primary site liaison with public agencies and officials and site contractors

The qualified alternate PM for this site is Mr. Fred W. Porter, Senior Project Engineer at Stewart Environmental.

1.1.2 Site Safety and Health Officer (SSHO)

The SSHO for this site is Ms. Clover L. Stout, Environmental Health and Safety Manager at Stewart Environmental.

The SSHO has full responsibility and authority to develop and implement this HASP and to verify compliance. The SSHO is readily accessible to site personnel during all work operations and has the authority to halt site work if unsafe conditions are detected. The specific responsibilities of the SSHO are:

- Managing the health and safety functions on this site
- Serving as the site's point of contact for health and safety matters
- Ensuring site monitoring, worker training, medical surveillance, and effective selection and use of personal protective equipment (PPE)
- Assessing site conditions for unsafe acts and conditions and providing corrective action
- Assisting the preparation and review of this HASP
- Maintaining effective health and safety records as described in this HASP
- Coordinating with the ERC, site supervisor(s), and others as necessary for health and safety efforts

1.1.3 Emergency Response Coordinator (ERC)

The ERC for this site is Mr. Randy R. Evans, Senior Project Engineer at Stewart Environmental.

The ERC is responsible for assessing site conditions and directing and controlling emergency response activities and personnel in accordance with the Site Emergency Response Plan. The ERC reports to the PM. The ERC will ensure the evacuation, emergency transport, and treatment of site personnel, and will notify the appropriate emergency response units and management staff in accordance with the emergency response plan of this HASP. Specific duties of the ERC include:

- Developing and reviewing the emergency response plan
- Conducting emergency response rehearsals
- Ensuring effective emergency response to and evacuation of the site
- Coordinating emergency response functions with the SSHO
- Integrating site emergency response plans with the disaster, fire, and/or emergency response plans of local, state, and federal organizations and agencies

The qualified alternate ERC for this site is Mr. C. Kole Peterson, Chemical Engineer at Stewart Environmental.

1.1.4 Site Supervisor

The site supervisor is Mr. Evans.

The site supervisor is responsible for field operations and reports to the PM. The site supervisor ensures the implementation of the HASP requirements and procedures in the field. The specific responsibilities of the site supervisor are:

- Executing the work plan and schedule as detailed by the PM
- Coordinating with the SSHO on health and safety
- Ensuring site work compliance with the requirements of this HASP

The qualified alternate site supervisor is Mr. Peterson.

1.1.5 Site Workers

Site workers are responsible for complying with this HASP, using the proper PPE, reporting unsafe acts and conditions, and following the lines of authority established for this project site.

1.1.6 Decontamination Manager

The decontamination manager for this site is Mr. Evans.

The decontamination manager is responsible for decontamination procedures, equipment, and supplies. The specific responsibilities of the decontamination manager are:

- Setting up decontamination lines and the solutions appropriate for the type of contamination on site
- Controlling the decontamination of all equipment, personnel, and samples from the contaminated areas
- Assisting in disposal of contaminated clothing and materials
- Ensuring all required equipment is available and in working order
- Providing for collection, storage, and disposal of waste

The qualified alternate decontamination manager for this site is Mr. Peterson.

2.0 SITE CHARACTERIZATION AND JOB HAZARD ANALYSIS

This section of the HASP identifies and describes health and safety hazards associated with site work. The purpose of characterization and job hazard analysis is to identify and quantify the health and safety hazards associated with each site task and operation, and to evaluate the risks to workers. With this information, risks can be eliminated if possible, or effectively controlled. The information contained in this section of the HASP is essential to effective preparation of all other sections of the HASP.

The person responsible for ongoing site characterization and job hazard analysis at this site is Mr. Evans, with the assistance of Mr. Peterson and Ms. Stout.

2.1 Job Hazard Analysis

The HASP Form contains the job hazard analysis information for this site and the planned hazard controls. This table lists each task or operation required for this project, by site location. Biological and chemical hazards and their known or anticipated concentrations are identified for each distinct combination of location and task/operation. Based on the task/operation at a particular location, anticipated physical hazards are also identified. Then, based on the best available knowledge of how that task/operation will be performed, the likelihood of exposure to the hazards identified for the task/operation at that location is indicated.

The HASP Form also lists the control measures implemented to protect employees from the hazards identified. The information provided here is designed to satisfy the job hazard analysis requirements and the workplace hazard assessment requirements. The HASP Form summarizes health hazard information for each chemical and biological substance listed.

The HASP Form is modified by Mr. Evans and Ms. Stout when:

- The Scope of Work is changed by adding, eliminating, or modifying tasks
- · New methods of performing site tasks are selected
- Observation of the performance of site tasks results in a revised characterization of the hazards
- New chemical, biological, or physical hazards are identified
- Exposure data indicate changes in the concentration and/or likelihood of exposure
- New/different control measures are selected

These tables summarize the information used to select and implement the specific exposure controls identified in the remainder of the HASP. When the tables are modified, related provisions elsewhere in the HASP are also modified.

2.2 Employee Notification of Hazards and Overall Site Information Program

The information in the HASP Form is made available to all employees who potentially may be affected by worksite hazards. Other contractors and subcontractors are informed about the nature and level of hazardous substances at this site and likely degree of exposure to workers who participate in site operations. Mr. Eaton is responsible for providing site characterization information, this HASP, and modifications to it to other contractors and subcontractors working on this site.

2.3 Accident Prevention and Hazard Assessment

This section is supported by the WestWater Accident Prevention Plan as included in the WestWater Health and Safety Manual, which will be provided as the facility nears completion, since much of the information in these programs is dependent on final site layout and operation.

2.3.1 Injury and Illness Data

The Environmental Health and Safety Manager will maintain records of all work-related injuries and illnesses of our employees. The following forms or records are applicable only to work-related injuries and illnesses:

- Occupational Safety and Health Administration (OSHA) 300, Log of Work-Related Injuries and Illnesses
- OSHA 301, Injuries and Illnesses Incident Report
- Record of first aid or other non-recordable accidents/incidents

The OSHA 300, Log of Work-Related Injuries and Illnesses will be maintained in the Stewart Environmental main office. The OSHA 301, Injuries and Illnesses Incident Report will be established, bearing a case number correlating with a case identifier on the OSHA 300 log and all pertinent and required information. The information contained in or entered on these records will be maintained current within seven calendar days after a recordable accident is reported.

The OSHA Form 300A, <u>Summary of Work-Related Injuries and Illnesses</u> will be posted in a conspicuous location for employee review no later than February 1, for the previous calendar year and will remain in place until April 30.

All injury and illness documentation will be reviewed annually in January by management and supervisors to analyze occurrences, identify developing trends, and plan courses of corrective actions.

2.3.2 Safety and Health Surveys and Inspection/Program

The Environmental Health and Safety Manager will maintain and review records of all safety audits and inspections that are conducted within or that affect our company or employees.

Reports generated as a result of comprehensive surveys conducted by outside professional agencies will receive immediate attention and consideration. All hazards identified and recommendations will be acted upon in a timely manner. All methods of addressing the issues contained in the reports will be documented in writing and a copy maintained with the survey report. This documentation will also show the date corrections were made or actions taken. These reports and all associated documentation will be maintained for record and periodic review.

Checklists will be developed as part of the periodic self-inspection process (see Self-inspection Form in Appendix A of the Accident Prevention Plan). All discrepancies identified during the inspection will be evaluated as soon as possible. The periodic self-inspection checklists will be reviewed and evaluated on a regular basis to ensure current applicability.

2.3.3 Accident Investigation

The Environmental Health and Safety Manager will ensure proper records and documentation of all accident and incident investigation activities are maintained and reviewed.

All accidents and near-miss incidents resulting in injury or illness to a person, property damage of any magnitude, or the potential for either will be investigated and documented. All items on the designated accident investigation form will be addressed in detail as soon as possible following the accident/incident. Management, supervisors, and affected employees will review and use the information acquired to establish all contributing factors and causes. From the investigation, a plan of corrective action will be established to prevent recurrence of the accident/incident. All reports and investigations will be conducted in compliance with the WestWater Incident Reporting Program as included in the WestWater Health and Safety Manual.

3.0 SITE CONTROL

The site control program is designed to reduce the spread of hazardous substances from contaminated areas to clean areas, to identify and isolate contaminated areas of the site, to facilitate emergency evacuation and medical care, to prevent unauthorized entry to the site, and to deter vandalism and theft.

The site control program provides the following site-specific information:

- site access procedures
- site security
- both internal (onsite) and external communications

Mr. Evans is responsible for evaluating site conditions and for verifying that the site control program functions effectively. The site control program is updated regularly to reflect current site conditions, work operations, and procedures.

3.1 Site Access

Access to this site is restricted to reduce the potential for exposure to its health and safety hazards. During hours of site operation, site entry and exit is authorized only at authorized point(s) identified by Mr. Evans. Entry and exit at these points is monitored by WestWater personnel.

A WestWater employee must accompany visitors at all times. Visitors are expected to comply with the requirements of this HASP. Visitors who want to enter active areas of the site must provide documentation that they have the required training, and must receive a site-specific briefing about protecting themselves from site hazards and following emergency evacuation procedures prior to entry. Visitors must complete the Visitor Safety Declaration in Appendix A of this document.

3.2 Site Security

Security at this site is maintained during both working hours and non-working hours to prevent unauthorized entry; exposure of unauthorized, unprotected people to site hazards; and increased hazards due to vandalism and theft.

The general site takes the following measures for security during working and non-working hours:

- A security camera continuously monitors the site
- The site is located on private property and a fence is erected around the perimeter to prevent unauthorized entry or exit

3.3 Site Communications

The following communication equipment is used to support onsite communications:

- Cell phones
- Hand signals
- Voice commands

4.0 TRAINING PROGRAM

The site training program is designed to ensure that workers receive the training they need to work safely. Site health and safety training requirements are based on the job hazard assessments contained in the HASP Form and relevant Occupational Safety and Health Administration (OSHA) requirements.

At this site, Ms. Stout oversees the implementation of this training program and is responsible for ensuring that employees are adequately and currently trained for all tasks they are asked to perform. Employees who have not been trained to a level required by their job function and responsibility are not permitted to participate in or supervise field activities.

This training program is consistent with the requirements of 29 CFR 1910, OSHA, Department of Labor, and addresses the following site-specific information:

- Initial training for site workers
- Exceptions to initial training requirements
- Site briefings for visitors and workers
- Refresher training
- Training certification
- Emergency response training

4.1 Initial Training for Site Workers and Supervisors

All employees shall be trained in the following areas prior to arrival on site:

- Names of personnel and alternates responsible for site health and safety
- · Safety, health, and other hazards present on the site
- Use of PPE
- Work practices by which the employee can minimize risks from hazards
- Safe use of engineering controls and equipment on the site

All sections of this HASP including:

- Job hazard analysis procedures
- Site control procedures
- Training program elements
- Emergency response plan
- The spill containment program
- Decontamination procedures
- Medical surveillance requirements
- Personal protective equipment requirements
- Respiratory protection program elements
- Bloodborne pathogens exposure prevention
- Hazard Communication Program requirements
- Confined space entry procedures
- Control of Hazardous Energy procedures

In addition, personnel at this site have successfully completed 40-hour initial HAZWOPER training consistent with the requirements of 29 CFR 1910.120(e)(3)(i), or have received equivalent training consistent with the provisions of 29 CFR 1910.120(e)(9), in order to work in contaminated areas. In addition, such personnel have received three days of supervised field experience applicable to this site.

4.2 Exceptions to Initial Training

All employees at this site have training consistent with what is described in Section 4.1. There are no exceptions.

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4.3 Site-Specific Briefings for Visitors and Workers

A site-specific briefing is provided to all individuals, including site visitors, who enter the site beyond the initial point of access.

For clients and visitors, the site-specific briefing provides information about site hazards, the site layout including work zones and places of refuge, the emergency alarm system and emergency evacuation procedures, and other pertinent health and safety requirements as appropriate.

4.4 Refresher Training

All workers on this site receive annual HAZWOPER refresher training consistent with the requirements of 29 CFR 1910.120.

4.5 Training Certification

This site maintains written certification of the successful completion of applicable training requirements for all personnel. Training records are maintained up-to-date and are retained in WestWater's main office.

Employees and supervisors receive a written certificate when they complete necessary training and field experience. Any person who has not been so certified or who does not meet the requirements of equivalent training is prohibited from engaging in operations on this site.

5.0 EMERGENCY RESPONSE PLAN

This section of the HASP describes potential emergencies at this site, procedures for responding to those emergencies, roles and responsibilities during emergency response, and training that workers must receive in order to follow emergency procedures. This chapter also describes the provisions this site has made to coordinate its emergency response planning with other contractors on site and with offsite emergency response organizations.

This emergency response plan provides the following site-specific information:

- Pre-emergency planning
- Onsite emergency response equipment and PPE
- Emergency maps: evacuation routes and route to nearest hospital
- Emergency roles and responsibilities
- Emergency alerting and evacuation procedures
- Emergency response procedures
- Emergency decontamination, medical treatment and first aid
- Response critique and plan updates
- Emergency response training

During the development of this emergency response plan, local, state, and federal agency disaster, fire, and emergency response organizations were consulted to ensure that this plan is compatible and integrated with the plans of those organizations.

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5.1 Pre-emergency Planning

This site has been evaluated for potential emergency occurrences, based on site hazards, the tasks within the work plan, the building layout, and the ventilation system design and operation. Details are outlined in the HASP Form attached in Appendix B of this document.

5.2 Onsite Emergency Response Equipment

Emergency procedures may require specialized equipment to facilitate worker rescue, contamination control and reduction, or post-emergency cleanup. Emergency response equipment stocked on this site is listed on the HASP Form. The equipment inventory and storage locations are based on the potential emergencies described in pre-emergency planning. This equipment inventory is designed to meet onsite emergency response needs and any specialized equipment needs that offsite responders might require because of the hazards at this site.

Any additional PPE required and stocked for emergency response is also listed in the HASP Form. During an emergency, the highest-ranking Stewart Environmental employee will act as the emergency coordinator until relieved by local authorities. The emergency coordinator is responsible for specifying the level of PPE required for emergency response.

Emergency response equipment is inspected at regular intervals and maintained in good working order. The equipment inventory is replenished as necessary to maintain response capabilities.

5.3 Emergency Planning Maps

The HASP Form provides a map of the site with key onsite emergency planning information clearly marked. Emergency evacuation route(s), places of refuge, assembly point(s), and the locations of key site emergency equipment are identified on this map. Site zone boundaries are shown to alert responders to known areas of contamination. Major building features and any ventilation system design or operation features that could affect emergency response planning are also marked on this map. The HASP Form is posted at site entry and indicates the route to the nearest emergency medical assistance.

5.4 Roles and Responsibilities for Onsite and Offsite Personnel

The highest-ranking onsite WestWater employee is designated the ERC. The ERC is responsible for implementing the emergency response plan and coordinates emergency response activities on this site. The ERC provides specific direction for emergency action based upon information available regarding the incident and response capabilities, and initiates emergency procedures, including protection of the public and notification of appropriate authorities.

In the event of an emergency, all visitors and non-40-hour HAZWOPER-trained employees are evacuated and do not participate in emergency response activities.

The site also relies on the offsite emergency response organizations listed in the HASP Form.

5.5 Emergency Alerting and Evacuation

Upon discovering an emergency situation, personnel will notify the ERC, who will evaluate available information and initiate an appropriate response. Site workers are alerted to emergencies through voice, hand signals, or telephone systems.

5.6 Emergency Response

The ERC (or designee), after investigating the incident and reviewing relevant information, determines the level of response required for containment, rescue, medical care, and cleanup. The appropriate emergency response team (onsite or offsite) is mobilized to the incident with sufficient personnel, PPE, and emergency equipment.

When the ERC (or designee) determines that onsite emergency response capability is inadequate for the emergency or that outside assistance is required, the applicable offsite organization shown in the HASP Form shall be contacted. The ERC (or designee) provides relevant information to the responding organizations, including hazards associated with the emergency incident, potential containment problems, and missing site personnel.

5.7 Emergency Decontamination, Medical Treatment and First Aid

Site provisions for medical services and first aid are consistent with 1910.151, as well as HAZWOPER.

This site will have several workers with current first aid certification assigned to provide first aid during each shift. Because of this practice, the site has an exposure control plan in accordance with OSHA's bloodborne pathogens standard, 1910.1030 (c)(1)(i). The site also offers Hepatitis B vaccinations to workers whose primary job assignment is to provide first aid. A record of those vaccinations or the employee's declination of the vaccination is kept in her/his medical records file.

Site personnel who are contaminated and need medical treatment will be decontaminated before treatment is provided and/or before being transported to a medical facility if decontamination does not delay life-saving treatment, interfere with essential treatment, or aggravate the injury.

When emergency decontamination is performed, contaminated protective clothing and equipment is washed, rinsed and/or cut off. If an emergency victim is grossly contaminated with extremely toxic or corrosive material, the victim will be wrapped in blankets, plastic, or rubber before any first aid or medical treatment is performed to reduce potential exposure of contaminates to other personnel.

Personnel who provide first aid and offsite medical treatment will be alerted to the chemicals and hazards to which a victim has been potentially exposed. This will be done by sending relevant material safety data sheets (MSDSs) and other applicable hazard data with the victim or by having the victim accompanied by personnel who are familiar with the incident and the hazards.

5.8 Emergency Response Critique and Plan Updates

After every emergency incident or evacuation of this site, the ERC (or designee) and the SSHO will evaluate the quality and safety of response activities. Any deficiencies in response actions will be included in a specific follow-up plan and corrected.

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5.9 Emergency Response Training

All persons who enter this worksite, including visitors, receive a site-specific briefing about anticipated emergency situations and the emergency procedures.

Prior to the commencement of work and in accordance with Section 4, Training Program, site personnel are trained in the contents of this emergency response plan, including potential emergencies, personnel roles and responsibilities, evacuation routes and procedures, and the location of medical assistance.

Site personnel designated as emergency responders have completed emergency response training consistent with the level of their responsibilities and in accordance with 29 CFR 1910.120(q)(6).

6.0 SPILL CONTAINMENT PROGRAM

This section of the HASP describes spill containment at this site, procedures for responding to those emergencies, roles and responsibilities during emergency response, and training that workers must receive in order to follow the emergency procedures that are addressed in section 5.0. This section is designed to supplement the Emergency Spill Response Program as contained in the WestWater Health and Safety Manual.

This section provides the following site-specific information:

· Results of Evaluation for potential Spills

6.1 Results of Evaluation for Potential Spills

An evaluation was conducted to determine the potential for hazardous substance spills at this site. That evaluation indicates that there is potential for a hazardous substance spill of a sufficient quantity to require containment planning, equipment, and procedures. Spill prevention guidelines will be followed as indicated in the WestWater Health and Safety Manual. This program includes spill potentials, spill response and containment, emergency response procedures, and protective measures during incidental releases. Training on hazardous substances is provided, consistent with the Hazard Communication Standard, 29 CFR 1910.1200.

Spill kits are available on site and only trained personnel shall participate in spill cleanup.

7.0 DECONTAMINATION

The decontamination chapter of the HASP describes how personnel and equipment are decontaminated after an incident or spill. This chapter also describes how residual waste from decontamination processes is disposed. These procedures minimize worker contact with contaminants and protect against the transfer of contaminants outside designated work zones. They also extend the useful life of PPE by reducing the amount of time that contaminants contact and permeate PPE surfaces. The decontamination procedures described below include project-specific information about:

The location and type of project decontamination facilities

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- General and specific decontamination procedures for personnel and PPE
- General and specific decontamination procedures for equipment
- Disposal of residual waste from decontamination

Normal use PPE decontamination is described in detail in the PPE Program and Respiratory Protection Program, which are contained in the WestWater Health and Safety Manual. Ms. Stout oversees implementation of project decontamination procedures and is responsible for ensuring their effectiveness.

7.1 Decontamination Procedures for Personnel and PPE

Based on the nature of the hazards and duration of work, showers and change rooms are not necessary and are not provided for workers. A portable emergency shower and eye wash station is provided on site for employee use during emergency situations while construction is underway. Once the facility is in operation, emergency showers and eye wash stations will be available in all material-handling areas as required by OSHA.

The following are general decontamination procedures established and implemented during this project:

- PPE is decontaminated or prepared for disposal on the premises.
- Workers are required and trained to immediately exit the work zone, perform applicable decontamination procedures, shower, and change into uncontaminated clothing if their permeable clothing is splashed or becomes wetted with a hazardous substance.

Procedures for decontamination waste disposal meet all applicable local, state, and federal regulations.

7.2 Decontamination Procedures for Equipment

All tools, equipment, and machinery are decontaminated prior to removal from the site. Equipment decontamination procedures are designed to minimize the potential for hazardous skin or inhalation exposure, cross-contamination, and chemical incompatibilities.

The following are general equipment decontamination procedures established and implemented during this project.

- Equipment that can be used again, that is still operable, and that will not pose an increased exposure hazard during re-use is on site until it is no longer needed. This eliminates unnecessary decontamination and reduces the potential for physical transfer of contaminants off site.
- Decontamination is required for all equipment exiting a contaminated area.
- Equipment that cannot be successfully decontaminated is disposed of as hazardous waste.

7.3 Contamination Control and Decontamination Procedures for Routine Material Handling

7.3.1 Assumptions

Known materials, stored at client site, basic sampling, preparation for shipment, and loading; materials are not covered by 29 CFR I910 Subpart Z.

7.3.2 Contamination Control

- 1. Each storage area is considered an exclusion zone. It is a potentially contaminated area. Personnel entering this area should have on appropriate PPE and respirator protection as required by the nature of the task to be performed, e.g., labeling, sampling.
- 2. At a minimum, protective boot covers may be worn to prevent the spread of contamination from the storage area.
- Once zones have been established, don appropriate PPE and respirator before opening containers or moving containers with external contamination or containers that are in poor condition and require overpacking.
- 4. If chemical or hazardous materials splash onto protective clothing, immediately proceed to contamination reduction area. In no case should contaminated PPE be worn longer than one hour unless the PPE was designed for longer exposure to the materials and a determination has been made by the SSHO that work should continue.
- 5. Remove all external PPE in the contamination reduction area in the following order:
 - a. outer gloves
 - b. suit
 - c. outer boots
 - d. steel-toed boots
 - e. hard hat
 - f. respirator
 - g. inner gloves
- 6. Wash hands.
- 7. If equipment requires decontamination, decontaminate all equipment before removing PPE. (See Equipment Decontamination Procedures.)
- 8. If showers are available at the work site, proceed to dirty room, remove clothing, and bag dirty clothing, shower, and don street clothing in clean room. If showers are not available at work site, proceed directly to lodging, remove clothing at door to room, bag dirty clothing, and proceed to shower. Do not bring any equipment into lodging unless it has been thoroughly decontaminated.
- 9. Send dirty laundry to a commercial laundry for cleaning.

8.0 MEDICAL SURVEILLANCE

The medical surveillance section of the HASP describes how worker health status is monitored at this site. Medical surveillance is used when there is the potential for worker exposure to harmful levels of hazardous substances. The purpose of a medical surveillance program is to medically monitor worker health to ensure that personnel are not

adversely affected by site hazards. The provisions for medical surveillance at this site are based on the site characterization and job hazard analysis found in the HASP Form.

The medical surveillance program addresses the following information:

- Provisions of the site medical surveillance program
- Communication between the site, physicians, and workers
- Medical recordkeeping procedures

The person responsible for ensuring this program is implemented and maintained is Ms. Stout.

8.1 Site Medical Surveillance Program

A medical surveillance program is implemented at this site based on the potential for employee exposure to levels of hazardous substances or health hazards in excess of the permissible exposure limit (PEL) or other published exposure limits, the use of respiratory protection, and/or the assignment of workers to a HAZMAT team.

Medical surveillance requirements are based on a worker's potential for exposure as determined by the site characterization and job hazard analysis documented in the HASP Form.

 Some personnel who enter contaminated areas of this site do not need to be included in the medical surveillance program. Table 4 below lists the types of workers who are <u>not</u> covered by the medical surveillance program.

Table 4. Types of Workers Excluded from the Medical Surveillance Program

Visitors, clients, and supervisors visiting the site

Workers not operating equipment

- 2. Personnel within the medical surveillance program receive medical examinations on the following schedule:
 - a. Prior to assignment

Personnel covered by the medical surveillance program are medically examined prior to commencing work in active areas of the site. The purpose of this examination is to assess baseline health status and the worker's ability to perform anticipated duties wearing required PPE without any adverse health effects. The pre-assignment medical examination must have been performed within the past 12 months. The content of the exam must include, at a minimum, the items required by OSHA for HAZWOPER-trained employees.

b. On an annual basis

Personnel within the medical surveillance program receive medical exams at least once every 12 months to provide for ongoing assessment of a worker's health status.

c. At termination or reassignment

Personnel are offered the opportunity for a medical examination upon their termination of employment or reassignment to work where the worker is not exposed to hazardous materials or required to wear a respirator.

d. Post-injury/illness

Any worker who is injured, becomes ill, or develops signs or symptoms of possible overexposure to hazardous substances or health hazards receives a medical examination as soon as possible after the occurrence, with follow-up examinations provided as required by the attending physician.

All medical examinations and procedures are performed by or under the supervision of a licensed physician and are provided to workers free of cost, without loss of pay, and at a reasonable time and place.

A physician's written opinion of the results of these examinations is required for each worker and a copy is maintained on site. The contents of the written opinion are limited to:

- A statement of the worker's health status in relation to his/her job duties and a description of any detected medical condition that could put the worker at increased risk,
- Notation of any recommended limitations in work activity or PPE use, and
- Confirmation that the physician has informed the employee of the examination results and any further examination or treatment required.

8.2 Communication Between the Physicians and Workers

The SSHO shall be notified when any employee requires medical attention. Information about the site hazards and potential exposure levels, work activities and PPE requirements, and other information as required by OSHA is made available to treating physicians and to site personnel and/or their personal physicians.

8.3 Medical Recordkeeping Procedures

Medical recordkeeping procedures are consistent with OSHA requirements and are described in the company's overall health and safety program. A copy of that program is available at Stewart Environmental's main office.

8.4 Program Review

Every 12 months, the medical program is reviewed to ensure its effectiveness. Ms. Stout is responsible for this review. At a minimum, this review consists of:

- Review of accident and injury records and medical records to determine whether the causes of accidents and illness are promptly investigated and whether corrective measures are taken wherever possible,
- Evaluation of the appropriateness of required medical tests on the basis of site exposures, and
- Review of emergency treatment procedures and emergency contacts list to ensure they are site-specific, effective, and current.

9.0 PERSONAL PROTECTIVE EQUIPMENT (PPE)

This section addresses site-specific PPE. This chapter of the HASP describes how PPE is selected and used to protect workers from exposure to hazardous substances and hazardous conditions on this site, and is intended to supplement the PPE Program as contained in the WestWater Health and Safety Manual. The following topics are addressed in the following sections:

- PPE selection criteria
- training in use of PPE
- respiratory protection
- hearing conservation

The person with the overall responsibility for implementing the PPE program on site is Ms. Stout.

9.1 PPE Selection Criteria

Site health and safety hazards are eliminated or reduced to the greatest extent possible through engineering controls and work practices. Where hazards are still present, a combination of engineering controls, work practices, and PPE are used to protect employees.

An initial level of PPE is assigned to each task to provide an adequate barrier to exposure hazards. Initial PPE ensembles are selected based on the anticipated route(s) of entry of biological and chemical hazards and their concentration. Ensemble materials are selected using permeation data supplied by individual manufacturers. Materials providing the greatest duration of protection have been chosen. Tear and seam strength of the PPE are also considered to ensure ensemble durability while work is performed. When necessary, multiple layers of protection are used to accommodate the range of hazards that may be encountered. Where possible, employees are provided with a range of component sizes to ensure properly fitted PPE.

Specific PPE requirements, selection criteria, inspection criteria, and cleaning and storage procedures are communicated in the PPE program, which is contained in the WestWater Health and Safety Manual. Specifically, the following criteria are used in selecting PPE levels at this site.

9.1.1 Use of Level C Protection

Employees use Level C protection during tasks that have or potentially have the following characteristics:

- When the contaminant(s) are known, cartridges/canisters exist, and concentrations are within the substance-specific standard guidelines or within the maximum use concentration (MUC) for the APR used
- When liquid splashes or other direct contact with hazardous substances will not adversely affect employee health or be absorbed through any exposed skin.

Level C protective equipment may include:

 Full-face or half-mask air-purifying respirator (National Institute for Occupational Safety and Health [NIOSH] certified) with appropriately-selected cartridges

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- Hooded chemical-resistant clothing (overalls, two-piece chemical-splash suit, disposable chemical-resistant overalls)
- Booties outer, chemical-resistant, disposable
- Inner and outer gloves
- · Safety boots steel-toed and shank, chemical-resistant
- Safety glasses or chemical splash goggles (not required with full face respirator)
- · Face shield (not required with full-face respirator)
- Hardhat (where required)
- Hearing protection (where required)

In accordance with 29 CFR 1910.134(d)(3)(iii)(B)(2), a cartridge/canister change schedule has been determined. Cartridges and canisters used with air-purifying respirators on this site are replaced when any of the following occurs:

- · A NIOSH-approved end of service life indicator (ESLI) is activated,
- The service time has passed (service time is total period of time canisters/cartridges are exposed to the environment), or
- · Inhalation is restricted

If warning properties (chemical odors, tastes, or physical irritation) are noted, employees will immediately leave the work area and notify their site supervisor or the SSHO.

9.1.2 Use of Level D Protection

Employee will use Level D protection during tasks that have the following characteristics:

The atmosphere contains no known hazard and work functions preclude splashes, immersion, or the
potential for unexpected inhalation of or contact with hazardous levels of any biological or chemical
substances.

Level D protective equipment may include:

- Cotton clothing
- Safety boots steel-toed and shank
- Safety glasses
- Hardhat (where required)
- Hearing protection (where required)

9.2 Training

Employees receive general training regarding proper selection, use, and inspection of PPE during initial HAZWOPER training (or equivalent) and subsequent refresher training.

10.0 RESPIRATORY PROTECTION

Respiratory protection is selected, fitted, used, stored, and maintained in accordance with the Respiratory Protection Program as contained in the WestWater Health and Safety Manual. This section of the HASP is designed to supplement the WestWater Respiratory Protection Program as contained in the WestWater Health and Safety Manual.

This section provides the following site-specific information:

- Selection
- Use
- Cleaning
- Inspection
- Cartridge Change Schedule
- Storage

10.1 Selection

WestWater selects and provides an appropriate respirator based on the respiratory hazard(s) to which the worker is exposed. WestWater shall also select the respirators based on workplace and user factors that affect respirator performance and reliability. WestWater will use National Institute for Occupational Safety and Health (NIOSH) certified respirators and will select respirators from a sufficient number of respirator models and sizes so that the respirator is acceptable to and correctly fits each user. Consideration will also be given to the specific nature of respiratory hazards, including:

- 1. Contaminant concentration
- 2. Physical and chemical properties of the contaminants
- 3. Warning properties
- 4. Oxygen-deficient atmospheres and Immediately Dangerous to Life or Health (IDLH) atmospheres

WestWater shall provide one of the following respirators for protection against gas and vapors:

- 1. An atmosphere-supplied respirator
- 2. An air-purifying respirator with an end-of-service-life indicator (ESLI) certified by NIOSH
- 3. An air-purifying respirator for which canisters and cartridges are changed before the end of their service life based on a change schedule established by the employer if there is no ESLI appropriate for the workplace conditions

WestWater shall provide one of the following respirators for protection against particulates:

- An air-purifying respirator with a filter cartridge certified by NIOSH as a high efficiency particulate air (HEPA) filter
- 2. An air-purifying respirator with a filter cartridge certified by NIOSH under 42 CFR 84
- An air-purifying respirator equipped with any filter certified for particulates by NIOSH if the contaminant(s) consists primarily of particles with mass median aerodynamic diameters (MMAD) of at least 2 micrometers (μm).

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10.2 Use

As required, the Environmental Health and Safety Manager will conduct a hazard evaluation for each operation, process, or particular project where airborne contaminants may be present in routine operations or during an emergency. The hazard evaluation will include the identification of hazardous substances, the development of a list of those substances to which an employee may be exposed at each project site, and a review of work processes to determine where potential exposures to these substances may occur. Non-routine tasks requiring the use of respiratory protection shall not be performed until the Site Specific Health and Safety Plan has been developed and implemented.

Employees will use their respirators in accordance with the training they receive on the use of respirators and in manners consistent with the manufacturer recommendations and as certified by NIOSH. All employees shall conduct user seal checks each time they wear their respirators by using either positive or negative pressure checks.

Employees must leave their work area whenever:

- 1. Personal hygiene issues arise
- 2. Breakthrough or leakage of the facepiece occurs
- 3. Replacement of the respirator, filter, cartridge, or canister elements is required

Employees who wear protective glasses must do so in a manner that does not interfere with the seal of the facepiece to his or her face.

10.3 Cleaning

All full and part-time employees of WestWater who have the potential to wear respiratory protection at any time, for any reason, during a work-shift, must report for the work shift freshly shaven and in compliance with the facial hair rules outlined below.

Respirators issued for the exclusive use of an employee shall be cleaned and disinfected after each use. All respirators will be cleaned using the following methods:

- 1. Disassemble respirator, removing any filters, canisters, or cartridges
- 2. Wash facepieces and associated parts in a mild detergent with warm water
- 3. Do not use organic solvents
- 4. Rinse in clean warm water
- 5. Wipe the respirator with disinfectant wipes (70 percent Isopropyl Alcohol)
- 6. Air-dry in a clean area
- 7. Reassemble the respirator and replace any defective parts
- 8. Store in a clean, dry plastic bag or other air-tight container

10.4 Inspections

Respirators are to be properly maintained at all times in order to ensure that they function properly and adequately protect the employee. Maintenance involves a thorough visual inspection for cleanliness and defects. Worn or deteriorated parts will be replaced prior to use.

The following checklist will be used when inspecting respirators:

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1. Facepiece:

- a. Cracks, tears, or holes
- b. Facemask distortion
- c. Cracked or loose lenses/faceshield
- d. Rubber integrity

2. Headstraps:

- a. Breaks or tears
- b. Broken buckles

3. Valves:

- a. Residue or dirt
- b. Cracks or tears

3. 4. Filters/Cartridges:

- a. Approval designation
- b. Gaskets
- c. Cracks or dents in housing
- d. Proper cartridge for hazard

Respirators that are defective or have defective parts shall be taken out of service immediately. If an employee discovers a defect in the respirator, he or she shall bring the defect to the attention of his or her supervisor.

All defective respirators shall be provided to the Environmental Health and Safety Manager, who shall immediately tag the respirator as defective. Defective respirators shall be disposed. Employees shall not wear respirators that are tagged as defective. When a respirator is taken out of service, the employee will be given a replacement respirator of similar make, model, and size.

10.5 Cartridge Change Schedule

WestWater requires that all filter cartridges equipped with an ESLI device be replaced with new cartridges when the ESLI device indicates chemical breakthrough has occurred. All filter cartridges not equipped with an ESLI device will be changed/replaced with new cartridges after eight hours of total use, or at least monthly.

Additionally, employees will replace the filter cartridges whenever the employee can detect that chemical breakthrough has occurred by odor or irritation. Employees wearing APRs with P100 filters for protection against dust, asbestos, and other particulates shall change the cartridges on their respirators when they first begin to experience difficulty breathing while wearing their masks, or at least monthly.

10.6 Storage

WestWater will provide its employees respirators which are clean, sanitary, and in good working order. Respirators must be stored in a clean, dry area in accordance with the manufacturer's recommendations or by following the procedures in Appendix B-2 of the standard.

Respirators used by a single user are to be cleaned and disinfected as often as necessary to be maintained in a sanitary condition. Respirators are to be stored in a clean and sanitary location away from dust, sunlight, extreme

temperatures, excessive moisture, damaging chemicals, and other sources of damage or contamination. They are to be stored with the facepiece and exhalation valve facing up so the valve will not become deformed.

11.0 HEARING CONSERVATION

Hearing Conservation is evaluated, employees are protected, and hazard areas are labeled in accordance with the Occupational Noise Exposure Program as contained in the WestWater Health and Safety Manual. This section of the HASP is designed to supplement the WestWater Occupational Noise Exposure Program

This section provides the following site-specific information:

- Survey
- Protection
- Warning signs and labels

11.1 Survey

A preliminary (general) noise survey shall be conducted to determine area(s) of the facility that may have hazardous noise levels and to identify employees for inclusion in the ONEP. All sources of constant, intermittent, and impulse noise should be identified and surveyed.

The survey consists of real-time sound level monitoring that is converted into a time-weighted-average (TWA) dose. A Type 1 or Type 2 sound level meter with an A-scale slow response, or an audiodosimeter capable of providing measurements of equal or better accuracy should be used. To ensure accuracy, the instrument should be calibrated before and after the monitoring. Records of the calibrations should be made on the Sound Level Meter/Dosimeter Calibration Form (Appendix A of the Occupational Noise Exposure Program).

The following factors should be considered in the sampling strategy:

- Worker mobility
- Location(s) of noise source(s) and employee work stations
- Type of noise (constant, intermittent, impulse)
- Variations in sound levels

The results of the general noise survey should be recorded on the Sound Level Survey Form (Appendix B of the Occupational Noise Exposure Program). Based on the results of the general noise survey, employee exposure monitoring may be performed in areas with hazardous noise levels. Employee exposure monitoring can be substituted for general noise surveys in areas where noise levels have significant variations in sound levels, there are significant contributions from impulse noise, and/or there is high worker mobility.

The general noise survey is repeated annually or within 60 days of new or modified processes or equipment. A general noise survey is also required when process or equipment changes result in exposure to additional employees or attenuation provided by hearing protectors currently being used by employees becomes inadequate. Survey results are maintained by the Environmental Health and Safety Manager or designee. Copies of the results should be made available to employees.

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11.2 Protection

Hearing protective devices are made available without cost to any employee who may be exposed to noise above the action level of 85 dBA TWA. Any employee exposed to noise above the action level of 85 dBA TWA, or above any permissible noise level identified in table G-16 of 1910.95, will be required to wear hearing protection. Hearing protection must also be worn in areas with warning signs posted for noise hazards and during tasks that specify hearing protective devices as part of the personal protective equipment (PPE).

Hearing protective devices are individually issued and employees are provided the opportunity to select their own personal hearing protectors from a variety of suitable devices. Training on the proper fit and usage of hearing protective devices is given prior to employee's usage in the workplace. Employees are responsible for the care and maintenance of their hearing protective devices. Hearing protective devices shall be replaced as necessary due to wear or deterioration.

Hearing protective device attenuation shall be evaluated for the specific noise environments in which the protective device will be used. The methods used for attenuation shall be consistent with the methods described in Appendix B of 29 CFR 1910.95. The goal is to select hearing protective devices that attenuate employee exposure at or below the action level of 85 dBA TWA. This goal is also used for employees who have experienced a standard threshold shift.

11.3 Warning Signs and Labels

- Areas requiring hearing protection shall be clearly labeled with warning signs.
- Equipment that requires the use of hearing protective devices shall be labeled as such.

Areas at WestWater that require hearing protection are the blower room and the generator building. Three blowers will be housed in a sound attenuated room located within the treatment building. They are the 450 standard cubic feet per minute (scfm) aeration tank blower, 200 scfm reaction tank blower, and the 200 scfm reverse osmosis permeate tank blower. Two generators will be housed in a generator building outside the treatment building.

12.0 BLOODBORNE PATHOGEN

This section of the HASP describes ways to minimize the possibility of disease transmission by establishing procedures for the handling of potentially infectious materials. This section of the HASP is designed to supplement the WestWater Bloodborne Pathogens Program as contained in the WestWater Health and Safety Manual.

This emergency response plan provides the following site-specific information:

- Assumptions
- Contamination Control
- · Equipment Decontamination
- Exposure monitoring

12.1 Assumptions

Handling of infectious materials is uncommon. Sites are assumed to have been surveyed, and the contaminated areas properly demarcated. The procedures below assume the worst-case conditions.

12.2 Contamination Control

- 1. Establish control zones.
- Don appropriate PPE and respirator in accordance with WestWater's Bloodborne Pathogen Exposure Control program.
- 3. Deposit equipment used on site (e.g., PID, HNU, Draeger Tubes, etc.) on plastic sheeting. Segregation at the drop reduces the probability of cross-contamination.
- 4. Remove outer boots and gloves. Deposit in disposal container with a plastic liner.
- 5. If worker leaves exclusion zone to change air tank or cartridges, this is the last step in the decontamination procedure. Workers' air tank or cartridges are exchanged, new outer gloves and boot covers donned, joints taped, and worker returns to duty. Deposit used cartridges in disposal container with plastic liner.
- While still wearing face piece, disconnect hose from regulator valve and remove backpack. Place backpack on table.
- 7. Remove coverall and deposit in disposal container with plastic liner. If necessary, get assistance from helper.
- 8. Remove facepiece. Avoid touching face with gloves. Deposit in a plastic bag with sealer.
- 9. Remove inner gloves and deposit in disposal container with plastic liner.
- 10. Thoroughly wash hands, face, arms, and neck with disinfectant soap. A shower is mandatory upon returning back to the facility or office.

12.3 Equipment and Work Surface Decontamination

- 1. Don the appropriate PPE according to Bloodborne Pathogen Exposure Control program.
- 2. All equipment will be cleaned and decontaminated with a sodium hypochlorite solution after contact with blood or other potentially infectious materials and at the end of the work shift.
- 3. All work surfaces are to be decontaminated with a sodium hypochlorite solution after contact with blood or other potentially infectious materials and at the end of the work shift.
- 4. Steps may be modified based on specific site needs at the discretion of the Region/Branch Health and Safety Manager or designee.

12.4 Exposure Monitoring

Due to the types and limited quantities of chemicals in use at this facility, exposure monitoring is not required. All personnel shall don respiratory protective equipment when working with open containers of chemicals, including changing out containers.

13.0 HAZARD COMMUNICATION

This section of the HASP defines the minimum requirements and responsibilities for the proper communication of hazards posed by chemicals in the workplace and to ensure this information is accessible to WestWater employees and contractors. This section of the HASP is designed to supplement the WestWater Hazard Communication Program as contained in the WestWater Health and Safety Manual.

This section provides the following site-specific information:

- Hazard Determination
- Training
- Labeling

13.1 Hazard Determination

Most chemicals handled within WestWater are considered hazardous according to the criteria of the hazard communication standard, unless the manufacturer of the chemical has identified them as non-hazardous.

The Environmental Health and Safety Manager or designee will review the criteria in 29 CFR §1910.1200(d), as specified in material safety data sheets (MSDSs) and other information sources, to determine a chemical's hazardous properties. Other sources noted in Appendix C of 29 CFR §1910.1200, as well as various MSDS Online Database systems or generically published MSDSs, may also be utilized in making the determination. MSDSs for chemicals to be used at the facility are provided in Appendix C of this document.

WestWater incorporates different methods and observations (human senses) to detect the presence or release of hazardous chemicals in the workplace. The various warning properties of the classes of chemicals may also help to detect a problem. The methods available to detect a leak or release include the following:

- 1. Leak detection equipment built into Megator tanks
- 2. A visible pool of liquid around the base of a drum or container
- 3. Visible liquid on the side of a drum or container
- 4. Unusual odors present in the work area
- 5. Unusual hissing or bubbling sounds signifying escaping gas or other pressurized material
- 6. Formation of vapor clouds

13.2 Training

Workers are trained in compliance with the OSHA standard 29 CFR 1910.1200 – Hazard Communication, 29 CFR 1910 Subpart Z – Toxic and Hazardous Substances, 29 CFR 1926.59 – Hazard Communication, and 29 CFR 1926 Subpart Z – Toxic and Hazardous Substances.

Training is provided to all employees who handle or come in contact with hazardous chemicals. The training is conducted by the SSHO or other qualified staff. At a minimum, employees are trained in hazard communication:

- 1. During orientation
- 2. Annually
- 3. When new data is made available on current chemical hazards
- 4. When a new hazard is introduced into the workplace

13.3 Labeling

Hazardous material containers will be labeled in accordance with 29 CFR §1910.1200(f), "Labeling and other forms of warning." This includes providing:

- 1. The identity of the hazardous chemical(s)
- 2. The appropriate hazard warning
- 3. The name and address of the manufacturer or other responsible party

Appropriate hazard warnings may include the use of words, pictures, symbols, or a combination of these and shall be prominently displayed, legible and in English. These warnings shall be readily available to all employees throughout their work shift as described in the written program.

14.0 OTHER

There are other sections required by OSHA and not addressed in this HASP that will be included in the WestWater Health and Safety Manual, such as a comprehensive chemical handling program, confined space program, fork truck operation, control of hazardous energy program, working surfaces guidelines, ladder safety, fire protection, fall protection, loading and unloading, and specific facility operation emergency response. These sections will be completed and included in the WestWater Health and Safety Manual as the facility nears completion, since much of the information in these programs is dependent on final site layout and operation.

Appendix A

Visitor Safety Declaration

VISITOR SAFETY DECLARATION

	duly authorized and designated representative and age certify and agree for myself that:	nt of, I					
1.	I have received an orientation briefing by Stewart Environmental Consultants, LLC including, but not limited to, site-specific safety rules, accident/injury reporting, emergency procedures, and potential hazards in the work area during routine site operations;						
2.	I have reviewed a written copy of the site-specific sa any applicable federal, state, and local health and safe	fety rules and will comply with those rules, as well as ty regulations;					
3.	I understand that unless I am a contracted employed personal protective equipment (PPE) when working or	ee, I should provide my own required respirator and stewart Environmental projects;					
4.	my designated work assignments (including fit testing	months and have been medically qualified to perform g and wearing of respirators and personal protective ccupational Safety and Health Administration (OSHA)					
5.	respiratory protection, hearing conservation, haza	nealth and safety topics (including, but not limited to, and communication and equipment operation), in ns; including 40-hour OSHA training and eight-hour 0.120; and					
6.	If applicable, my employer performs regularly schedequipment. Known defects will be repaired prior to equipment operation, the equipment will be taken out	o operation and, as defects become apparent during					
Stewart	Employee Giving Orientation	Date					
Visitor		Date					

Appendix B
Health and Safety Plan Form

WestWater Farms Production Water Recycling Facility 100 West State Highway 6 Westwater, Utah HEALTH AND SAFETY PLAN FORM

This form must be completed for each facility, pilot study, or non-routine task.

I. EMERGENCY PREPAREDNESS

Address:	WestWater Farms Production Water Recycling Facility 100 West State Highway 6 Westwater, Utah					
Contact Person:	Mr. Brad E. Eaton, PE	Mobile Telephone 970-371-4665				
Alarm System:	None	Telepho Location		None		
Nearest Hospital:	Family Health West 300 West Ottley Avenue Fruita, CO 81521 (see attached map)	Telephone Number:		(970) 234-2420 Main (970) 858-2119 After hours		
Emergency/Evacuation, Meeting Location:	Main entrance					
Onsite Emergency #:	None	Fire: 911				
Ambulance:	911	Police: 911				

II. HAZARD ASSESSMENT AND CONTROL

The site has been evaluated for hazards, and control methods have been implemented. Refer to the HASP Plan for additional information.

Emergency Equipment	⊠First Aid Kit ⊠Safety Shower	Fire Extinguisher (Type_ABC)	Eyewash
Chemical Hazards	Flammable/Combustible Corrosive Carcinogen	Compressed gas Toxic Irritant	Other: Sulfuric acid, hydrochloric acid, sodium hypochlorite, membrane coagulant, ferric chloride
Physical Hazards	Slipping or tripping hazards ⊠Eye hazards ⊠Foot hazards □ Head hazards		⊠Electrical hazards ⊠Material handling hazards ⊠Other: UV lights, pressurized water lines

Other Hazards (ergonomics, biological, etc.)

Wash hands and other affected body parts as soon as possible after contact with untreated water.

III. SPILL CONTROL PROCEDURES

- 1. Try to identify the material.
- 2. Remove all ignition sources.
- 3. Evacuate non-essential personnel from the spill area.
- 4. Don appropriate personal protection equipment (PPE) and respiratory protection.
- 5. Control and contain the source of the spill with absorbent dikes.
- 6. Use appropriate absorbent to collect spilled liquids.
- 7. Containerize absorbent for disposal in properly labeled Department of Transportation (DOT) container.
- 8. Notify appropriate Stewart Environmental Consultants, LLC personnel, as well as local, state, and federal regulatory agencies.

IV. CONTINGENCY PLAN AND HEALTH AND SAFETY PLAN REVIEW

All site personnel (Stewart Environmental employees, contractors, leased employees, and visitors) have reviewed the enclosed documentation including:

- 1. Site overview
- 2. Emergency response procedures
- 3. Potential physical and health hazards on site
- 4. PPE requirements
- 5. Site decontamination control

V. PERSONAL PROTECTIVE EQUIPMENT SELECTION

The following PPE has been selected based on hazards identified.

Work Task Description:	Chemical Transfer					
Protection Level:	□A	□В	⊠c	□D		
Inner Garment:	⊠Work Uniform		□Nomex			
Outer Garment:	⊠Tyvek □Saranex	☐ Kleenguard ☐CPF II		oly Coated arricade		PF I other)
Gloves: Specify Inner or Outer	□Rubber □Viton ☑ (other): Do	⊠Nitrile □PVA uble Glove	□Neoprene □Silvershiel		□PVC □Kevlar	□Butyl Rubber □Leather
Boots: (Steel-toed)	☐Butyl Rubbe	r Neoprene	⊠Leather	☐ (ot	her) <u>:</u>	
Head:	☐Hard Hat					
Eye/Face:	Safety glasses w/sideshields		□Goggles	□Face	eshield	
Respiratory:	□SCBA □Cartridges/F	□Airline ilter type:	⊠Air-purifyi	ng:		

Work Task Description:	Mixing/Dilution
Protection Level:	□A □B ☑C □D
Inner Garment:	⊠Work Uniform □Nomex
Outer Garment:	☑Tyvek ☐ Kleenguard ☐ Poly Coated Tyvek ☐ CPF I ☐Saranex ☐ CPF II ☐ Barricade ☐ (other)
Gloves: Specify Inner or Outer	□Rubber □Neoprene □PVC □Butyl Rubber □Viton □PVA □Silvershield/4H □Kevlar □Leather □ (other): Double Glove
Boots: (Steel-toed)	☐Butyl Rubber ☐Neoprene ☐Leather ☐ (other):
Head:	☐Hard Hat
Eye/Face:	Safety glasses w/sideshields □Goggles □Faceshield
Respiratory:	□SCBA □Airline ⊠Air-purifying: □Cartridges/Filter type:
	T
Work Task Description:	Walking on working surfaces
Protection Level:	□A □B □C □D
Inner Garment:	□Work Uniform □Nomex
Outer Garment:	□Tyvek □ Kleenguard □Poly Coated Tyvek □CPF I □Saranex □CPF II □Barricade □ (other)
Gloves: Specify Inner or Outer	□Rubber □Nitrile □Neoprene □PVC □Butyl Rubber □Viton □PVA □Silvershield/4H □Kevlar □Leather □ (other): Double Glove
Boots: (Steel-toed)	☐Butyl Rubber ☐Neoprene ☐ (other) <u>:</u>
Head:	☐Hard Hat
Eye/Face:	☐Safety glasses w/sideshields ☐Goggles ☐Faceshield
Respiratory:	□SCBA □Airline □Air-purifying: □Cartridges/Filter type:
Work Task Description:	Compressed air
Protection Level:	□A □B □C ⊠D
Inner Garment:	□Work Uniform □Nomex
Outer Garment:	□ Tyvek □ Kleenguard □ Poly Coated Tyvek □ CPF I □ Saranex □ CPF II □ Barricade □ (other)
Gloves: Specify Inner or Outer	□Rubber □Nitrile □Neoprene □PVC □Butyl Rubber □Viton □PVA □Silvershield/4H □Kevlar □Leather □ (other): Double Glove
Boots: (Steel-toed)	☐Butyl Rubber ☐Neoprene ☐Leather ☐ (other):
Head:	☐ Hard Hat
Eye/Face:	Safety glasses w/sideshields □Goggles □Faceshield
Respiratory:	□SCBA □Airline □Air-purifying: □Cartridges/Filter type:
Additional Notes	Turn off compressor, turn off supply valve or disconnect air line prior to working with live hoses

Work Task Description:	Cylinder Shaft on						
Protection Level:	□A □B		□с	⊠D			
Inner Garment:	☐Work Uniform		□Nomex				
Outer Garment:		☐ Kleenguard ☐CPF II		Poly Coated Barricade	Tyvek	□CPF I	
Gloves: Specify Inner or Outer		⊒Nitrile ⊒PVA le Glove	□Neoprer □Silvershi		□PVC □Kevla	ar	□Butyl Rubber □Leather
Boots: (Steel-toed)	☐Butyl Rubber [Neoprene	⊠Leather	☐ (otl	ner) <u>:</u>		
Head:	☐Hard Hat						
Eye/Face:	Safety glasses •	w/ sideshields	□Goggles	□Face	eshield		
Respiratory:	□SCBA [□Cartridges/Filte	□Airline er type:	☐Air-purif	ying:		¥	
Additional Notes	Do not bypass ma	achine guardin	g				
Work Task Description:	High Pressure Wa	ater lines					
Protection Level:		В	C	⊠D			
Inner Garment:	☐Work Uniform		Nomex				
Outer Garment:		☐ Kleenguard ☐CPF II		Poly Coated Barricade	Tyvek	□CPF I	
Gloves: Specify Inner or Outer		□Nitrile □PVA le Glove	□Neoprer □Silvershi		□PVC □Kevla	ar	□Butyl Rubber □Leather
Boots: (Steel-toed)	☐Butyl Rubber [Neoprene	Leather	☐ (oth	ner) <u>:</u>		
Head:	☐Hard Hat						
Eye/Face:	Safety glasses v	w/ sideshields	□Goggles	□Face	eshield		
Respiratory:	□SCBA □ □Cartridges/Filte	□Airline er type:	☐Air-purif	ying:			
Additional Notes	Observe lines on immediately.	regular basis to	o check for	leaks. If leal	king, shut	system	down
Work Task Description:	Energized (220/1	10 single phase	e and 120 V	olt AC/24 Vo	olt AC and	d DC)	
Protection Level:	□A [В	□C	⊠D			
Inner Garment:	☐Work Uniform		□Nomex				
Outer Garment:		☐ Kleenguard ☐CPF II		Poly Coated Barricade	Tyvek	□CPF I	er)
Gloves: Specify Inner or Outer	A CONTRACTOR OF THE PROPERTY O	⊒Nitrile ⊒PVA le Glove	□Neopren □Silvershi		□PVC □Kevla	ır	□Butyl Rubber □Leather
Boots: (Steel-toed)	☐Butyl Rubber [Neoprene	Leather	☐ (oth	ner) <u>:</u>		
Head:	☐Hard Hat						
Eye/Face:	Safety glasses v	w/ sideshields	□Goggles	ПЕасе	shield		

			_
Respiratory:	□SCBA □Airline □Cartridges/Filter type:	☐Air-purifying:	
Additional Notes		ndary breaker, and main breaker prior to connecting.	
Work Task Description:	Chemical Handling		
Protection Level:	□A □B	⊠c □D	
Inner Garment:	⊠Work Uniform	□Nomex	
Outer Garment:		☐ Poly Coated Tyvek ☐ CPF I☐ Barricade ☐ (other)	
Gloves: Specify Inner or Outer	□Rubber ☑Nitrile □Viton □PVA ☑ (other): Double Glove	□ Neoprene □ PVC □ Butyl Rubbe □ Silvershield/4H □ Kevlar □ Leather	er
Boots: (Steel-toed)	☐Butyl Rubber ☐Neoprene	⊠Leather ☐ (other) <u>:</u>	
Head:	☐Hard Hat		
Eye/Face:	Safety glasses w/sideshields	Goggles ⊠Faceshield	
Respiratory:	□SCBA □Airline □Cartridges/Filter type:	⊠Air-purifying:	
Work Task Description:	Untreated Produced Water Un		
Protection Level:	□A □B	⊠c □D	
Inner Garment:	☐Work Uniform	□Nomex	
Outer Garment:	☐Tyvek ☐ Kleenguard ☐Saranex ☐CPF II	☐Poly Coated Tyvek ☐CPF I☐Barricade ☐ (other)	
Gloves:	☐Rubber ☐Nitrile	□Neoprene □PVC □Butyl Rubbe	r
Specify Inner or Outer	□Viton □PVA ☑ (other): Double Glove	□Silvershield/4H □Kevlar □Leather	
Boots: (Steel-toed)	☐Butyl Rubber ☐Neoprene	⊠Leather	
Head:	☐Hard Hat		
Eye/Face:	Safety glasses w/sideshields	☐Goggles ☐Faceshield	
Respiratory:	SCBA Airline	☐Air-purifying:	
V 100-001	☐Cartridges/Filter type:		
Work Task Description:	Treated Water Loading		
Protection Level:	□A □B	□C ⊠D	
Inner Garment:	□Work Uniform	□C □D □Nomex	
	☐Tyvek ☐ Kleenguard		
Outer Garment:	Saranex CPF II	☐Poly Coated Tyvek ☐CPF I☐Barricade ☐ (other)	
Gloves:	☐Rubber ☐Nitrile	□ Neoprene □ PVC □ Butyl Rubber	-
Specify Inner or Outer	□Viton □PVA	Silvershield/4H Kevlar Leather	
	(other): Double Glove		
Boots: (Steel-toed)	☐Butyl Rubber ☐Neoprene	□ (other):	
Head:	☐ Hard Hat		

Eye/Face:	Safety glasses w/sideshields	☐ Goggles ☐ Faceshield
Respiratory:	□SCBA □Airline	☐Air-purifying:
	☐Cartridges/Filter type:	
Work Task Description:	Generators	
Protection Level:	□A □B	□C ⊠D
Inner Garment:	☐Work Uniform	□Nomex
Outer Garment:	☐Tyvek ☐ Kleenguard	☐Poly Coated Tyvek ☐CPF I
Outer darment.	☐Saranex ☐CPF II	☐Barricade ☐ (other)
Gloves:	☐Rubber ☐Nitrile	□ Neoprene □ PVC □ Butyl Rubber
Specify Inner or Outer	□Viton □PVA	Silvershield/4H
3 11	(other): Double Glove	
Boots: (Steel-toed)	☐Butyl Rubber ☐Neoprene	☑Leather ☐ (other) <u>:</u>
Head:	☐Hard Hat	
Eye/Face:	Safety glasses w/sideshields	☐Goggles ☐Faceshield
Respiratory:	□SCBA □Airline	☐Air-purifying:
	☐Cartridges/Filter type:	
Additional Notes	Wear hearing protection	
Work Task Description:	Blowers	
Protection Level:	□A □B	□C ⊠D
Inner Garment:	☐Work Uniform	□Nomex
Outer Garment:	☐Tyvek ☐ Kleenguard	☐Poly Coated Tyvek ☐CPF I
Outer darment.	☐Saranex ☐CPF II	☐Barricade ☐ (other)
Gloves:	☐Rubber ☐Nitrile	□ Neoprene □ PVC □ Butyl Rubber
Specify Inner or Outer	□Viton □PVA	Silvershield/4H Kevlar Leather
	(other): Double Glove	
Boots: (Steel-toed)	☐Butyl Rubber ☐Neoprene	
Head:	☐Hard Hat	
Eye/Face:	Safety glasses w/sideshields	☐ Goggles ☐ Faceshield
Respiratory:	□SCBA □Airline	☐Air-purifying:
	☐Cartridges/Filter type:	
Additional Notes	Wear hearing protection	

A. Additional Health and Safety Provisions

For additional information, refer to the Site Health and Safety Plan (HASP) guidance document and Stewart Environmental Health and Safety Programs.

VI. EQUIPMENT LIST

General Equipment:

K-7		The Market		
⊠Drum dolly	Fork truck	Personnel lift	Crane	Backhoe
Compressor	Generator	Tamper	Hydraulic ram	Dump truck
Excavator	Roller	⊠Pump		Cutting device
⊠Hand tools	⊠ Trucks	⊠Ladder	Other	Other
Safety Equipment:				
Safety shower	⊠Eyewash	Barriers	Barrier tape	
⊠Water	Decontamination Equipment	Lighting	Portable alarm	Ventilation
⊠Grounding rods	First aid kits	Lifeline	⊠Harness	⊠Lockout/Tagout
Air horn	Extraction device	⊠Ladder	Fire extinguisher Type (_ABC)	Other

VII. CONTINGENCY PLAN - (THIS SECTION MAY BE COMPLETED ON SITE)

Address:	WestWater	WestWater Farms Production Water Recycling Facility			
Location:	100 West State Highway 6 Westwater, Utah				
Project Start Date:	March 15, 20	011			
EHS Manager:	Ms. Clover Stout Telephone 970-631-5370 Numbers: 970-213-4152			970-631-5370 970-213-4152	
Onsite Emergency Coordinator:	Mr. Randy Ev	vans	•		
(4 ₂ , 4 = 4 ₂ , 4 = 10)	SEC:	631-5370 or 213-4152			
Emergency Phone Number	Police:	911			
Emergency Phone Number	Fire:	911			
	Ambulance:	911			
	Name	Family Health West			
Hospital:	Phone	(970) 234-2420 Main (970) 858-2119 After hours			
	Address	300 West Ottley Avenue Fruita, CO 81521			
	See Attach	ed Map to Fam	ily Health West		
EVACUATION ROUTE AND ASSEMBLY AREA:	Main Entrance				
EVACUATION ALARM DESCRIPTION:	None				

VIII. COMMUNICATIONS

Methods have been established for personnel communication throughout the project. These methods may be buddy system, hand signals, rope pulling signals, portable radios, etc.

The following communication method will be used for this project:

- · Cell phone
- Hand signals
- Voice commands

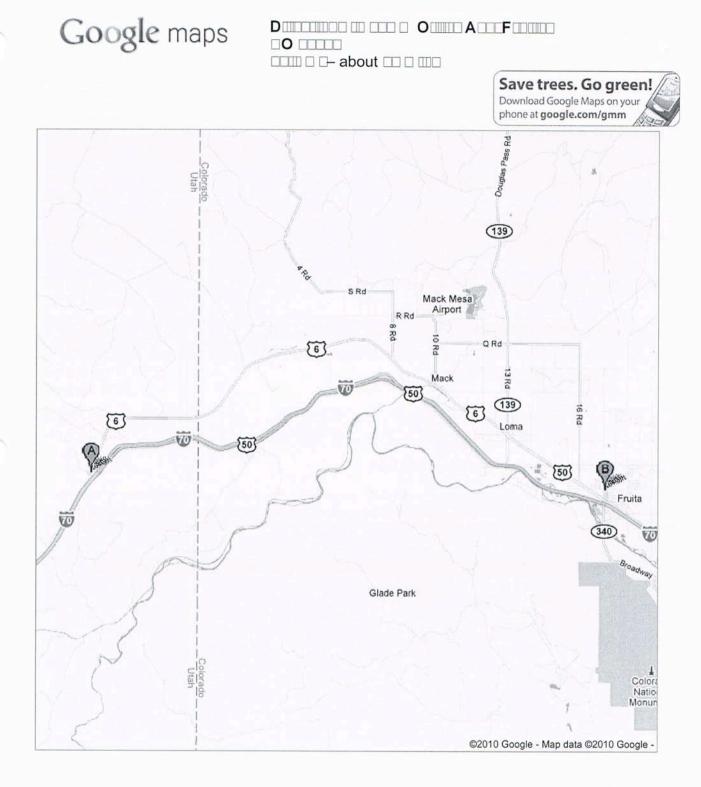
IX. HASP REVIEW AND APPROVAL

Based on the information provided, this plan has been reviewed and certified in accordance with 29 CFR 1910.120 "Hazardous Waste Operations and Emergency Response," 29 CFR 1910.132 "Personal Protective Equipment," and 29 CFR 1910.1200 "Hazard Communication."

Prepared by:		Date:	/ /
Operations Review b	py:		
Health and Safety Re	eview by:		
Approvals: Print Name:	Signature E	Date	Verbal Written
I have reviewed and u	understand the contents of t	the enclosed documents	
Print Name	Signature		ractor/Leased Employee Firm
			ractor/Leased Employee Firm

WestWater Farms Production Water Recycling Facility Tailgate Meeting Documentation Form

Topic:	Date:
Topic Covered By:	
Attendees:	
Attendees.	
Print	Signature
Горіс:	Date:
Горіс Covered By:	
Attendees:	
Print	Signature



Unknown road

1	. Head	go 217 ft total 217 ft
1 2	. Turn □□□toward □S□□B□S E	go 0.2 mi total 0.2 mi
6 3	Take the 1st Onto S BS E About 1 min	go 0.4 mi total 0.6 mi
70 4	Turn IIII to merge onto I E Entering Colorado About 22 mins	go 23.7 mi total 24.3 mi
7 5	Take exit for other toward single.	go 0.2 mi total 24.6 mi
<u>340</u> 6	At the traffic circle, take the conto cont	go 0.1 mi total 24.7 mi
7	Continue onto S DODE SD About 2 mins	go 0.6 mi total 25.3 mi
1 8	Turn IIII at R III O III A III Destination will be on the left	go 325 ft total 25.4 mi
® 30	0 W Ottley Ave, Fruita, CO 81521	

These directions are for planning purposes only. You may find that construction projects, traffic, weather, or other events may cause conditions to differ from the map results, and you should plan your route accordingly. You must obey all signs or notices regarding your route.

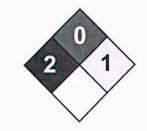
Map data ©2010 Google

Directions weren't right? Please find your route on maps.google.com and click "Report a problem" at the bottom left.

Appendix C

Material Safety Data Sheets







Material Safety Data Sheet Hydrogen Peroxide 35% MSDS

Section 1: Chemical Product and Company Identification

Product Name: Hydrogen Peroxide 35%

Catalog Codes: SLH1927, SLH2776

CAS#: Mixture.

RTECS: Not applicable.

TSCA: TSCA 8(b) inventory: Water; Hydrogen Peroxide

CI#: Not applicable.

Synonym: Hydrogen Peroxide 35%

Chemical Name: Not applicable.

Chemical Formula: Not applicable.

Contact Information:

Sciencelab.com, Inc. 14025 Smith Rd.

Houston, Texas 77396

US Sales: 1-800-901-7247

International Sales: 1-281-441-4400

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:

1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name CAS# % by Weight

Water 7732-18-5 65 Hydrogen Peroxide 7722-84-1 35

Toxicological Data on Ingredients: Hydrogen Peroxide: ORAL (LD50): Acute: 2000 mg/kg [Mouse]. DERMAL (LD50): Acute:

Section 3: Hazards Identification

4060 mg/kg [Rat]. 2000 mg/kg [pig]. VAPOR (LC50): Acute: 2000 mg/m 4 hours [Rat].

Potential Acute Health Effects:

Very hazardous in case of skin contact (irritant), of eye contact (irritant). Hazardous in case of skin contact (corrosive, permeator), of eye contact (corrosive), of ingestion, . Slightly hazardous in case of inhalation (lung sensitizer). Non-corrosive for lungs. Liquid or spray mist may produce tissue damage particularly on mucous membranes of eyes, mouth and respiratory tract. Skin contact may produce burns. Inhalation of the spray mist may produce severe irritation of respiratory tract, characterized by coughing, choking, or shortness of breath. Prolonged exposure may result in skin burns and ulcerations. Over-exposure by inhalation may cause respiratory irritation. Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.

Potential Chronic Health Effects:

CARCINOGENIC EFFECTS: Classified A3 (Proven for animal.) by ACGIH [Hydrogen Peroxide]. Classified 3 (Not classifiable for human.) by IARC [Hydrogen Peroxide]. MUTAGENIC EFFECTS: Mutagenic for mammalian somatic cells.

[Hydrogen Peroxide]. Mutagenic for bacteria and/or yeast. [Hydrogen Peroxide]. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to blood, upper respiratory tract, skin, eyes, central nervous system (CNS). Repeated or prolonged exposure to the substance can produce target organs damage. Repeated or prolonged contact with spray mist may produce chronic eye irritation and severe skin irritation. Repeated or prolonged exposure to spray mist may produce respiratory tract irritation leading to frequent attacks of bronchial infection.

Section 4: First Aid Measures

Eve Contact:

Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. Get medical attention immediately.

Skin Contact:

In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Cover the irritated skin with an emollient. Cold water may be used. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

Serious Skin Contact:

Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.

Serious Inhalation:

Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. WARNING: It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.

Ingestion:

Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention if symptoms appear.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Non-flammable.

Auto-Ignition Temperature: Not applicable.

Flash Points: Not applicable.

Flammable Limits: Not applicable.

Products of Combustion: Not available

Fire Hazards in Presence of Various Substances: combustible materia

Explosion Hazards in Presence of Various Substances: Slightly explosive in presence of open flames and sparks, of heat, of organic materials, of metals, of acids.

Fire Fighting Media and Instructions:

Fire: Small fires: Use water. Do not use dry chemicals or foams. CO2, or Halon may provide limited control. Large fires: Flood fire area with water from a distance. Move containers from fire area if you can do it without risk. Do not move cargo or vehicle if cargo has been exposed to heat. Fight fire from maximum distance or use unmanned hose holders or monitor nozzles. Col containers with flooding quantities of water until well after fire is out. ALWAYS stay away from tanks engulfed in fire. For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible, withdraw from area and let fire burn. Hydrogen peroxide, aqueous solution, with not less than 8% but less than 20% Hydrogen peroxide; Hydrogen peroxide,

aqueous solution, with not less than 20% but not more than 60% Hydrogen peroxide (stabilized as necessary)/ [QC Reviewed] [U.S. Department of Transportation. 2000 Emergency Response Guidebook. RSPA P 5800.8 Edition. Washington, D.C: U.S. Government Printing Office, 2000,p. G-140]

Special Remarks on Fire Hazards:

Most cellulose (wood, cotton) materials contain enough catalyst to cause spontaneous ignition with 90% Hydrogen Peroxide. Hydrogen Peroxide is a strong oxider. It is not flammable itself, but it can cause spontaneous combustion of flammable materials and continued support of the combustion because it liberates oxygen as it decomposes. Hydrogen peroxide mixed with magnesium and a trace of magnesium dioxide will ignite immediately.

Special Remarks on Explosion Hazards:

Soluble fuels (acetone, ethanol, glycerol) will detonate on a mixture with peroxide over 30% concentration, the violence increasing with concentration. Explosive with acetic acid, acetic anhydride, acetone, alcohols, carboxylic acids, nitrogen containing bases, As2S3, Cl2 + KOH, FeS, FeSO4 + 2 methylpryidine + H2SO4, nitric acid, potassium permanganate. P2O5, H2Se, Alcohols + H2SO4, Alcohols + tin chloride, Antimoy trisulfide, chlorosulfonic acid, Aromatic hydrocarbons + trifluoroacetic acid, Azeliac acid + sulfuric acid (above 45 C), Benzenesulfonic anhydride, tert-butanol + sulfuric acid, Hydrazine, Sulfuric acid, Sodium iodate, Tetrahydrothiophene, Thiodiglycol, Mercurous oxide, mercuric oxide, Lead dioxide. Lead oxide, Manganese dioxide, Lead sulfide, Gallium + HCl, Ketenes + nitric acid, Iron (II) sulfate + 2-methylpyridine + sulfuric acid, Iron (II) sulfate + nitric acid, + sodium carboxymethylcellulose (when evaporated). Vinyl acetate, trioxane, water + oxygenated compounds (eg: acetaldehyde, acetic acid, acetone, ethanol, formaldehyde, formic acid, methanol, 2-propanol, propionaldehyde), organic compounds. Beware: Many mixitures of hydrogen peroxide and organic materials may not explode upon contact. However, the resulting combination is detonatable either upon catching fire or by impact, EXPLOSION HAZARD: SEVERE, WHEN HIGHLY CONCENTRATED OR PURE H2O2 IS EXPOSED TO HEAT, MECHANICAL IMPACT. OR CAUSED TO DECOMPOSE CATALYTICALLY BY METALS & THEIR SALTS, DUSTS & ALKALIES. ANOTHER SOURCE OF HYDROGEN PEROXIDE EXPLOSIONS IS FROM SEALING THE MATERIAL IN STRONG CONTAINERS. UNDER SUCH CONDITIONS EVEN GRADUAL DECOMPOSITION OF HYDROGEN PEROXIDE TO WATER + 1/2 OXYGEN CAN CAUSE LARGE PRESSURES TO BUILD UP IN THE CONTAINERS WHICH MAY BURST EXPLOSIVELY. Fire or explosion: May explode from friction, heat or contamination. These substances will accelerate burning when involved in a fire. May ignite combustibles (wood, paper, oil, clothing, etc.). Some will react explosively with hydrocarbons (fuels). Containers may explode when heated. Runoff may create fire or explosion hazard. /Hydrogen peroxide, aqueous solution, stabilized, with more than 60% Hydrogen peroxide; Hydrogen peroxide, stabilized/ [QC Reviewed] [U.S. Department of Transportation. 2000 Emergency Response Guidebook. RSPA P 5800.8 Edition. Washington, D.C: U.S. Government Printing Office, 2000,p. G-143]. Fire or explosion: These substances will accelerate burning when involved in a fire. Some may decompose explosively when heated or involved in a fire. May explode from heat or contamination. Some will react explosively with hydrocarbons (fuels). May ignite combustibles (wood, paper, oil, clothing, etc.). Containers may explode when heated. Runoff may create fire or explosion hazard. /Hydrogen peroxide, aqueous solution, with not less than 8% but less than 20% Hydrogen peroxide; Hydrogen peroxide, aqueous solution, with not less than 20% but not more than 60% Hydrogen peroxide (stabilized as necessary)/ [QC Reviewed] [U.S. Department of Transportation. 2000 Emergency Response Guidebook. RSPA P 5800.8 Edition. Washington, D.C: U.S. Government Printing Office, 2000,p. G-140] (Hydrogen Peroxide)

Section 6: Accidental Release Measures

Small Spill:

Dilute with water and mop up, or absorb with an inert dry material and place in an appropriate waste disposal container.

Large Spill:

Corrosive liquid. Oxidizing material. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not get water inside container. Avoid contact with a combustible material (wood, paper, oil, clothing...). Keep substance damp using water spray. Do not touch spilled material. Use water spray curtain to divert vapor drift. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:

Keep container dry. Keep away from heat. Keep away from sources of ignition. Keep away from combustible material.. Do not ingest. Do not breathe gas/fumes/ vapor/spray. Never add water to this product. In case of insufficient ventilation, wear

suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, reducing agents, combustible materials, organic materials, metals, acids, alkalis.

:torage:

Keep container tightly closed. Keep container in a cool, well-ventilated area. Separate from acids, alkalies, reducing agents and combustibles. See NFPA 43A, Code for the Storage of Liquid and Solid Oxidizers. Do not store above 8°C (46.4°F). Refrigerate Sensitive to light. Store in light-resistant containers.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:

Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection:

Face shield. Full suit. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves. Boots.

Personal Protection in Case of a Large Spill:

Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:

Hydrogen Peroxide TWA: 1 (ppm) from ACGIH (TLV) [United States] TWA: 1 (ppm) from OSHA (PEL) [United States] TWA: 1 STEL: 2 [Canada] TWA: 1.4 (mg/m3) from NIOSH TWA: 1.4 (mg/m3) from OSHA (PEL) [United States] TWA: 1 (ppm) [United Kingdom (UK)] TWA: 1.4 (mg/m3) [United Kingdom (UK)] TWA: 1.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor: Odorless.

Taste: Bitter. Slight acid.

Molecular Weight: Not applicable.

Color: Clear Colorless.

pH (1% soln/water): Neutral. Boiling Point: 108°C (226.4°F) Melting Point: -33°C (-27.4°F)

Critical Temperature: Not available.

Specific Gravity: 1.1 (Water = 1)

Vapor Pressure: 3.1 kPa (@ 20°C)

Vapor Density: 1.1 (Air = 1)

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

ispersion Properties: See solubility in water, diethyl ether.

Solubility:

Section 10: Stability and Reactivity Data

Stability: The product is stable. It contains a stabilizer.

Instability Temperature: Not available.

Conditions of Instability: Light, excess heat, combustible materials, incompatible materials (Hydrogen Peroxide)

Incompatibility with various substances:

Reactive with reducing agents, combustible materials, organic materials, metals, acids, alkalis. Slightly reactive with water.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity:

Light sensitive. Incompatible with reducing materials, ethers (dioxane, furfuran, tetrahydrofuran), oxidizing materials, Metals(eg. potassium, sodium lithium, iron, copper, brass, bronze, chromium, zinc, lead, silver, nickel), metal oxides (eg. cobalt oxide, iron oxide, lead oxide, lead hydroxide, manganese oxide), metal salts (eg. calcium permanganate, salts of iron), manganese, asbestos, vanadium, platinium, tungsten, molybdeum, triethylamine, palladium, sodium pyrophosphate, carboxylic acids, cyclopentadiene, formic acid, rust, ketones, sodium carbonate, alcohols, sodium borate, aniline, mercurous chloride, rust, nitric acid, sodium pyrophosphate, hexavalent chromium compounds, tetrahydrofuran, sodium fluoride organic matter, potassium permanganate, urea, chlorosulfonic acid, manganese dioxide, hydrogen selenide, charcoal, coal, sodium borate, alkalies, cyclopentadiene, glycerine, cyanides (potassium, cyanide, sodium cyanide), nitrogen compounds.. Caused to decompose catalytically by metals (in order of decreasing effectiveness): Osmium, Palladium, Platinum, Iridium, Gold, Silver, Manganese, Cobalt, Copper, Lead. Concentrated hydrogen peroxide may decompose violently or explosively in contact with iron, copper, chromium, and most other metals and their salts, and dust. (Hydrogen Peroxide)

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Eye contact.

Toxicity to Animals:

Acute oral toxicity (LD50): 5714 mg/kg (Mouse) (Calculated value for the mixture). Acute dermal toxicity (LD50): 5714 mg/kg (pig) (Calculated value for the mixture).

Chronic Effects on Humans:

CARCINOGENIC EFFECTS: Classified A3 (Proven for animal.) by ACGIH [Hydrogen Peroxide]. Classified 3 (Not classifiable for human.) by IARC [Hydrogen Peroxide]. MUTAGENIC EFFECTS: Mutagenic for mammalian somatic cells. [Hydrogen Peroxide]. Mutagenic for bacteria and/or yeast. [Hydrogen Peroxide]. Contains material which may cause damage to the following organs: blood, upper respiratory tract, skin, eyes, central nervous system (CNS).

Other Toxic Effects on Humans:

Very hazardous in case of skin contact (irritant). Hazardous in case of skin contact (corrosive, permeator), of eye contact (corrosive), of ingestion, of inhalation (lung corrosive).

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans:

May cause cancer and may affect genetic material based on animal data. May be tumorigenic. (Hydrogen Peroxide)

Special Remarks on other Toxic Effects on Humans:

Acute Potential Health Effects: Skin: Causes severe skin irritation and possible burns. Absorption into skin may affect behavior/central nervous system (tremor, ataxia, convulsions), respiration (dyspnea, pulmonary emboli), brain. Eyes: Causes severe eye irritation, superficial clouding, corneal edema, and may cause burns. Inhalation: Causes respiratory tract irritation with coughing, lacrimation. May cause chemical burns to the respiratory tract. May affect behavior/Central nervous system (insomnia, headache, ataxia, nervous tremors with numb extremities) and may cause ulceration of nasal tissue, and, chemical

pneumonia, unconciousness, and possible death. At high concentrations, respiratory effects may include acute lung damage, and delayed pulmonary edema. May affect blood. Ingestion: Causes gastrointestional tract irritation with nausea, vomiting, hypermotility, and diarrhea. Causes

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are less toxic than the product itself.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification:

Class 8: Corrosive material CLASS 5.1: Oxidizing material.

lentification: : Hydrogen peroxide, aqueous solution UNNA: 2014 PG: II

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:

New York acutely hazardous substances: Hydrogen Peroxide Rhode Island RTK hazardous substances: Hydrogen Peroxide Pennsylvania RTK: Hydrogen Peroxide Florida: Hydrogen Peroxide Minnesota: Hydrogen Peroxide Massachusetts RTK: Hydrogen Peroxide New Jersey: Hydrogen Peroxide California Director's List of Hazardous Substances: Hydrogen Peroxide TSCA 8(b) inventory: Hydrogen Peroxide SARA 302/304/311/312 extremely hazardous substances: Hydrogen Peroxide CERCLA: Hazardous substances: Hydrogen Peroxide: 1 lbs. (0.4536 kg);

Other Regulations: OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

Other Classifications:

WHMIS (Canada):

CLASS C: Oxidizing material. CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

DSCL (EEC):

R8- Contact with combustible material may cause fire. R34- Causes burns. S3- Keep in a cool place. S26- In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. S28- After contact with skin, wash immediately with plenty of water. S36/37/39- Wear suitable protective clothing, gloves and eye/face protection. S45- In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

HMIS (U.S.A.):

Health Hazard: 3

Fire Hazard: 0

Reactivity: 1

Personal Protection:

National Fire Protection Association (U.S.A.):

Health: 2

Flammability: 0

Reactivity: 1

Specific hazard:

Protective Equipment:

Gloves. Full suit. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Face shield.

Section 16: Other Information

References: Not available.

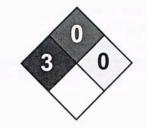
Other Special Considerations: Not available.

Created: 10/09/2005 05:46 PM

Last Updated: 11/06/2008 12:00 PM

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Material Safety Data Sheet Aluminum Chloride Solution MSDS

Section 1: Chemical Product and Company Identification

Product Name: Aluminum Chloride Solution

Catalog Codes: SLA2521

CAS#: Mixture.

RTECS: Not applicable.

TSCA: TSCA 8(b) inventory: Water

CI#: Not applicable.

Synonym: Aluminum Chloride Solution for Sulfide, APHA

Chemical Name: Not applicable.

Chemical Formula: Not applicable.

Contact Information:

Sciencelab.com, Inc. 14025 Smith Rd. Houston, Texas 77396

US Sales: 1-800-901-7247

International Sales: 1-281-441-4400

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:

1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

 Name
 CAS #
 % by Weight

 Aluminum chloride hexahydrate
 7784-13-6
 69.4

 Water
 7732-18-5
 30.6

Toxicological Data on Ingredients: Aluminum chloride hexahydrate: ORAL (LD50): Acute: 3311 mg/kg [Rat]. 1990 mg/kg [Mouse].

Section 3: Hazards Identification

Potential Acute Health Effects:

Very hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, . Hazardous in case of skin contact (corrosive), of eye contact (corrosive). Liquid or spray mist may produce tissue damage particularly on mucous membranes of eyes, mouth and respiratory tract. Skin contact may produce burns. Inhalation of the spray mist may produce severe irritation of respiratory tract, characterized by coughing, choking, or shortness of breath. Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.

Potential Chronic Health Effects:

Slightly hazardous in case of skin contact (sensitizer). CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: ot available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be understand to blood, kidneys, mucous membranes, brain, skin, eyes, bones, central nervous system (CNS). Repeated or prolonged exposure to the substance can produce target organs damage. Repeated or prolonged contact with spray mist may produce

chronic eye irritation and severe skin irritation. Repeated or prolonged exposure to spray mist may produce respiratory tract irritation leading to frequent attacks of bronchial infection.

Section 4: First Aid Measures

Eye Contact:

Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. Get medical attention immediately.

Skin Contact:

In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Cover the irritated skin with an emollient. Cold water may be used. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

Serious Skin Contact:

Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek medical attention.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.

Serious Inhalation:

Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.

Ingestion:

Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention if symptoms appear.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Non-flammable.

Auto-Ignition Temperature: Not applicable.

Flash Points: Not applicable.

Flammable Limits: Not applicable.

Products of Combustion: Not available.

Fire Hazards in Presence of Various Substances: Not applicable.

Explosion Hazards in Presence of Various Substances: Non-explosive in presence of open flames and sparks, of shocks.

Fire Fighting Media and Instructions: Not applicable.

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill:

Dilute with water and mop up, or absorb with an inert dry material and place in an appropriate waste disposal container.

Large Spill:

Corrosive liquid. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not get water inside container. Do not touch spilled material. Use water spray curtain to divert vapor drift. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal.

Section 7: Handling and Storage

recautions:

Do not ingest. Do not breathe gas/fumes/ vapor/spray. Never add water to this product. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, alkalis.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:

Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value.

Personal Protection:

Face shield. Full suit. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves. Boots.

Personal Protection in Case of a Large Spill:

Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits: Not available.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Jdor: Not available.

Taste: Not available.

Molecular Weight: Not applicable.

Color: Clear Colorless.

pH (1% soln/water): Neutral.

Boiling Point: The lowest known value is 100°C (212°F) (Water).

Melting Point: Not available.

Critical Temperature: Not available.

Specific Gravity: Weighted average: 1.68 (Water = 1)

Vapor Pressure: The highest known value is 2.3 kPa (@ 20°C) (Water).

Vapor Density: The highest known value is 0.62 (Air = 1) (Water).

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available. lonicity (in Water): Not available.

Dispersion Properties: See solubility in water, diethyl ether.

Solubility: Easily soluble in cold water, hot water, diethyl ether.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Incompatible materials

Incompatibility with various substances: Reactive with oxidizing agents, alkalis.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity: Deliquescent. Decomposes on exposure to moist air or water. (Aluminum chloride

hexahydrate)

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Eye contact. Inhalation. Ingestion.

Toxicity to Animals: Acute oral toxicity (LD50): 2867 mg/kg (Mouse) (Calculated value for the mixture).

Chronic Effects on Humans:

May cause damage to the following organs: blood, kidneys, mucous membranes, brain, skin, eyes, bones, central nervous system (CNS).

Other Toxic Effects on Humans:

Very hazardous in case of skin contact (irritant), of ingestion, . Hazardous in case of skin contact (corrosive), of eye contact (corrosive), of inhalation (lung corrosive).

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans:

May cause birth defects (teratogenic) based on animal test data. No human test data found. May affect genetic material (mutagenic) (Aluminum chloride hexahydrate)

Special Remarks on other Toxic Effects on Humans:

Acute Potential Health Effects: Skin: Corrosive. Causes severe skin irritation and burns. Eyes: Corrosive. Causes severe eye irritation and burns. May cause conjunctivitis and corneal damage. Inhalation: Corrosive. Material is irritating to mucous membranes and upper respiratory tract. It can cause chemical burns to the respiratory tract. It may cause systemic effects. Ingestion: Corrosive. Causes gastrointestinal tract irritation and burns. May cause severe and permanent damage to the digestive tract. Symptoms may include nausea, vomiting and abdominal pain and spasms. May cause systemic effects since aluminum may be readily absorbed from the gastrointestinal tract. It may affect the urinary system (kidneys- hematuria), brain (degenerative changes). Chronic Potential Health Effects: Skin: Repeated or prologed skin contact may cause dermatitis, an allergic reaction. Ingestion: Prolonged or repeated ingestion, resulting in aluminum accumulation, may affect behavior/ brain/nervous system (degenerative changes, hallucinations, decreased cognitive function, memory loss, seizures, ataxia, convulsions, dimished alertness, personality changes, intellectual changes, altered mood, speech and language impairment, tremors, myoclonic jerks, weakness, fatigue), blood (anemia, changes in red blood cell and white blood cell count), metabolism (hypocalcemia, hypophosphatemia due to alterations in blood serum electrolytes), liver, urinary system (kidneys - acute renal failure, acute tubular necrosis), and musculoskeletal system/bones (aluminum-induced osteomalacia or also known as aluminum-related bone disease due to decreased bone formation/inhibition of osteoblast function). Aluminum accumulation may also affect the heart and cause cardiomegaly.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The product itself and its products of degradation are not toxic.

pecial Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: Class 8: Corrosive material

Identification: : Aluminum Chloride Solution UNNA: 2581 PG: III

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations: TSCA 8(b) inventory: Water

Other Regulations: OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

Other Classifications:

WHMIS (Canada): CLASS E: Corrosive liquid.

JSCL (EEC):

R34- Causes burns. S24/25- Avoid contact with skin and eyes. S26- In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. S28- After contact with skin, wash immediately with plenty of [***] S37/39- Wear suitable gloves and eye/face protection. S38- In case of insufficient ventilation, wear suitable respiratory equipment.

HMIS (U.S.A.):

Health Hazard: 3

Fire Hazard: 0

Reactivity: 0

Personal Protection:

National Fire Protection Association (U.S.A.):

Health: 3

Flammability: 0

Reactivity: 0

Specific hazard:

Protective Equipment:

Gloves. Full suit. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Face shield.

Section 16: Other Information

References: Not available.

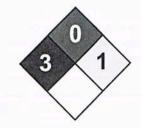
Other Special Considerations: Not available.

Created: 10/10/2005 12:47 AM

Last Updated: 11/06/2008 12:00 PM

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Material Safety Data Sheet Hydrochloric acid, 20 deg. Be MSDS

Section 1: Chemical Product and Company Identification

Product Name: Hydrochloric acid, 20 deg. Be

Catalog Codes: SLH2578

CAS#: Mixture.

RTECS: MW4025000

TSCA: TSCA 8(b) inventory: Hydrochloric acid

CI#: Not applicable.

Synonym: Hydrochloric Acid; Muriatic Acid

Chemical Name: Not applicable.

Chemical Formula: Not applicable.

Contact Information:

Sciencelab.com, Inc. 14025 Smith Rd. Houston, Texas 77396

US Sales: 1-800-901-7247

Order Online: ScienceLab.com

International Sales: 1-281-441-4400

CHEMTREC (24HR Emergency Telephone), call:

1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

 Name
 CAS #
 % by Weight

 Hydrogen chloride
 7647-01-0
 30-32

 Water
 7732-18-5
 68-70

Toxicological Data on Ingredients: Hydrogen chloride: GAS (LC50): Acute: 4701 ppm 0.5 hours [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects:

Very hazardous in case of skin contact (corrosive, irritant, permeator), of eye contact (irritant, corrosive), of ingestion, . Slightly hazardous in case of inhalation (lung sensitizer). Non-corrosive for lungs. Liquid or spray mist may produce tissue damage particularly on mucous membranes of eyes, mouth and respiratory tract. Skin contact may produce burns. Inhalation of the spray mist may produce severe irritation of respiratory tract, characterized by coughing, choking, or shortness of breath. Severe over-exposure can result in death. Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.

Potential Chronic Health Effects:

Slightly hazardous in case of skin contact (sensitizer). CARCINOGENIC EFFECTS: Classified 3 (Not classifiable for uman.) by IARC [Hydrochloric acid]. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. JEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to kidneys, liver, mucous membranes, upper respiratory tract, skin, eyes, Circulatory System, teeth. Repeated or prolonged exposure to the substance can produce target

organs damage. Repeated or prolonged contact with spray mist may produce chronic eye irritation and severe skin irritation. Repeated or prolonged exposure to spray mist may produce respiratory tract irritation leading to frequent attacks of bronchial infection. Repeated exposure to a highly toxic material may produce general deterioration of health by an accumulation in one or many human organs.

Section 4: First Aid Measures

Eye Contact:

Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. Get medical attention immediately.

Skin Contact

In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Cover the irritated skin with an emollient. Cold water may be used. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

Serious Skin Contact:

Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.

Serious Inhalation:

Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. WARNING: It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.

Ingestion:

If swallowed, do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Non-flammable.

Auto-Ignition Temperature: Not applicable.

Flash Points: Not applicable.

Flammable Limits: Not applicable.

Products of Combustion: Not available.

Fire Hazards in Presence of Various Substances: of metals

Explosion Hazards in Presence of Various Substances: Non-explosive in presence of open flames and sparks, of shocks.

Fire Fighting Media and Instructions: Not applicable.

Special Remarks on Fire Hazards:

Non combustible. Calcium carbide reacts with hydrogen chloride gas with incandescence. Uranium phosphide reacts with hydrochloric acid to release spontaneously flammable phosphine. Rubidium acetylene carbides burns with slightly warm hydrochloric acid. Lithium silicide in contact with hydrogen chloride becomes incandescent. When dilute hydrochloric acid is used, gas spontaneously flammable in air is evolved. Magnesium boride treated with concentrated hydrochloric acid produces spontaneously flammable gas. Cesium acetylene carbide burns hydrogen chloride gas. Cesium carbide ignites in contact with hydrochloric acid unless acid is dilute. Reacts with most metals to produce flammable Hydrodgen gas.

Special Remarks on Explosion Hazards:

Hydrogen chloride in contact with the following can cause an explosion, ignition on contact, or other violent/vigorous reaction: Acetic anhydride AgCIO + CCI4 Alcohols + hydrogen cyanide, Aluminum Aluminum-titanium alloys (with HCI vapor), 2-Amino ethanol, Ammonium hydroxide, Calcium carbide Ca3P2 Chlorine + dinitroanilines (evolves gas), Chlorosulfonic acid Cesium arbide Cesium acetylene carbide, 1,1-Difluoroethylene Ethylene diamine Ethylene imine, Fluorine, HCIO4 Hexalithium disilicide H2SO4 Metal acetylides or carbides, Magnesium boride, Mercuric sulfate, Oleum, Potassium permanganate, beta-Propiolactone Propylene oxide Rubidium carbide, Rubidium, acetylene carbide Sodium (with aqueous HCI), Sodium hydroxide Sodium tetraselenium, Sulfonic acid, Tetraselenium tetranitride, U3P4, Vinyl acetate. Silver perchlorate with carbon tetrachloride in the presence of hydrochloric acid produces trichloromethyl perchlorate which detonates at 40 deg. C.

Section 6: Accidental Release Measures

Small Spill:

Dilute with water and mop up, or absorb with an inert dry material and place in an appropriate waste disposal container. If necessary: Neutralize the residue with a dilute solution of sodium carbonate.

Large Spill:

Corrosive liquid. Poisonous liquid. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not get water inside container. Do not touch spilled material. Use water spray curtain to divert vapor drift. Use water spray to reduce vapors. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal. Neutralize the residue with a dilute solution of sodium carbonate. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:

Keep locked up.. Keep container dry. Do not ingest. Do not breathe gas/fumes/ vapor/spray. Never add water to this product. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, organic naterials, metals, alkalis, moisture. May corrode metallic surfaces. Store in a metallic or coated fiberboard drum using a strong polyethylene inner package.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:

Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection:

Face shield. Full suit. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves. Boots.

Personal Protection in Case of a Large Spill:

Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:

CEIL: 5 (ppm) from OSHA (PEL) [United States] CEIL: 7 (mg/m3) from OSHA (PEL) [United States] CEIL: 5 from NIOSH CEIL: 7 (mg/m3) from NIOSH TWA: 1 STEL: 5 (ppm) [United Kingdom (UK)] TWA: 2 STEL: 8 (mg/m3) [United Kingdom (UK)] Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

hysical state and appearance: Liquid.

Odor: Pungent. Irritating (Strong.)

Taste: Not available.

Molecular Weight: Not applicable.

Color: Colorless to light yellow.

pH (1% soln/water): Acidic.

Boiling Point: 80°C (176°F) - 85 C(185 F) **Melting Point:** -55°C (-67°F) to -46.2 C

Critical Temperature: Not available.

Specific Gravity: 1.149 - 1.159(Water = 1)

Vapor Pressure: 7.7 kPa (@ 120°C)

Vapor Density: 1.267 (Air = 1)

Volatility: Not available.

Odor Threshold: 0.25 to 10 ppm Water/Oil Dist. Coeff.: Not available. Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water, diethyl ether. **Solubility:** Soluble in cold water, hot water, diethyl ether.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Incompatible materials

Incompatibility with various substances:

Highly reactive with metals. Reactive with oxidizing agents, organic materials, alkalis.

Corrosivity:

Extremely corrosive in presence of aluminum, of copper, of stainless steel(304), of stainless steel(316). Non-corrosive in presence of glass.

Special Remarks on Reactivity:

Reacts with water especially when water is added to the product. Absorption of gaseous hydrogen chloride on mercuric sulfate becomes violent @ 125 deg. C. Sodium reacts very violently with gaseous hydrogen chloride. Calcium phosphide and hydrochloric acid undergo very energetic reaction. It reacts with oxidizers releasing chlorine gas. Incompatible with, alkali metals, carbides, borides, metal oxides, vinyl acetate, acetylides, sulphides, phosphides, cyanides, carbonates. Reacts with most metals to produce flammable Hydrogen gas. Reacts violently (moderate reaction with heat of evolution) with water especially when water is added to the product. Isolate hydrogen chloride from heat, direct, alkalies (reacts vigorously), organic materials, and oxidizers (especially nitric acid and chlorates), amines, metals, copper and alloys (e.g. brass), hydroxides, zinc (galvanized materials), lithium silicide (incandescence), sulfuric acid(increase in temperature and pressure) Hydrogen chloride gas is emitted when this product is in contact with sulfuric acid. Adsorption of Hydrochloric Acid onto silicon dioxide results in exothmeric reaction. Hydrogen chloride causes aldehydes and epoxides to violently polymerize. Hydrogen chloride or Hydrochloric Acid in contact with the following can cause explosion or ignition on contact or other violent/vigorous reaction: Acetic anhydride, Alcohols + hydrogen cyanide, Aluminum, Aluminum phosphide, Aluminum-titanium alloys (with HCI vapor), 2-Amino ethanol, Ammonium, Ammonium hydroxide, 1,4-Benzoquinone diimine, Calcium acetylide (incandescence upon warming), Calcium carbide, Calcium phosphide, Carbon tetrachloride + silver perchlorate (produce trichlormethyl perchlorate), Cesium acetylene carbide, Cesium carbide, Cesium telluroacylates, Chlorine + dinitroanilines (evolves gas), Chloroacetaldehyde oxime, Chlorosulfonic acid, Cyanogen chloride (when catalyzed by HCI), 1,1-Difluoroethylene, Dinitroanilines, Ethylene, Ethylene diamine, Ethyl 2-formylpropionate oxime (when generated by using HCl as a catalyst),

Special Remarks on Corrosivity:

Highly corrosive. Incompatible with copper and copper alloys. It attacks nearly all metals (mercury, gold, platinium, tantalum, silver, and certain alloys are exceptions). It is one of the most corrosive of the nonoxidizing acids in contact with copper alloys. No corrosivity data on zinc, steel. Severe Corrosive effect on brass and bronze

Jolymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Dermal contact. Eye contact. Inhalation.

Toxicity to Animals:

Acute oral toxicity (LD50): 900 mg/kg [Rabbit]. Acute toxicity of the vapor (LC50): 1108 ppm, 1 hours [Mouse]. Acute toxicity of the vapor (LC50): 3124 ppm, 1 hours [Rat].

Chronic Effects on Humans:

CARCINOGENIC EFFECTS: Classified 3 (Not classifiable for human.) by IARC [Hydrochloric acid]. May cause damage to the following organs: kidneys, liver, mucous membranes, upper respiratory tract, skin, eyes, Circulatory System, teeth.

Other Toxic Effects on Humans:

Very hazardous in case of skin contact (corrosive, irritant, permeator), of ingestion, . Hazardous in case of eye contact (corrosive), of inhalation (lung corrosive).

Special Remarks on Toxicity to Animals:

Lowest Published Lethal Doses (LDL/LCL) LDL [Man] -Route: Oral; 2857 ug/kg LCL [Human] - Route: Inhalation; Dose: 1300 ppm/30M LCL [Rabbit] - Route: Inhalation; Dose: 4413 ppm/30M

Special Remarks on Chronic Effects on Humans:

May cause adverse reproductive effects (fetoxicity). May affect genetic material.

Special Remarks on other Toxic Effects on Humans:

Acute Potential Health Effects: Skin: Corrosive. Causes severe skin irritation and burns. Eyes: Corrosive. Causes severe ve irritation/conjuntivitis, burns, corneal necrosis. Inhalation: May be fatal if inhaled. Material is extremely destructive to assue of the mucous membranes and upper respiratory tract. Inhalation of hydrochloric acid fumes produces nose, throat, and larryngeal burning, and irritation, pain and inflammation, coughing, sneezing, choking sensation, hoarseness, laryngeal spasms, upper respiratory tract edema, chest pains, as well has headache, and palpitations. Inhalation of high concentrations can result in corrosive burns, necrosis of bronchial epithelium, constriction of the larynx and bronchi, nasospetal perforation, glottal closure, occur, particularly if exposure is prolonged. May affect the liver, Ingestion: May be fatal if swallowed. Causes irritation and burning, ulceration, or perforation of the gastrointestinal tract and resultant peritonitis, gastric hemorrhage and infection. Can also cause nausea, vomitting (with "coffee ground" emesis), diarrhea, thirst, difficulty swallowing, salivation. chills, fever, uneasiness, shock, strictures and stenosis (esophogeal, gastric, pyloric). May affect behavior (excitement), the cardiovascular system (weak rapid pulse, tachycardia), respiration (shallow respiration), and urinary system (kidneysrenal failure, nephritis). Acute exposure via inhalation or ingestion can also cause erosion of tooth enamel. Chronic Potential Health Effects: Prolonged or repeated inhalation and/or ingestion may affect liver, bleeding of nose and gums, nasal and oral mucosal ulceration, conjunctivitis, respiratory tract (changes in pulmonary function, chronic bronchitis, overt respiratory tract abnormalities), teeth (yellowing of teethand erosion of tooth enamel), kidneys, and behavior (muscle contraction or spasticity). Prolonged or repeated skin contact may cause dermatitis. Prolonged or repeated eye contact with vapor/mist can cause conjunctivitis dyspnea, bronchitis. Chemical pneumonitis and pulmonary edema can also

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are less toxic than the product itself.

special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: Class 8: Corrosive material

Identification: : Hydrochloric acid, solution UNNA: 1789 PG: II

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:

Connecticut hazardous material survey.: Hydrochloric acid Illinois toxic substances disclosure to employee act: Hydrochloric acid Illinois chemical safety act: Hydrochloric acid New York release reporting list: Hydrochloric acid Rhode Island RTK hazardous substances: Hydrochloric acid Pennsylvania RTK: Hydrochloric acid Minnesota: Hydrochloric acid Massachusetts RTK: Hydrochloric acid Massachusetts spill list: Hydrochloric acid New Jersey: Hydrochloric acid New Jersey spill list: Hydrochloric acid Louisiana RTK reporting list: Hydrochloric acid Louisiana spill reporting: Hydrochloric acid California Director's List of Hazardous Substances: Hydrochloric acid TSCA 8(b) inventory: Hydrochloric acid TSCA 4(a) proposed test rules: Hydrochloric acid SARA 302/304/311/312 extremely hazardous substances: Hydrochloric acid SARA 313 toxic chemical notification and release reporting: Hydrochloric acid CERCLA: Hazardous substances:: Hydrochloric acid: 5000 lbs. (2268 kg)

Other Regulations:

OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada):

CLASS D-2A: Material causing other toxic effects (VERY TOXIC). CLASS E: Corrosive liquid.

DSCL (EEC):

R25- Toxic if swallowed. R26- Very toxic by inhalation. R34- Causes burns. S1/2- Keep locked up and out of the reach of children. S26- In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. S28- After contact with skin, wash immediately with plenty of [***] S36/37/39- Wear suitable protective clothing, gloves and eye/face protection. S45- In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

HMIS (U.S.A.):

Health Hazard: 3

Fire Hazard: 0

Reactivity: 1

Personal Protection:

National Fire Protection Association (U.S.A.):

Health: 3

Flammability: 0

Reactivity: 1

Specific hazard:

Protective Equipment:

Gloves. Full suit. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Face shield.

Section 16: Other Information

deferences:

Hawley, G.G.. The Condensed Chemical Dictionary, 11e ed., New York N.Y., Van Nostrand Reinold, 1987. -SAX, N.I. Dangerous Properties of Indutrial Materials. Toronto, Van Nostrand Reinold, 6e ed. 1984. -The Sigma-Aldrich Library of Chemical Safety Data, Edition II. -Guide de la loi et du règlement sur le transport des marchandises dangeureuses au canada. Centre de conformité internatinal Ltée. 1986.

Other Special Considerations: Not available.

Created: 10/09/2005 05:45 PM

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Material Safety Data Sheet Nitric Acid, 20% w/w MSDS

Section 1: Chemical Product and Company Identification

Product Name: Nitric Acid, 20% w/w

Catalog Codes: SLN1942

CAS#: Mixture.

RTECS: Not applicable.

TSCA: TSCA 8(b) inventory: Nitric acid, 70%; Water

CI#: Not applicable.

Synonym:

Chemical Name: Not applicable.

Chemical Formula: Not applicable.

Contact Information:

Sciencelab.com, Inc. 14025 Smith Rd.

Houston, Texas 77396

US Sales: 1-800-901-7247

International Sales: 1-281-441-4400

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:

1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

 Name
 CAS #
 % by Weight

 Water
 7732-18-5
 86

Nitric acid, fuming 7697-37-2 14

Toxicological Data on Ingredients: Nitric acid, fuming: VAPOR (LC50): Acute: 67 ppm 4 hour(s) [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects:

Very hazardous in case of skin contact (corrosive, irritant, permeator), of eye contact (irritant), of ingestion, of inhalation. Liquid or spray mist may produce tissue damage particularly on mucous membranes of eyes, mouth and respiratory tract. Skin contact may produce burns. Inhalation of the spray mist may produce severe irritation of respiratory tract, characterized by coughing, choking, or shortness of breath. Severe over-exposure can result in death. Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.

Potential Chronic Health Effects:

Very hazardous in case of skin contact (corrosive, irritant, permeator), of eye contact (irritant), of ingestion, of inhalation. Non-sensitizer for skin. CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance is toxic to lungs, mucous membranes Repeated or prolonged exposure to the substance can produce target organs damage. Repeated or prolonged contact with spray mist may produce chronic eye irritation and severe skin irritation. Repeated or prolonged exposure to spray mist

may produce respiratory tract irritation leading to frequent attacks of bronchial infection. Repeated exposure to an highly toxic material may produce general deterioration of health by an accumulation in one or many human organs. Repeated or prolonged inhalation of vapors may lead to chronic respiratory irritation.

Section 4: First Aid Measures

Eye Contact:

Check for and remove any contact lenses. Immediately flush eyes with running water for at least 15 minutes, keeping eyelids open. Cold water may be used. Do not use an eye ointment. Seek medical attention.

Skin Contact:

If the chemical got onto the clothed portion of the body, remove the contaminated clothes as quickly as possible, protecting your own hands and body. Place the victim under a deluge shower. If the chemical got on the victim's exposed skin, such as the hands: Gently and thoroughly wash the contaminated skin with running water and non-abrasive soap. Be particularly careful to clean folds, crevices, creases and groin. Cold water may be used. If irritation persists, seek medical attention. Wash contaminated clothing before reusing.

Serious Skin Contact:

Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

Inhalation: Allow the victim to rest in a well ventilated area. Seek immediate medical attention.

Serious Inhalation:

Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. WARNING: It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.

Ingestion:

no not induce vomiting. Examine the lips and mouth to ascertain whether the tissues are damaged, a possible indication that me toxic material was ingested; the absence of such signs, however, is not conclusive. Loosen tight clothing such as a collar, tie, belt or waistband. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek immediate medical attention.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Non-flammable.

Auto-Ignition Temperature: Not applicable.

Flash Points: Not applicable.

Flammable Limits: Not applicable.

Products of Combustion: Not available.

Fire Hazards in Presence of Various Substances: Not applicable.

Explosion Hazards in Presence of Various Substances:

Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available. Slightly explosive to explosive in presence of reducing materials, of combustible materials, of organic materials.

Fire Fighting Media and Instructions: Not applicable.

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill:

Dilute with water and mop up, or absorb with an inert dry material and place in an appropriate waste disposal container. If necessary: Neutralize the residue with a dilute solution of sodium carbonate.

Large Spill:

Corrosive liquid. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not get water inside container. Do not touch spilled material. Use water spray curtain to divert vapor drift. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal. Neutralize the residue with a dilute solution of sodium carbonate. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:

Keep locked up Keep container dry. Do not ingest. Do not breathe gas/fumes/ vapour/spray. Never add water to this product In case of insufficient ventilation, wear suitable respiratory equipment If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes Keep away from incompatibles such as reducing agents, combustible materials, metals, alkalis. May corrode metallic surfaces. Store in a metallic or coated fiberboard drum using a strong polyethylene inner package.

Storage:

May corrode metallic surfaces. Store in a metallic or coated fiberboard drum using a strong polyethylene inner package. Corrosive materials should be stored in a separate safety storage cabinet or room.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:

Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection:

Face shield. Full suit. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves. Boots.

Personal Protection in Case of a Large Spill:

Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:

Nitric acid, fuming TWA: 2 CEIL: 4 (ppm) TWA: 5 CEIL: 10 (mg/m3) Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor: Disagreeable and choking. (Strong.)

Taste: Not available.

Molecular Weight: Not applicable.

Color: Clear Colorless.

pH (1% soln/water): Acidic.

Boiling Point: The lowest known value is 82.6°C (180.7°F) (Nitric acid, fuming). Weighted average: 97.56°C (207.6°F)

Melting Point: May start to solidify at -41.6°C (-42.9°F) based on data for: Nitric acid, fuming.

Critical Temperature: Not available.

Specific Gravity: Weighted average: 1.05 (Water = 1)

apor Pressure:

The highest known value is 45 mm of Hg (@ 20°C) (Nitric acid, fuming). Weighted average: 21.38 mm of Hg (@ 20°C)

Vapor Density: The highest known value is 0.62 (Air = 1) (Water).

Volatility: Not available.

Odor Threshold: The highest known value is 0.29 ppm (Nitric acid, fuming)

Water/Oil Dist. Coeff.: Not available. lonicity (in Water): Not available.

Dispersion Properties: See solubility in water.

Solubility: Easily soluble in cold water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances:

Extremely reactive or incompatible with alkalis. Highly reactive with metals. Reactive with reducing agents, combustible materials. Slightly reactive to reactive with organic materials, acids.

orrosivity:

Highly corrosive in presence of steel, of aluminum, of zinc, of copper. Corrosive in presence of stainless steel (304). Slightly corrosive to corrosive in presence of stainless steel (316). Non-corrosive in presence of glass.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: No.

Section 11: Toxicological Information

Routes of Entry: Dermal contact. Eye contact. Inhalation. Ingestion.

Toxicity to Animals:

WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE. Acute toxicity of the vapor (LC50): 479 ppm 4 hour(s) (Rat) (Calculated value for the mixture).

Chronic Effects on Humans: The substance is toxic to lungs, mucous membranes.

Other Toxic Effects on Humans: Very hazardous in case of skin contact (corrosive, irritant, permeator), of ingestion, of inhalation.

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Not available.

Special Remarks on other Toxic Effects on Humans: Not available.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are less toxic than the product itself.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification: CLASS 8: Corrosive liquid.

Identification: : Nitric acid, solution (Nitric acid, fuming) : NA2031 PG: III

Special Provisions for Transport: Marine Pollutant

Section 15: Other Regulatory Information

Federal and State Regulations:

Pennsylvania RTK: Nitric acid, 70% Massachusetts RTK: Nitric acid, 70% TSCA 8(b) inventory: Nitric acid, 70%; Water SARA 302/304/311/312 extremely hazardous substances: Nitric acid, 70% SARA 313 toxic chemical notification and release reporting: Nitric acid, 70% CERCLA: Hazardous substances.: Nitric acid, 70%;

Other Regulations: OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

Other Classifications:

WHMIS (Canada):

CLASS D-1A: Material causing immediate and serious toxic effects (VERY TOXIC). CLASS D-2A: Material causing other toxic effects (VERY TOXIC). CLASS E: Corrosive liquid.

DSCL (EEC):

R26- Very toxic by inhalation. R35- Causes severe burns.

HMIS (U.S.A.):

Health Hazard: 3

Fire Hazard: 0

Reactivity: 0

Personal Protection:

National Fire Protection Association (U.S.A.):

Health: 3

Flammability: 0

Reactivity: 0

Specific hazard:

Protective Equipment:

Gloves. Full suit. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Face shield.

Section 16: Other Information

References: Not available.

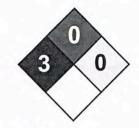
Other Special Considerations: Not available.

Created: 10/10/2005 11:00 AM

Last Updated: 11/06/2008 12:00 PM

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Material Safety Data Sheet Sodium Hydroxide - Thiosulfate, 50% MSDS

Section 1: Chemical Product and Company Identification

Product Name: Sodium Hydroxide - Thiosulfate, 50%

Catalog Codes: SLS2452

CAS#: Mixture.

RTECS: Not applicable.

TSCA: TSCA 8(b) inventory: Sodium hydroxide: Sodium

thiosulfate anhydrous: Water

CI#: Not available.

Synonym:

Chemical Name: Not applicable.

Chemical Formula: Not applicable.

Contact Information:

Sciencelab.com, Inc. 14025 Smith Rd. Houston, Texas 77396

US Sales: 1-800-901-7247

International Sales: 1-281-441-4400
Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:

1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS#	% by Weight
Sodium hydroxide	1310-73-2	50
Sodium thiosulfate anhydrous	7772-98-7	2.5
Water	7732-18-5	47.5

Toxicological Data on Ingredients: Sodium hydroxide LD50: Not available. LC50: Not available. Sodium thiosulfate anhydrous LD50: Not available. LC50: Not available.

Section 3: Hazards Identification

Potential Acute Health Effects:

Extremely hazardous in case of skin contact (corrosive, irritant), of eye contact (irritant), of ingestion. Very hazardous in case of inhalation. Liquid or spray mist may produce tissue damage particularly on mucous membranes of eyes, mouth and respiratory tract. Skin contact may produce burns. Inhalation of the spray mist may produce severe irritation of respiratory tract, characterized by coughing, choking, or shortness of breath. Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.

Potential Chronic Health Effects:

Non-corrosive for skin. Non-irritant for skin. Non-sensitizer for skin. Non-permeator by skin. Non-irritating to the eyes. Non-hazardous in case of ingestion. Non-hazardous in case of inhalation. CARCINOGENIC EFFECTS: Not available.

MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance is toxic to lungs, mucous membranes. Repeated or prolonged exposure to the substance can produce target organs damage. Repeated or prolonged contact with spray mist may produce chronic eye irritation and severe kin irritation. Repeated or prolonged exposure to spray mist may produce respiratory tract irritation leading to frequent attacks of bronchial infection.

Section 4: First Aid Measures

Eye Contact:

Check for and remove any contact lenses. Immediately flush eyes with running water for at least 15 minutes, keeping eyelids open. Cold water may be used. Do not use an eye ointment. Seek medical attention.

Skin Contact:

If the chemical got onto the clothed portion of the body, remove the contaminated clothes as quickly as possible, protecting your own hands and body. Place the victim under a deluge shower. If the chemical got on the victim's exposed skin, such as the hands: Gently and thoroughly wash the contaminated skin with running water and non-abrasive soap. Be particularly careful to clean folds, crevices, creases and groin. Cold water may be used. If irritation persists, seek medical attention. Wash contaminated clothing before reusing.

Serious Skin Contact:

Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek medical attention.

Inhalation: Allow the victim to rest in a well ventilated area. Seek immediate medical attention.

Serious Inhalation:

Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. WARNING: It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.

agestion:

Do not induce vomiting. Loosen tight clothing such as a collar, tie, belt or waistband. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek immediate medical attention.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Non-flammable.

Auto-Ignition Temperature: Not applicable.

Flash Points: Not applicable.

Flammable Limits: Not applicable.

Products of Combustion: Not available.

Fire Hazards in Presence of Various Substances: Not applicable.

Explosion Hazards in Presence of Various Substances:

Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions: Not applicable.

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill:

Dilute with water and mop up, or absorb with an inert dry material and place in an appropriate waste disposal container. If necessary: Neutralize the residue with a dilute solution of acetic acid.

Large Spill:

Corrosive liquid. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not get water inside container. Do not touch spilled material. Use water spray curtain to divert vapor drift. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal. Neutralize the residue with a dilute solution of acetic acid. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:

Keep container dry. Do not breathe gas/fumes/ vapour/spray. Never add water to this product In case of insufficient ventilation, wear suitable respiratory equipment If you feel unwell, seek medical attention and show the label when possible. Avoid contact with skin and eyes Keep away from incompatibles such as moisture.

Storage: Corrosive materials should be stored in a separate safety storage cabinet or room.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:

Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value.

Personal Protection:

Face shield. Full suit. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves. Boots.

Personal Protection in Case of a Large Spill:

Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:

Sodium hydroxide CEIL: 2 (mg/m3) from ACGIH [1995] Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor: Not available.

Taste: Not available.

Molecular Weight: Not applicable.

Color: Not available.

pH (1% soln/water): Basic.

Boiling Point: The lowest known value is 100°C (212°F) (Water).

Melting Point: Not available.

Critical Temperature: Not available.

Specific Gravity: Weighted average: 1.38 (Water = 1)

Vapor Pressure: The highest known value is 17.535 mm of Hg (@ 20°C) (Water).

Vapor Density: The highest known value is 0.62 (Air = 1) (Water).

Volatility: Not available.

Jdor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water.

Solubility:

Easily soluble in cold water. Soluble in hot water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances: Not available.

Corrosivity: Slightly corrosive to corrosive in presence of glass.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: No.

Section 11: Toxicological Information

Routes of Entry: Eye contact. Inhalation. Ingestion.

Toxicity to Animals:

LD50: Not available. LC50: Not available.

Chronic Effects on Humans: The substance is toxic to lungs, mucous membranes.

Other Toxic Effects on Humans:

Extremely hazardous in case of skin contact (corrosive, irritant), of ingestion. Very hazardous in case of inhalation.

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Not available.

Special Remarks on other Toxic Effects on Humans: Not available.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are more toxic.

special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification: CLASS 8: Corrosive liquid.

Identification: : Sodium hydroxide, solution (Sodium hydroxide) : UN1824 PG: II

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:

Pennsylvania RTK: Sodium hydroxide Massachusetts RTK: Sodium hydroxide TSCA 8(b) inventory: Sodium hydroxide; Sodium thiosulfate anhydrous; Water

Other Regulations: OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

Other Classifications:

WHMIS (Canada):

CLASS D-2A: Material causing other toxic effects (VERY TOXIC). CLASS E: Corrosive liquid.

DSCL (EEC): R35- Causes severe burns.

HMIS (U.S.A.):

Health Hazard: 3

Fire Hazard: 0

Reactivity: 0

Personal Protection:

National Fire Protection Association (U.S.A.):

Health: 3

Flammability: 0

Reactivity: 0

Specific hazard:

Protective Equipment:

Gloves. Full suit. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Face shield.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

Created: 10/10/2005 12:06 PM

Last Updated: 11/06/2008 12:00 PM

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SIGMA-ALDRICH

Material Safety Data Sheet

Version 3.0 Revision Date 02/12/2010 Print Date 09/21/2010

1. PRODUCT AND COMPANY IDENTIFICATION

Product name : Sodium hypochlorite solution

Product Number : 425044

Brand : Sigma-Aldrich

Company : Sigma-Aldrich

3050 Spruce Street

SAINT LOUIS MO 63103

USA

Telephone : +18003255832 Fax : +18003255052 Emergency Phone # : (314) 776-6555

2. COMPOSITION/INFORMATION ON INGREDIENTS

Formula : CINaO

CAS-No.	EC-No.	Index-No.	Concentration
Sodium hypochlo	rite		
7681-52-9	231-668-3	017-011-00-1	>= 10 - <= 15 %
Water			
7732-18-5	231-791-2		>= 85 - <= 90 %

3. HAZARDS IDENTIFICATION

Emergency Overview

OSHA Hazards

Corrosive

HMIS Classification

Health hazard: 3 Flammability: 0 Physical hazards: 0

NFPA Rating

Health hazard: 3 Fire: 0 Reactivity Hazard: 0

Potential Health Effects

Inhalation May be harmful if inhaled. Material is extremely destructive to the tissue of the

mucous membranes and upper respiratory tract.

Skin May be harmful if absorbed through skin. Causes skin burns.

Eyes Causes eye burns.

Ingestion

May be harmful if swallowed. Causes burns.

4. FIRST AID MEASURES

General advice

Consult a physician. Show this safety data sheet to the doctor in attendance. Move out of dangerous area.

If inhaled

If breathed in, move person into fresh air. If not breathing give artificial respiration Consult a physician.

In case of skin contact

Take off contaminated clothing and shoes immediately. Wash off with soap and plenty of water. Consult a physician.

In case of eve contact

Continue rinsing eyes during transport to hospital. Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

If swallowed

Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

5. FIRE-FIGHTING MEASURES

Flammable properties

Flash point

not applicable

Ignition temperature

no data available

Suitable extinguishing media

Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

Special protective equipment for fire-fighters

Wear self contained breathing apparatus for fire fighting if necessary.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions

Wear respiratory protection. Avoid breathing vapors, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas.

Environmental precautions

Do not let product enter drains.

Methods for cleaning up

Soak up with inert absorbent material and dispose of as hazardous waste. Keep in suitable, closed containers for disposal.

7. HANDLING AND STORAGE

Handling

Avoid inhalation of vapour or mist.

Normal measures for preventive fire protection.

Storage

Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage.

Do not store near acids.

Recommended storage temperature: 2 - 8 °C

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Components with workplace control parameters

Components	CAS-No.	Value	Control parameters	Update	Basis
Sodium hypochlorite	7681-52-9	STEL	2 mg/m3	2008-01-01	USA. Workplace Environmental Exposure Levels (WEEL)

Personal protective equipment

Respiratory protection

Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type ABEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Hand protection

Handle with gloves.

Eye protection

Tightly fitting safety goggles. Faceshield (8-inch minimum).

Skin and body protection

Choose body protection according to the amount and concentration of the dangerous substance at the work place.

Hygiene measures

Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance

Form liquid

Safety data

pH no data available

Melting point -30 - -20 °C (-22 - -4 °F)

Boiling point 111 °C (232 °F)

Flash point not applicable
Ignition temperature no data available
Lower explosion limit no data available
Upper explosion limit no data available

Vapour pressure 23.3 hPa (17.5 mmHg) at 20 °C (68 °F)

Density 1.206 g/mL at 25 °C (77 °F)

Water solubility completely miscible

10. STABILITY AND REACTIVITY

Storage stability

Stable under recommended storage conditions.

Materials to avoid

Strong acids, Organic materials, Powdered metals, Forms shock-sensitive mixtures with certain other materials., Amines, Reacts violently with ammonium salts, aziridine, methanol, and phenylacetonitrile, sometimes resulting in explosions. Reacts with primary aliphatic or aromatic amines to form explosively unstable n-chloroamines. Reaction with formic acid becomes explosive at 55°C.

Hazardous decomposition products

Hazardous decomposition products formed under fire conditions. - Hydrogen chloride gas, Sodium oxides

11. TOXICOLOGICAL INFORMATION

Acute toxicity

no data available

Irritation and corrosion

no data available

Sensitisation

no data available

Chronic exposure

IARC: No component of this product present at levels greater than or equal to 0.1% is identified as

probable, possible or confirmed human carcinogen by IARC.

ACGIH: No component of this product present at levels greater than or equal to 0.1% is identified as

a carcinogen or potential carcinogen by ACGIH.

NTP: No component of this product present at levels greater than or equal to 0.1% is identified as

a known or anticipated carcinogen by NTP.

OSHA: No component of this product present at levels greater than or equal to 0.1% is identified as

a carcinogen or potential carcinogen by OSHA.

Potential Health Effects

Inhalation May be harmful if inhaled. Material is extremely destructive to the tissue of the

mucous membranes and upper respiratory tract.

Skin May be harmful if absorbed through skin. Causes skin burns.

Eyes Causes eye burns.

Ingestion May be harmful if swallowed. Causes burns.

12. ECOLOGICAL INFORMATION

Elimination information (persistence and degradability)

no data available

Ecotoxicity effects

no data available

Further information on ecology

no data available

13. DISPOSAL CONSIDERATIONS

Product

Observe all federal, state, and local environmental regulations. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)

UN-Number: 1791 Class: 8 Packing group: III

Proper shipping name: Hypochlorite solutions

Reportable Quantity (RQ): 667 lbs

Marine pollutant: No

Poison Inhalation Hazard: No

IMDG

UN-Number: 1791 Class: 8 Packing group: III EMS-No: F-A, S-B

Proper shipping name: HYPOCHLORITE SOLUTION

Marine pollutant: No

IATA

UN-Number: 1791 Class: 8 Packing group: III

Proper shipping name: Hypochlorite solution

15. REGULATORY INFORMATION

OSHA Hazards

Corrosive

DSL Status

All components of this product are on the Canadian DSL list.

SARA 302 Components

SARA 302: No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components

SARA 313: This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

SARA 311/312 Hazards

Acute Health Hazard

Massachusetts Right To Know Components

CAS-No. 7681-52-9	Revision Date 2007-03-01
CAS-No. 7732-18-5 7681-52-9	Revision Date 2007-03-01
CAS-No. 7732-18-5 7681-52-9	Revision Date 2007-03-01
	7681-52-9 CAS-No. 7732-18-5 7681-52-9 CAS-No. 7732-18-5

California Prop. 65 Components

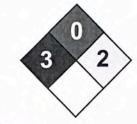
This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

6. OTHER INFORMATION

Further information

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Material Safety Data Sheet Sulfuric acid 66 Be MSDS

Section 1: Chemical Product and Company Identification

Product Name: Sulfuric acid 66 Be

Catalog Codes: SLS4414, SLS2197

CAS#: 7664-93-9

RTECS: WS5600000

TSCA: TSCA 8(b) inventory: Sulfuric acid

CI#: Not applicable.

Synonym: Oil of Vitriol; Sulfuric Acid Chemical Name: Hydrogen sulfate

Chemical Formula: H2-SO4

Contact Information:

Sciencelab.com, Inc. 14025 Smith Rd. Houston, Texas 77396

US Sales: 1-800-901-7247

International Sales: 1-281-441-4400

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:

1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name

Sulfuric acid

CAS#

7664-93-9

% by Weight

91 - 95

Toxicological Data on Ingredients: Sulfuric acid: ORAL (LD50): Acute: 2140 mg/kg [Rat.]. VAPOR (LC50): Acute: 510 mg/m 2 hours [Rat]. 320 mg/m 2 hours [Mouse].

Section 3: Hazards Identification

Potential Acute Health Effects:

Very hazardous in case of skin contact (corrosive, irritant, permeator), of eye contact (irritant, corrosive), of ingestion, of inhalation. Liquid or spray mist may produce tissue damage particularly on mucous membranes of eyes, mouth and respiratory tract. Skin contact may produce burns. Inhalation of the spray mist may produce severe irritation of respiratory tract, characterized by coughing, choking, or shortness of breath. Severe over-exposure can result in death. Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.

Potential Chronic Health Effects:

CARCINOGENIC EFFECTS: Classified 1 (Proven for human.) by IARC, + (Proven.) by OSHA. Classified A2 (Suspected for human.) by ACGIH. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to kidneys, lungs, heart, cardiovascular system, upper respiratory tract, eyes, teeth. Repeated or prolonged exposure to the substance can produce target organs damage. Repeated or prolonged

contact with spray mist may produce chronic eye irritation and severe skin irritation. Repeated or prolonged exposure to spray mist may produce respiratory tract irritation leading to frequent attacks of bronchial infection. Repeated exposure to a highly toxic material may produce general deterioration of health by an accumulation in one or many human organs.

Section 4: First Aid Measures

Eye Contact:

Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. Get medical attention immediately.

Skin Contact:

In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Cover the irritated skin with an emollient. Cold water may be used. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

Serious Skin Contact:

Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.

Serious Inhalation:

Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. WARNING: It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.

Ingestion:

To NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious erson. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention if symptoms appear.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Non-flammable.

Auto-Ignition Temperature: Not applicable.

Flash Points: Not applicable.

Flammable Limits: Not applicable.

Products of Combustion:

Products of combustion are not available since material is non-flammable. However, products of decompostion include fumes of oxides of sulfur. Will react with water or steam to produce toxic and corrosive fumes. Reacts with carbonates to generate carbon dioxide gas. Reacts with cyanides and sulfides to form poisonous hydrogen cyanide and hydrogen sulfide respectively.

Fire Hazards in Presence of Various Substances: Combustible materials

Explosion Hazards in Presence of Various Substances:

Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available. Slightly explosive in presence of oxidizing materials.

Fire Fighting Media and Instructions: Not applicable.

Special Remarks on Fire Hazards:

Metal acetylides (Monocesium and Monorubidium), and carbides ignite with concentrated sulfuric acid. White Phosphorous + piling Sulfuric acid or its vapor ignites on contact. May ignite other combustible materials. May cause fire when sulfuric acid as mixed with Cyclopentadiene, cyclopentanone oxime, nitroaryl amines, hexalithium disilicide, phorphorous (III) oxide, and oxidizing agents such as chlorates, halogens, permanganates.

Special Remarks on Explosion Hazards:

Mixturesofsulfuricacidandanyofthefollowingcanexplode:p-nitrotoluene,pentasilvertrihydroxydiaminophosphate, perchlorates, alcohols with strong hydrogen peroxide, ammonium tetraperoxychromate, mercuric nitrite, potassium chlorate, potassium permanganate with potassium chloride, carbides, nitro compounds, nitrates, carbides, phosphorous, iodides, picratres, fulminats, dienes, alcohols (when heated) Nitramide decomposes explosively on contact with concentrated sulfuric acid. 1,3,5-Trinitrosohexahydro-1,3,5-triazine + sulfuric acid causes explosive decompositon.

Section 6: Accidental Release Measures

Small Spill:

Dilute with water and mop up, or absorb with an inert dry material and place in an appropriate waste disposal container. If necessary: Neutralize the residue with a dilute solution of sodium carbonate.

Large Spill:

Corrosive liquid. Poisonous liquid. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not get water inside container. Do not touch spilled material. Use water spray curtain to divert vapor drift. Use water spray to reduce vapors. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal. Neutralize the residue with a dilute solution of sodium carbonate. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:

Keep locked up.. Keep container dry. Do not ingest. Do not breathe gas/fumes/ vapor/spray. Never add water to this product. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, reducing agents, combustible materials, organic materials, metals, acids, alkalis, moisture. May corrode metallic surfaces. Store in a metallic or coated fiberboard drum using a strong polyethylene inner package.

Storage:

Hygroscopic. Reacts. violently with water. Keep container tightly closed. Keep container in a cool, well-ventilated area. Do not store above 23°C (73.4°F).

Section 8: Exposure Controls/Personal Protection

Engineering Controls:

Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection:

Face shield. Full suit. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves. Boots.

Personal Protection in Case of a Large Spill:

Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:

TWA: 1 STEL: 3 (mg/m3) [Australia] Inhalation TWA: 1 (mg/m3) from OSHA (PEL) [United States] Inhalation TWA: 1 STEL: 3 (mg/m3) from ACGIH (TLV) [United States] [1999] Inhalation TWA: 1 (mg/m3) from NIOSH [United States] Inhalation TWA: 1 (mg/m3) [United Kingdom (UK)]Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid. (Thick oily liquid.)

Odor: Odorless, but has a choking odor when hot.

Taste: Marked acid taste. (Strong.)

Molecular Weight: 98.08 g/mole

Color: Colorless.

pH (1% soln/water): Acidic.

Boiling Point:

270°C (518°F) - 340 deg. C Decomposes at 340 deg. C

Melting Point: -35°C (-31°F) to -32 deg. C

Critical Temperature: Not available. Specific Gravity: 1.84 (Water = 1)

Vapor Pressure: Not available.

Vapor Density: 3.4 (Air = 1)

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water.

Solubility:

Easily soluble in cold water. Sulfuric is soluble in water with liberation of much heat. Soluble in ethyl alcohol

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability:

Conditions to Avoid: Incompatible materials, excess heat, combustible material materials, organic materials, exposure to moist air or water, oxidizers, amines, bases.

Incompatibility with various substances:

Reactive with oxidizing agents, reducing agents, combustible materials, organic materials, metals, acids, alkalis, moisture.

Corrosivity:

Extremely corrosive in presence of aluminum, of copper, of stainless steel(316). Highly corrosive in presence of stainless steel(304). Non-corrosive in presence of glass.

Special Remarks on Reactivity:

Hygroscopic. Strong oxidizer. Reacts violently with water and alcohol especially when water is added to the product. Incompatible (can react explosively or dangerously) with the following: ACETIC ACID, ACRYLIC ACID, AMMONIUM HYDROXIDE, CRESOL, CUMENE, DICHLOROETHYL ETHER, ETHYLENE CYANOHYDRIN, ETHYLENEIMINE, NITRIC ACID, 2-NITROPROPANE, PROPYLENE OXIDE, SULFOLANE, VINYLIDENE CHLORIDE, DIETHYLENE GLYCOL MONOMETHYL ETHER, ETHYL ACETATE, ETHYLENE CYANOHYDRIN, ETHYLENE GLYCOL MONOETHYL ETHER ACETATE, GLYOXAL, METHYL ETHYL KETONE, dehydrating agents, organic materials, moisture (water), Acetic anhydride, Acetone, cyanohydrin, Acetone+nitric acid, Acetone + potassium dichromate, Acetonitrile, Acrolein, Acrylonitrile, Acrylonitrile +water, Alcohols + hydrogen peroxide, ally compounds such as Allyl alcohol, and Allyl Chloride, 2-Aminoethanol, Ammonium ydroxide, Ammonium triperchromate, Aniline, Bromate + metals, Bromine pentafluoride, n-Butyraldehyde, Carbides, Cesium acetylene carbide, Chlorates, Cyclopentanone oxime, chlorinates, Chlorates + metals, Chlorine trifluoride, Chlorosulfonic acid, 2-cyano-4-nitrobenzenediazonium hydrogen sulfate, Cuprous nitride, p-chloronitrobenzene, 1,5-Dinitronaphthlene +

sulfur, Diisobutylene, p-dimethylaminobenzaldehyde, 1,3-Diazidobenzene, Dimethylbenzylcarbinol + hydrogen peroxide, Epichlorohydrin, Ethyl alcohol + hydrogen peroxide, Ethylene diamine, Ethylene glycol and other glycols, , Ethylenimine, Fulminates, hydrogen peroxide, Hydrochloric acid, Hydrofluoric acid, Iodine heptafluoride, Indane + nitric acid, Iron, Isoprene, Lithium silicide, Mercuric nitride, Mesityl oxide, Mercury nitride, Metals (powdered), Nitromethane, Nitric acid + glycerides, p-Nitrotoluene, Pentasilver trihydroxydiaminophosphate, Perchlorates, Perchloric acid, Permanganates + benzene, 1-Phenyl-2-methylpropyl alcohol + hydrogen peroxide, Phosphorus, Phosphorus isocyanate, Picrates, Potassium tert-butoxide, Potassium chlorate, Potassium Permanganate and other permanganates, halogens, amines, Potassium Permanganate + Potassium chloride, Potassium Permanganate + water, Propiolactone (beta)-, Pyridine, Rubidium aceteylene carbide, Silver permanganate, Sodium, Sodium carbonate, sodium hydroxide, Steel, styrene monomer, toluene + nitric acid, Vinyl acetate, Thalium (I) azidodithiocarbonate, Zinc chlorate, Zinc Iodide, azides, carbonates, cyanides, sulfides, sulfites, alkali hydrides, carboxylic acid anhydrides, nitriles, olefinic organics, aqueous acids, cyclopentadiene, cyano-alcohols, metal acetylides, Hydrogen gas is generated by the action of the acid on most metals (i.e. lead, copper, tin, zinc, aluminum, etc.). Concentrated sulfuric acid oxidizes, dehydrates, or sulfonates most organic compounds.

Special Remarks on Corrosivity:

Non-corrosive to lead and mild steel, but dillute acid attacks most metals. Attacks many metals releasing hydrogen. Minor corrosive effect on bronze. No corrosion data on brass or zinc.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Dermal contact. Eye contact. Inhalation. Ingestion.

Toxicity to Animals:

WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE. Acute oral toxicity (LD50): 2140 mg/kg [Rat.]. Acute toxicity of the vapor (LC50): 320 mg/m3 2 hours [Mouse].

Chronic Effects on Humans:

CARCINOGENIC EFFECTS: Classified 1 (Proven for human.) by IARC, + (Proven.) by OSHA. Classified A2 (Suspected for human.) by ACGIH. May cause damage to the following organs: kidneys, lungs, heart, cardiovascular system, upper respiratory tract, eyes, teeth.

Other Toxic Effects on Humans:

Extremely hazardous in case of inhalation (lung corrosive). Very hazardous in case of skin contact (corrosive, irritant, permeator), of eye contact (corrosive), of ingestion, .

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans:

Mutagenicity: Cytogenetic Analysis: Hamster, ovary = 4mmol/L Reproductive effects: May cause adverse reproductive effects based on animal data. Developmental abnormalities (musculoskeletal) in rabbits at a dose of 20 mg/m3 for 7 hrs.(RTECS) Teratogenecity: neither embryotoxic, fetoxic, nor teratogenetic in mice or rabbits at inhaled doses producing some maternal toxicity

Special Remarks on other Toxic Effects on Humans:

Acute Potential Health Effects: Skin: Causes severe skin irritation and burns. Continued contact can cause tissue necrosis. Eye: Causes severe eye irritation and burns. May cause irreversible eye injury. Ingestion: Harmful if swallowed. May cause permanent damage to the digestive tract. Causes gastrointestial tract burns. May cause perforation of the stomach, GI bleeding, edema of the glottis, necrosis and scarring, and sudden circulatory collapse(similar to acute inhalation). It may also cause systemic toxicity with acidosis. Inhalation: May cause severe irritation of the respiratory tract and mucous membranes with sore throat, coughing, shortness of breath, and delayed lung edema. Causes chemical burns to the repiratory tract. Inhalation may be fatal as a result of spasm, inflammation, edema of the larynx and bronchi, chemical pneumonitis, and pulmonary edema. Cause corrosive action on mucous membranes. May affect cardiovascular system (hypotension, depressed cardiac output, bradycardia). Circulatory collapse with clammy skin, weak and rapid pulse, shallow respiration, and scanty urine may follow. Circulatory shock is often the immediate cause of death. May also affect teeth(changes in teeth and supporting structures - erosion, discoloration). Chronic Potential Health Effects: Inhalation: Prolonged or repeated inhalation may affect behavior (muscle contraction or spasticity), urinary system (kidney damage), and cardiovascular system, heart (ischemic heart leisons), and respiratory system/lungs(pulmonary edema, lung damage), teeth (dental discoloration, erosion). Skin: Prolonged or repeated skin contact may cause dermatitis, an allergic skin reaction.

Section 12: Ecological Information

cotoxicity: Ecotoxicity in water (LC50): 49 mg/l 48 hours [bluegill/sunfish].

BOD5 and COD: Not available.

Products of Biodegradation:

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are less toxic than the product itself.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Sulfuric acid may be placed in sealed container or absorbed in vermiculite, dry sand, earth, or a similar material. It may also be diluted and neutralized. Be sure to consult with local or regional authorities (waste regulators) prior to any disposal. Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: Class 8: Corrosive material Identification: : Sulfuric acid UNNA: 1830 PG: II Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:

Illinois toxic substances disclosure to employee act: Sulfuric acid New York release reporting list: Sulfuric acid Rhode Island RTK hazardous substances: Sulfuric acid Pennsylvania RTK: Sulfuric acid Minnesota: Sulfuric acid Massachusetts RTK: Sulfuric acid New Jersey: Sulfuric acid California Director's List of Hazardous Substances (8 CCR 339): Sulfuric acid Tennessee RTK: Sulfuric acid TSCA 8(b) inventory: Sulfuric acid SARA 302/304/311/312 extremely hazardous substances: Sulfuric acid SARA 313 toxic chemical notification and release reporting: Sulfuric acid CERCLA: Hazardous substances.: Sulfuric acid: 1000 lbs. (453.6 kg)

Other Regulations:

OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada):

CLASS D-1A: Material causing immediate and serious toxic effects (VERY TOXIC). CLASS E: Corrosive liquid.

DSCL (EEC):

R35- Causes severe burns. S2- Keep out of the reach of children. S26- In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. S30- Never add water to this product. S45- In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

HMIS (U.S.A.):

Health Hazard: 3

Fire Hazard: 0

Reactivity: 2

Personal Protection:

National Fire Protection Association (U.S.A.):

Health: 3

Flammability: 0 Reactivity: 2

Specific hazard:

Protective Equipment:

Gloves. Full suit. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Face shield.

Section 16: Other Information

References:

-Material safety data sheet emitted by: la Commission de la Santé et de la Sécurité du Travail du Québec. -The Sigma-Aldrich Library of Chemical Safety Data, Edition II. -Hawley, G.G.. The Condensed Chemical Dictionary, 11e ed., New York N.Y., Van Nostrand Reinold, 1987.

Other Special Considerations: Not available.

Created: 10/09/2005 11:59 PM

Last Updated: 11/06/2008 12:00 PM

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Material Safety Data Sheet

Version 4.0 Revision Date 08/26/2010 Print Date 09/21/2010

1. PRODUCT AND COMPANY IDENTIFICATION

Product name

Sulfuric acid

Product Number

435589

Brand

Sigma-Aldrich

Company

Sigma-Aldrich

3050 Spruce Street

SAINT LOUIS MO 63103

USA

Telephone

+18003255832 +18003255052

Fax Emergency Phone #

(314) 776-6555

2. HAZARDS IDENTIFICATION

Emergency Overview

OSHA Hazards

Target Organ Effect, Corrosive

Target Organs

Teeth., Lungs

GHS Label elements, including precautionary statements

Pictogram

Signal word

Danger

Hazard statement(s)

H314

Causes severe skin burns and eye damage.

H402 Harmful to aquatic life.

Precautionary statement(s)

P280

Wear protective gloves/ protective clothing/ eye protection/ face protection.

P305 + P351 + P338

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if

present and easy to do. Continue rinsing.

P310 Immediately call a POISON CENTER or doctor/ physician.

HMIS Classification

Health hazard: 3
Chronic Health Hazard: *
Flammability: 0
Physical hazards: 2

NFPA Rating

Health hazard: 3
Fire: 0
Reactivity Hazard: 2
Special hazard.: W

Health hazard: 3 Fire: 0 Reactivity Hazard: 0

Potential Health Effects

Inhalation May be harmful if inhaled. Material is extremely destructive to the tissue of the mucous

membranes and upper respiratory tract.

Skin May be harmful if absorbed through skin. Causes skin burns.

Eyes Causes eye burns. Causes severe eye burns.

Ingestion May be harmful if swallowed.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Synonyms : sulfuric acid (Solution)

Formula : H₂O₄S

CAS-No.	EC-No.	Index-No.	Concentration	
Sulfuric acid				
7664-93-9	9 231-639-5 016-020-00-8 >= 95			
Water	- AE. T			
7732-18-5	231-791-2	-	>= 2 - <= 5 %	

4. FIRST AID MEASURES

General advice

Consult a physician. Show this safety data sheet to the doctor in attendance. Move out of dangerous area.

If inhaled

If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact

Take off contaminated clothing and shoes immediately. Wash off with soap and plenty of water. Consult a physician.

In case of eye contact

Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician. Continue rinsing eyes during transport to hospital.

If swallowed

Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

5. FIRE-FIGHTING MEASURES

Suitable extinguishing media

Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

Special protective equipment for fire-fighters

Wear self contained breathing apparatus for fire fighting if necessary.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions

Use personal protective equipment. Avoid breathing vapors, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas.

Environmental precautions

Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

Methods and materials for containment and cleaning up

Soak up with inert absorbent material and dispose of as hazardous waste. Keep in suitable, closed containers for disposal.

7. HANDLING AND STORAGE

Precautions for safe handling

Avoid inhalation of vapour or mist.

Normal measures for preventive fire protection.

Conditions for safe storage

Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Components with workplace control parameters

Components	CAS-No.	Value	Control parameters	Update	Basis
Sulfuric acid	7664-93-9	TWA	0.2 mg/m3	2004-01-01	USA. ACGIH Threshold Limit Values (TLV)
Remarks	ACGIH 200	4 Adoption di containe	Carcinogens. n d in strong inorga	nic acid mists	
		TWA	1 mg/m3	1989-03-01	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
		TWA	1 mg/m3	1993-06-30	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants

Personal protective equipment

Respiratory protection

Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type ABEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Hand protection

Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Eye protection

Tightly fitting safety goggles. Faceshield (8-inch minimum). Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin and body protection

Complete suit protecting against chemicals, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Hygiene measures

Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance

Form liquid

Safety data

pH 1.2 at 5 g/l

Melting point 3 °C (37 °F)

Boiling point 290 °C (554 °F) - lit.

Flash point not applicable

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Ignition temperature no data available
Lower explosion limit no data available
Upper explosion limit no data available

Vapour pressure 1.333 hPa (1.000 mmHg) at 145.8 °C (294.4 °F)

Density 1.84 g/cm3 at 25 °C (77 °F)

Water solubility soluble

10. STABILITY AND REACTIVITY

Chemical stability

Stable under recommended storage conditions.

Conditions to avoid

Avoid moisture.

Materials to avoid

Bases, Halides, Organic materials, Carbides, Chlorates, fulminates, Nitrates, picrates, Cyanides, Reacts violently with:, cyclopentadiene, cyclopentanone oxime, nitroaryl amines, hexalithium disilicide, phosphorous(III) oxide, Powdered metals

Hazardous decomposition products

Hazardous decomposition products formed under fire conditions. - Sulphur oxides, Hydrogen sulfide gas Hazardous decomposition products formed under fire conditions. - Sulphur oxides

11. TOXICOLOGICAL INFORMATION

Acute toxicity

LD50 Oral - rat - 2,140 mg/kg (Sulfuric acid)

LC50 Inhalation - rat - 2 h - 510 mg/m3(Sulfuric acid)

Skin corrosion/irritation

Skin - rabbit - Extremely corrosive and destructive to tissue. (Sulfuric acid)

Serious eye damage/eye irritation

Eyes - rabbit - Severe eye irritation (Sulfuric acid)

Respiratory or skin sensitization

no data available (Sulfuric acid)

Germ cell mutagenicity

Carcinogenicity

The International Agency for Research on Cancer (IARC) has determined that occupational exposure to strong-inorganic-acid mists containing sulfuric acid is carcinogenic to humans (group 1). (Sulfuric acid)

IARC: No component of this product present at levels greater than or equal to 0.1% is identified as probable,

possible or confirmed human carcinogen by IARC.

ACGIH: No component of this product present at levels greater than or equal to 0.1% is identified as a

carcinogen or potential carcinogen by ACGIH.

NTP: No component of this product present at levels greater than or equal to 0.1% is identified as a known or

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anticipated carcinogen by NTP.

OSHA: No component of this product present at levels greater than or equal to 0.1% is identified as a

carcinogen or potential carcinogen by OSHA.

Reproductive toxicity

Specific target organ toxicity - single exposure (Globally Harmonized System) no data available (Sulfuric acid)

Specific target organ toxicity - repeated exposure (Globally Harmonized System) no data available

Aspiration hazard

no data available (Sulfuric acid)

Potential health effects

Inhalation May be harmful if inhaled. Material is extremely destructive to the tissue of the mucous

membranes and upper respiratory tract.

Ingestion May be harmful if swallowed.

Skin May be harmful if absorbed through skin. Causes skin burns.

Eyes Causes eye burns. Causes severe eye burns.

Signs and Symptoms of Exposure

Material is extremely destructive to tissue of the mucous membranes and upper respiratory tract, eyes, and skin., spasm, inflammation and edema of the larynx, spasm, inflammation and edema of the bronchi, pneumonitis, pulmonary edema, burning sensation, Cough, wheezing, laryngitis, Shortness of breath, Headache, Nausea, Vomiting, Pulmonary edema. Effects may be delayed., To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated. (Sulfuric acid)

Additional Information

12. ECOLOGICAL INFORMATION

Toxicity

Toxicity to fish

LC50 - Gambusia affinis (Mosquito fish) - 42 mg/l - 96 h (Sulfuric acid)

Persistence and degradability

no data available

Bioaccumulative potential

no data available

Mobility in soil

no data available (Sulfuric acid)

PBT and vPvB assessment

no data available

Other adverse effects

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.

Harmful to aquatic life.

no data available

13. DISPOSAL CONSIDERATIONS

Product

Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)

UN-Number: 1830 Class: 8

Packing group: II

Proper shipping name: Sulfuric acid Reportable Quantity (RQ): 1020 lbs

Marine pollutant: No

Poison Inhalation Hazard: No

IMDG

UN-Number: 1830 Class: 8

Packing group: II

EMS-No: F-A, S-B

Proper shipping name: SULPHURIC ACID

Marine pollutant: No

IATA

UN-Number: 1830 Class: 8

Packing group: II

Proper shipping name: Sulphuric acid

15. REGULATORY INFORMATION

OSHA Hazards

Target Organ Effect, Corrosive

DSL Status

All components of this product are on the Canadian DSL list.

SARA 302 Components

The following components are subject to reporting levels established by SARA Title III, Section 302:

CAS-No. Sulfuric acid

Revision Date 7664-93-9 2007-03-01

SARA 313 Components

The following components are subject to reporting levels established by SARA Title III, Section 313:

CAS-No.

Revision Date Sulfuric acid 7664-93-9 2007-03-01

SARA 311/312 Hazards

Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

CAS-No. Revision Date Sulfuric acid 7664-93-9 2007-03-01

Pennsylvania Right To Know Components

CAS-No. Revision Date Water 7732-18-5 Sulfuric acid 7664-93-9 2007-03-01

New Jersey Right To Know Components

CAS-No. Revision Date Water 7732-18-5 Sulfuric acid 7664-93-9 2007-03-01

California Prop. 65 Components

WARNING! This product contains a chemical known to the State of CAS-No. Revision Date California to cause cancer. 7664-93-9 2007-09-28

Sulfuric acid

16. OTHER INFORMATION

Further information

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Material Safety Data Sheet

1. Product and company identification

Product name : TRETOLITE™ RBW255 WATER CLARIFIER

™ a trademark of Baker Hughes, Inc.

Supplier : Baker Petrolite

A Baker Hughes Company 12645 W. Airport Blvd. Sugar Land, TX 77478

For Product Information/MSDSs Call: 800-231-3606 (8:00 a.m. - 5:00 p.m. cst, Monday - Friday) 281-276-5400

Material Uses : Special: Reverse demulsifier.

 Code
 : RBW255

 Validation date
 : 2/9/2010.

 Print date
 : 2/9/2010.

Version : 3

Responsible name : Global Regulatory Affairs - Telephone 281-276-5400 or 800-231-3606

In case of emergency : CHEMTREC: 800-424-9300 (U.S. 24 hour)

Baker Petrolite: 800-231-3606

(001)281-276-5400

CANUTEC: 613-996-6666 (Canada 24 hours)

CHEMTREC Int'l 01-703-527-3887 (International 24 hour)

2. Hazards identification

ysical state : Liquid.

Jdor : Pungent.

Color : Amber.

OSHA/HCS status : This material is considered hazardous by the OSHA Hazard Communication Standard

(29 CFR 1910.1200).

Emergency overview : WARNING!

HARMFUL IF INHALED. CAUSES RESPIRATORY TRACT, EYE AND SKIN IRRITATION. MAY BE HARMFUL IF ABSORBED THROUGH SKIN OR IF SWALLOWED. CONTAINS MATERIAL THAT MAY CAUSE TARGET ORGAN

DAMAGE, BASED ON ANIMAL DATA.

Do not breathe vapor or mist. Do not ingest. Do not get in eyes. Avoid contact with skin and clothing. Use only with adequate ventilation. Keep container tightly closed and

sealed until ready for use. Wash thoroughly after handling.

Routes of entry : Dermal contact. Eye contact. Inhalation.

Potential acute health effects

Inhalation : Toxic by inhalation. Irritating to respiratory system.

Ingestion : Harmful if swallowed.

Skin : Harmful in contact with skin. Severely irritating to the skin.

Eyes : Severely irritating to eyes. Risk of serious damage to eyes.

Potential chronic health effects

Chronic effects : Contains material that may cause target organ damage, based on animal data.

Target organs : Contains material which may cause damage to the following organs: kidneys, the

nervous system, liver, mucous membranes, upper respiratory tract, skin, central nervous

system (CNS), eye, lens or cornea.

/er-exposure signs/symptoms

Inhalation : respiratory tract irritation, coughing

2/9/2010. RBW255

Hazards identification 2 .

Chronic effects : Contains material that may cause target organ damage, based on animal data.

Prolonged or repeated contact can defat the skin and lead to irritation, cracking and/or

dermatitis.

Target organs : Contains material which may cause damage to the following organs: the nervous system, gastrointestinal tract, upper respiratory tract, skin, central nervous system

(CNS), eve. lens or cornea.

Over-exposure signs/symptoms

Inhalation : respiratory tract irritation, nausea or vomiting, coughing, headache, drowsiness/fatigue,

dizziness/vertigo, unconsciousness

Ingestion : None known.

: irritation, redness, dryness, cracking Skin

Eves : irritation, watering, redness

Medical conditions aggravated by overexposure

: Pre-existing disorders involving any target organs mentioned in this MSDS as being at

risk may be aggravated by over-exposure to this product.

See toxicological information (section 11)

Composition/information on ingredients 3

<u>Name</u>	CAS number	%
Methanol	67-56-1	10 - 30
Aluminum salt	Trade secret.	10 - 30

First aid measures 4.

Eye contact : Get medical attention immediately. Immediately flush eyes with plenty of water for at

least 15 minutes, occasionally lifting the upper and lower eyelids.

Skin contact : In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Clean

shoes thoroughly before reuse. Get medical attention immediately.

Inhalation : Move exposed person to fresh air. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel.

Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention

immediately.

: Wash out mouth with water. Do not induce vomiting unless directed to do so by medical Ingestion

personnel. Never give anything by mouth to an unconscious person. Get medical

attention immediately.

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training. If it is

suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to

give mouth-to-mouth resuscitation.

Fire-fighting measures 5.

Flammability of the product : Flammable liquid. In a fire or if heated, a pressure increase will occur and the container

may burst, with the risk of a subsequent explosion. The vapor/gas is heavier than air and will spread along the ground. Vapors may accumulate in low or confined areas or travel a considerable distance to a source of ignition and flash back. Runoff to sewer

may create fire or explosion hazard.

Extinguishing media

Suitable : Use dry chemical, CO₂, water spray (fog) or foam.

Not suitable : Do not use water jet.

Accidental release measures

rsonal precautions

: No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Do not breathe vapor or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment (see section 8).

Environmental precautions

: Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers

Methods for cleaning up

Small spill

: Stop leak if without risk. Move containers from spill area. Absorb with an inert material. Dispose of via a licensed waste disposal contractor.

Large spill

Stop leak if without risk. Move containers from spill area. Approach release from upwind. Dike spill area and do not allow product to reach sewage system or surface or ground water. Notify any reportable spill to authorities. (See section 12 for environmental risks and 13 for disposal information.) Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations (see section 13). Dispose of via a licensed waste disposal contractor. Contaminated absorbent material may pose the same hazard as the spilled product. Note: see section 1 for emergency contact information and section 13 for waste disposal.

If RQ (Reportable Quantity) is exceeded, report to National Spill Response Office at 1-800-424-8802.

7. Handling and storage

Handling

: Put on appropriate personal protective equipment (see section 8). Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Do not get in eyes or on skin or clothing. Do not breathe vapor or mist. Do not ingest. Use only with adequate ventilation. Empty containers retain product residue and can be hazardous. Do not reuse container.

Storage

: Store in accordance with local regulations. Store in a dry, cool and well-ventilated area, away from incompatible materials (see section 10). Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination.

8. Exposure controls/personal protection

Occupational exposure limits		TWA	TWA (8 hours)		STEL (15 mins)			Ceiling			
Ingredients:	List name	ppm	mg/m³	Other	ppm	mg/m³	Other	ppm	mg/m³	Other	Notations
Aluminum chloride, as Al	OSHA PEL 1989	-	2	-		-	_	2	-		[A]
Propargyl alcohol	US ACGIH	1	2.3	-	2	2	_	-	-		[1]
	OSHA PEL 1989	1	2	-	-	-	5	-		-	[1]

[1]Absorbed through skin.

Notes: [A]as Al

Consult local authorities for acceptable exposure limits.

Only components of this product with established exposure limits appear in the box above.

If OSHA permissible exposure levels are shown above they are the OSHA 1989 levels or are from subsequent OSHA regulatory actions. Although the 1989 levels have been vacated the 11th Circuit Court of Appeals, Baker Hughes recommends that these lower exposure levels be observed as reasonable worker protection.

Recommended monitoring procedures

: If this product contains ingredients with exposure limits, personal, workplace atmosphere or biological monitoring may be required to determine the effectiveness of the ventilation or other control measures and/or the necessity to use respiratory protective equipment.

Exposure controls/personal protection 8 .

Occupational exposure limits		TWA (8 hours)			STEL (15 mins)			Ceiling			
Ingredients:	List name	ppm	mg/m³	Other	ppm	mg/m³	Other	ppm	mg/m³	Other	Notations
Aluminum salt, as Al Methanol	OSHA PEL 1989 US ACGIH OSHA PEL OSHA PEL 1989	- 200 200 200	2 262 260 260		- 250 - 250	- 328 - 325	-		:		[A] [1]

[1]Absorbed through skin.

Notes: [A]as Al

Consult local authorities for acceptable exposure limits.

Only components of this product with established exposure limits appear in the box above.

If OSHA permissible exposure levels are shown above they are the OSHA 1989 levels or are from subsequent OSHA regulatory actions. Although the 1989 levels have been vacated the 11th Circuit Court of Appeals, Baker Hughes recommends that these lower exposure levels be observed as reasonable worker protection.

Recommended monitoring procedures

: If this product contains ingredients with exposure limits, personal, workplace atmosphere or biological monitoring may be required to determine the effectiveness of the ventilation or other control measures and/or the necessity to use respiratory protective equipment.

Engineering measures

: Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. Use explosion-proof ventilation equipment.

Hygiene measures

: Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Ensure that eyewash stations and safety showers are close to the workstation location. Take off contaminated clothing and wash before re-use.

Personal protection

Respiratory

: Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

Hands

: Chemical-resistant gloves: Nitrile or Neoprene gloves.

Eyes

: Wear chemical safety goggles. When transferring material wear face-shield in addition to

chemical safety goggles.

Skin

Wear long sleeves and other protective clothing to prevent repeated or prolonged skin contact.

9 . Physical and chemical properties

Physical state

: Liquid. [Hazv.]

Flash point

: Closed cup: 29.444°C (85°F) [SFCC]

Auto-ignition temperature

: Not available.

Flammable limits

: Not available.

Color Odor

: Light to medium amber.

Boiling/condensation point

: Alcohol-like. : Not available. : Not available.

Initial Boiling Point Melting/freezing point : Not available. : Not available.

Relative density

: 1.065 (15.6°C)

Density Vapor density Odor threshold : 8.87 (lbs/gal) : >1 [Air = 1] : Not available.

3/21/2010.

RBW843

10 . Stability and Reactivity

remical stability

Possibility of hazardous reactions

- : The product is stable.
- : Under normal conditions of storage and use, hazardous reactions will not occur.

Hazardous polymerization

: Under normal conditions of storage and use, hazardous polymerization will not occur.

Conditions to avoid

: No specific data.

Materials to avoid Hazardous decomposition : Reactive or incompatible with the following materials: oxidizing materials and metals.

on

: Under normal conditions of storage and use, hazardous decomposition products should not be produced.

products
Conditions of reactivity

: Slightly flammable in the presence of the following materials or conditions: open flames, sparks and static discharge and heat.

11. Toxicological information

Acute toxicity				
Product/ingredient name	Result	Species	Dose	Exposure
Aluminum chloride	LD50 Dermal	Rabbit	>2 g/kg	-
	LD50 Oral	Rat	3450 mg/kg	-
Propargyl alcohol	LD50 Dermal	Rabbit	88 mg/kg	-
, 0,	LD50 Dermal	Rabbit	16 mg/kg	-
	LD50 Oral	Rat	55 mg/kg	-
	LD50 Oral	Rat	20 mg/kg	-
	LC50 Inhalation	Rat	1.8 gm/m3	2 hours
	Vapor			
	LC50 Inhalation	Rat	873 ppm	2 hours
	Gas.			
	LC50 Inhalation	Rat	520 ppm	4 hours

Chronic toxicity Remarks

1) Aluminum chloride

Aluminum chloride is a component of this product. Some aluminum workers are at risk for developing respiratory manifestations of aluminum toxicity, mainly asthma, chronic obstructive lung disease, and pulmonary fibrosis. Aluminum welders and polishers, and in workers involved in manufacturing alumina abrasives or explosives from stamped aluminum powders (Abramson et al, 1989; Dinman, 1987). Chronic interstitial pneumonia (pneumonia in the spaces of the lung tissue, but not within the lung cavity) with severe cavitations in the right upper lobe and small cavities in the rest of both lungs were reported in a man exposed to aluminum dust for 3.2 years (Stokinger, 1981). Workers involved in aluminum smelting may be at increased risk of developing chronic obstructive lung disease (Abramson et al, 1989).

2) Polyquaternary amine

Not available.

Propargyl alcohol

Propargyl alcohol is a component of this product. Exposure may damage the liver and kidneys.

It has produced in vitro mutagenicity in animal studies. (Blakey, D.H. et al, 1994) and (Basu, A.K. and L.J. Marnett, 1984) Chronic inhalation of propargyl alcohol has caused nasal tumors and mononuclear cell leukemia in laboratory animals. National Toxicology Program Technical Report (2008).

TRETOLITE™ RBW255 WATER CLARIFIER

12. Ecological information

Aquatic ecotoxicity

Conclusion/Summary

: Not available.

Biodegradability

Conclusion/Summary

: Not available.

13. Disposal considerations

Waste disposal

: The generation of waste should be avoided or minimized wherever possible. Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe way. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Disposal of this product, solutions and any byproducts should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

Disposal should be in accordance with applicable regional, national and local laws and regulations.

Refer to Section 7: HANDLING AND STORAGE and Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION for additional handling information and protection of employees.

14. Transport information

Regulatory information	UN number	Proper shipping name	Classes	PG*	Label	Additional information
DOT Classification	UN3266	CORROSIVE LIQUID, BASIC, INORGANIC, N.O.S. (Contains: Aluminum chloride)	8	111		
TDG Classification	UN3266	CORROSIVE LIQUID, BASIC, INORGANIC, N.O.S. (Contains: Aluminum chloride)	8	III		
IMDG Class	UN3266	CORROSIVE LIQUID, BASIC, INORGANIC, N.O.S. (Contains: Aluminum chloride)	8	111		Emergency schedules (EmS) F-A S-B

PG*: Packing group

DOT Reportable Quantity Propargyl alcohol, 6485 gal of this product.

Marine pollutant

Not applicable.

North-America NAERG : 154

15 . Regulatory information

HCS Classification

: Toxic material Irritating material Target organ effects

U.S. Federal regulations

: United States inventory (TSCA 8b): All components are listed or exempted.

11. Toxicological information

Journal, 45, pp 51-5) Chronic inhalation of methanol has caused liver effects in laboratory animals. (Poon, R et al, 1994, Toxocology and Industrial Health 10: 231-245) Chronic oral exposure has caused Central Nervous System effects and eye effects in laboratory animals. [Youssef, A. F. et al (1993) Neurotoxicology and Teratology 15: 223-227; Baumbach, G.L. et al (1977) Archives of Ophthalmology 95: 1859-1865; Hayreh, M.S. et al (1977) Archives of Ophthalmology 95: 1851-1858; Hayreh, M.S. et al (1980) Ocular toxicity of methanol: An experimental study – Raven Press, New York, pages 35-53; and Martin-Amat, G. et al (1977) Archives of Ophthalmology 95: 1847-1850]

Methanol has produced in vivo mutagenicity in animal studies. (Pereira, M.A. et al, 1982) and (Ward, J. B. et al, 1983)

Methanol was mutagenic in yeast (RTECS). Methanol has caused chromosome aberrations in yeast (RTECS) and grasshoppers (Saha & Khudabaksh, 1974).

Methanol has caused birth defects in rats exposed by the oral (Infurna et al, 1981) and inhalation (Nelson et al, 1984; Nelson et al, 1985) routes. Exencephaly (a defect in the skull bone structure that leaves the brain exposed) and cleft palate (a fissure or unformed bone structure in the roof of the mouth (palate), lip, or facial area, occurring during the embryonic stage of development) were increased in fetal mice exposed to methanol at an airborne concentration of 5,000 ppm or higher for 7 hours/day on days 6 to 15 of gestation.

Embryotoxicity and fetotoxicity were seen with maternal exposure to airborne concentrations of 7,500 ppm and above, and reduced fetal weights with concentrations of 10,000 ppm or greater. The NOAEL was 1,000 ppm. Effects similar to those seen in the 10,000 ppm dosage group were also seen in offspring of mice given a dose of 4 g/kg orally (Rogers et al, 1993).

2) Aluminum salt

Not available.

12. Ecological information

Aquatic ecotoxicity

Conclusion/Summary

: Not available.

Biodegradability

Conclusion/Summary

: Not available.

13. Disposal considerations

Waste disposal

: The generation of waste should be avoided or minimized wherever possible. Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe way. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Disposal of this product, solutions and any byproducts should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

Disposal should be in accordance with applicable regional, national and local laws and regulations.

Refer to Section 7: HANDLING AND STORAGE and Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION for additional handling information and protection of employees.

14. Transport information

15. Regulatory information

SARA 302/304/311/312 extremely hazardous substances: No products were found. SARA 302/304 emergency planning and notification: No products were found. SARA 302/304/311/312 hazardous chemicals: Aluminum chloride: prop-2-vn-1-ol SARA 311/312 MSDS distribution - chemical inventory - hazard identification: TRETOLITE™ RBW255 WATER CLARIFIER: Immediate (acute) health hazard, Delayed (chronic) health hazard

CERCLA: Hazardous substances.: prop-2-yn-1-ol: 1000 lbs. (454 kg); Formaldehyde: 100 lbs. (45.4 kg);

Clean Water Act (CWA) 307: No products were found.

Clean Water Act (CWA) 311: Formaldehyde

Clean Air Act (CAA) 112 accidental release prevention: Formaldehyde

Clean Air Act (CAA) 112 regulated flammable substances: No products were found.

Clean Air Act (CAA) 112 regulated toxic substances: Formaldehyde

Clean Air Act Section 112(b) Hazardous Air Pollutants (HAPs)

: Not listed

SARA 313

CAS number Concentration **Product name**

107-19-7 1-5 : Propargyl alcohol Supplier notification

United States inventory

(TSCA 8b)

: All components are listed or exempted.

Canada

WHMIS (Canada)

: Class D-1A: Material causing immediate and serious toxic effects (Very toxic).

Class D-2B: Material causing other toxic effects (Toxic).

Class E: Corrosive material

Canada (CEPA DSL):

: All components are listed or exempted.

16 . Other information

Label requirements

: HARMFUL IF INHALED. CAUSES RESPIRATORY TRACT, EYE AND SKIN IRRITATION. MAY BE HARMFUL IF ABSORBED THROUGH SKIN OR IF SWALLOWED. CONTAINS MATERIAL THAT MAY CAUSE TARGET ORGAN. DAMAGE, BASED ON ANIMAL DATA.

National Fire Protection Association (U.S.A.)

> Flammability Health Instability Special

Date of printing : 2/9/2010.

Indicates information that has changed from previously issued version.

Notice to reader

NOTE: The information on this MSDS is based on data which is considered to be accurate. Baker Hughes, however, makes no guarantees or warranty, either expressed or implied of the accuracy or completeness of this information.

The conditions or methods of handling, storage, use and disposal of the product are beyond our control and may be beyond our knowledge. For this and other reasons, we do not assume responsibility and expressly disclaim bility for loss, damage or expense arising out of or in any way connected with the handling, storage, use or sposal of this product.

TRETOLITE™ RBW255 WATER CLARIFIER

16. Other information

This MSDS was prepared and is to be used for this product. If the product is used as a component in another product, this MSDS information may not be applicable.



Material Safety Data Sheet

1. Product and company identification

Product name : TRETOLITE™ RBW843 REVERSE BREAKER

™ a trademark of Baker Hughes, Inc.

Supplier : Baker Petrolite

A Baker Hughes Company 12645 W. Airport Blvd. Sugar Land, TX 77478

For Product Information/MSDSs Call: 800-231-3606 (8:00 a.m. - 5:00 p.m. cst, Monday - Friday) 281-276-5400

Material Uses : Special: Water clarifier.

 Code
 : RBW843

 Validation date
 : 3/21/2010.

 Print date
 : 3/21/2010.

Version : 4

Responsible name : Global Regulatory Affairs - Telephone 281-276-5400 or 800-231-3606

In case of emergency : CHEMTREC: 800-424-9300 (U.S. 24 hour)

Baker Petrolite: 800-231-3606

(001)281-276-5400

CANUTEC: 613-996-6666 (Canada 24 hours)

CHEMTREC Int'l 01-703-527-3887 (International 24 hour)

2. Hazards identification

ysical state : Liquid. [Hazy.]

Jdor : Alcohol-like.

Color : Light to medium amber.

OSHA/HCS status : This material is considered hazardous by the OSHA Hazard Communication Standard

(29 CFR 1910.1200).

Emergency overview : WARNING!

FLAMMABLE LIQUID AND VAPOR. INHALATION CAUSES HEADACHES.

DIZZINESS, DROWSINESS AND NAUSEA AND MAY LEAD TO

UNCONSCIOUSNESS. CAUSES RESPIRATORY TRACT IRRITATION. MAY BE HARMFUL IF SWALLOWED. MAY CAUSE BLINDNESS IF SWALLOWED. MAY CAUSE EYE AND SKIN IRRITATION. PROLONGED OR REPEATED CONTACT MAY DRY SKIN AND CAUSE IRRITATION. CONTAINS MATERIAL THAT MAY CAUSE

TARGET ORGAN DAMAGE, BASED ON ANIMAL DATA.

Keep away from heat, sparks and flame. Do not breathe vapor or mist. Do not ingest. Avoid contact with eyes, skin and clothing. Use only with adequate ventilation. Keep container tightly closed and sealed until ready for use. Wash thoroughly after handling. Vapors may form explosive mixtures with air. Vapors can travel to a source of ignition and flashback. To avoid fire or explosion, dissipate static electricity during transfer by grounding and bonding containers and equipment before transferring material.

Routes of entry : Dermal contact. Eye contact. Inhalation.

Potential acute health effects

Inhalation : Can cause central nervous system (CNS) depression. Irritating to respiratory system.

Ingestion : Harmful if swallowed. Can cause central nervous system (CNS) depression. May cause

blindness if swallowed.

Skin : Moderately irritating to the skin.
yes : Moderately irritating to eyes.

Potential chronic health effects

Hazards identification 2 .

Chronic effects : Contains material that may cause target organ damage, based on animal data.

Prolonged or repeated contact can defat the skin and lead to irritation, cracking and/or

dermatitis.

Target organs : Contains material which may cause damage to the following organs: the nervous system, gastrointestinal tract, upper respiratory tract, skin, central nervous system

(CNS), eve. lens or cornea.

Over-exposure signs/symptoms

Inhalation : respiratory tract irritation, nausea or vomiting, coughing, headache, drowsiness/fatigue,

dizziness/vertigo, unconsciousness

Ingestion : None known.

: irritation, redness, dryness, cracking Skin

Eves : irritation, watering, redness

Medical conditions aggravated by overexposure

: Pre-existing disorders involving any target organs mentioned in this MSDS as being at

risk may be aggravated by over-exposure to this product.

See toxicological information (section 11)

Composition/information on ingredients 3

<u>Name</u>	CAS number	%
Methanol	67-56-1	10 - 30
Aluminum salt	Trade secret.	10 - 30

First aid measures 4.

Eye contact : Get medical attention immediately. Immediately flush eyes with plenty of water for at

least 15 minutes, occasionally lifting the upper and lower eyelids.

Skin contact : In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Clean

shoes thoroughly before reuse. Get medical attention immediately.

Inhalation : Move exposed person to fresh air. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel.

Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention

immediately.

: Wash out mouth with water. Do not induce vomiting unless directed to do so by medical Ingestion

personnel. Never give anything by mouth to an unconscious person. Get medical

attention immediately.

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training. If it is

suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to

give mouth-to-mouth resuscitation.

Fire-fighting measures 5.

Flammability of the product : Flammable liquid. In a fire or if heated, a pressure increase will occur and the container

may burst, with the risk of a subsequent explosion. The vapor/gas is heavier than air and will spread along the ground. Vapors may accumulate in low or confined areas or travel a considerable distance to a source of ignition and flash back. Runoff to sewer

may create fire or explosion hazard.

Extinguishing media

Suitable : Use dry chemical, CO₂, water spray (fog) or foam.

Not suitable : Do not use water jet.

5. Fire-fighting measures

necial exposure hazards

: Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool.

Hazardous thermal decomposition products

: carbon dioxide,carbon monoxide,nitrogen oxides,halogenated compounds,metal oxide/oxides

Special protective equipment for fire-fighters

: Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

6. Accidental release measures

Personal precautions

: No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Shut off all ignition sources. No flares, smoking or flames in hazard area. Do not breathe vapor or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment (see section 8).

Environmental precautions

: Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

Methods for cleaning up

Small spill

: Stop leak if without risk. Move containers from spill area. Absorb with an inert material. Use spark-proof tools and explosion-proof equipment. Dispose of via a licensed waste disposal contractor.

Large spill

: Stop leak if without risk. Move containers from spill area. Approach release from upwind. Dike spill area and do not allow product to reach sewage system or surface or ground water. Notify any reportable spill to authorities. (See section 12 for environmental risks and 13 for disposal information.) Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations (see section 13). Use spark-proof tools and explosion-proof equipment. Dispose of via a licensed waste disposal contractor. Contaminated absorbent material may pose the same hazard as the spilled product. Note: see section 1 for emergency contact information and section 13 for waste disposal.

If RQ (Reportable Quantity) is exceeded, report to National Spill Response Office at 1-800-424-8802.

7. Handling and storage

Handling

Put on appropriate personal protective equipment (see section 8). Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Do not breathe vapor or mist. Do not ingest. Avoid contact with eyes, skin and clothing. Use only with adequate ventilation. Store and use away from heat, sparks, open flame or any other ignition source. Use explosion-proof electrical (ventilating, lighting and material handling) equipment. Use non-sparking tools. Take precautionary measures against electrostatic discharges. To avoid fire or explosion, dissipate static electricity during transfer by grounding and bonding containers and equipment before transferring material. Empty containers retain product residue and can be hazardous. Do not reuse container.

Storage

: Store in accordance with local regulations. Store in a segregated and approved area. Store in a dry, cool and well-ventilated area, away from incompatible materials (see section 10). Eliminate all ignition sources. Separate from oxidizing materials. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination.

Exposure controls/personal protection 8 .

Occupational exposure limits		TWA (8 hours)			STEL (15 mins)			Ceiling			
Ingredients:	List name	ppm	mg/m³	Other	ppm	mg/m³	Other	ppm	mg/m³	Other	Notations
Aluminum salt, as Al Methanol	OSHA PEL 1989 US ACGIH OSHA PEL OSHA PEL 1989	- 200 200 200	2 262 260 260		- 250 - 250	- 328 - 325	-		:		[A] [1]

[1]Absorbed through skin.

Notes: [A]as Al

Consult local authorities for acceptable exposure limits.

Only components of this product with established exposure limits appear in the box above.

If OSHA permissible exposure levels are shown above they are the OSHA 1989 levels or are from subsequent OSHA regulatory actions. Although the 1989 levels have been vacated the 11th Circuit Court of Appeals, Baker Hughes recommends that these lower exposure levels be observed as reasonable worker protection.

Recommended monitoring procedures

: If this product contains ingredients with exposure limits, personal, workplace atmosphere or biological monitoring may be required to determine the effectiveness of the ventilation or other control measures and/or the necessity to use respiratory protective equipment.

Engineering measures

: Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. Use explosion-proof ventilation equipment.

Hygiene measures

: Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Ensure that eyewash stations and safety showers are close to the workstation location. Take off contaminated clothing and wash before re-use.

Personal protection

Respiratory

: Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

Hands

: Chemical-resistant gloves: Nitrile or Neoprene gloves.

Eyes

: Wear chemical safety goggles. When transferring material wear face-shield in addition to

chemical safety goggles.

Skin

Wear long sleeves and other protective clothing to prevent repeated or prolonged skin contact.

9 . Physical and chemical properties

Physical state

: Liquid. [Hazv.]

Flash point

: Closed cup: 29.444°C (85°F) [SFCC]

Auto-ignition temperature

: Not available.

Flammable limits

: Not available.

Color Odor

: Light to medium amber.

Boiling/condensation point

: Alcohol-like. : Not available. : Not available.

Initial Boiling Point

: Not available. : Not available.

Melting/freezing point Relative density

: 1.065 (15.6°C)

Density Vapor density Odor threshold : 8.87 (lbs/gal) : >1 [Air = 1] : Not available.

3/21/2010.

RBW843

Physical and chemical properties 9 .

aporation rate

: Not available.

VOC

Not available.

Viscosity

: Dynamic (15.6°C): 13.8 cP

Solubility (Water)

: Soluble

Vapor pressure

: Not available.

Pour Point

: -37.2°C (-35°F)

Partition coefficient

: Not available.

(LogKow)

10. Stability and Reactivity

Chemical stability

: The product is stable.

Possibility of hazardous reactions

: Under normal conditions of storage and use, hazardous reactions will not occur.

Hazardous polymerization

: Under normal conditions of storage and use, hazardous polymerization will not occur.

Conditions to avoid

: Avoid all possible sources of ignition (spark or flame). Do not pressurize, cut, weld. braze, solder, drill, grind or expose containers to heat or sources of ignition. Do not

allow vapor to accumulate in low or confined areas.

Materials to avoid

: Reactive or incompatible with the following materials: oxidizing materials and reducing

materials.

Methanol is incompatible and may react with acetyl bromide, alkyl aluminum solutions, beryllium hydride, boron trichloride, nitric acid, cyanuric chloride, dichloromethane, diethylzinc, metals (granulated forms of aluminum and magnesium - including aluminum

and zinc salts), phosphorus III oxide, and potassium tert-butoxide.

Чazardous decomposition

oducts

: Under normal conditions of storage and use, hazardous decomposition products should

not be produced.

Conditions of reactivity

: Highly flammable in the presence of the following materials or conditions: open flames,

sparks and static discharge and heat.

11. Toxicological information

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
Aluminum salt	LD50 Oral	Rat	681 mg/kg	-
Methanol	LD50 Dermal	Rabbit	15800 mg/kg	-
	LD50 Oral	Rabbit	14200 mg/kg	-
	LD50 Oral	Rat	5600 mg/kg	-
	LC50 Inhalation	Rat	64000 ppm	4 hours
	Gas.			
	LC50 Inhalation Vapor	Mouse	50000 ppm	4 hours

Chronic toxicity Remarks

1) Methanol

Methanol is a component of this product. Because methanol is eliminated from the body more slowly than ethanol, it can have cumulative toxicity with repeated exposures (ACGIH, 1992).

Acute dermal, oral, and inhalation exposure to methanol can cause Central Nervous System effects, optic nerve effects. diminished vision, and brain effects (necrosis and hemorrhaging). (Bennett, I.L. et al. 1953)

Ingestion of methanol can cause Central Nervous System depression, metabolic acidosis, blurred vision and blindness, estrointestinal effects, and coma and death. (Clayton, G.D. and Clayton, F.E., 1982, Patty's Industrial Hygiene and icology, Vol2C) Dermal exposure to methanol can cause Central Nervous System depression, blurred vision, and gustrointestinal effects. (Downie, A et al, 1992, Occupational Medicine, 42, pp 47-9) Chronic inhalation of methanol can cause Central Nervous System depression, blurred vision, and gastrointestinal effects. (Frederick, L.J. et al. 1984, AIHA

11. Toxicological information

Journal, 45, pp 51-5) Chronic inhalation of methanol has caused liver effects in laboratory animals. (Poon, R et al, 1994, Toxocology and Industrial Health 10: 231-245) Chronic oral exposure has caused Central Nervous System effects and eye effects in laboratory animals. [Youssef, A. F. et al (1993) Neurotoxicology and Teratology 15: 223-227; Baumbach, G.L. et al (1977) Archives of Ophthalmology 95: 1859-1865; Hayreh, M.S. et al (1977) Archives of Ophthalmology 95: 1851-1858; Hayreh, M.S. et al (1980) Ocular toxicity of methanol: An experimental study – Raven Press, New York, pages 35-53; and Martin-Amat, G. et al (1977) Archives of Ophthalmology 95: 1847-1850]

Methanol has produced in vivo mutagenicity in animal studies. (Pereira, M.A. et al, 1982) and (Ward, J. B. et al, 1983)

Methanol was mutagenic in yeast (RTECS). Methanol has caused chromosome aberrations in yeast (RTECS) and grasshoppers (Saha & Khudabaksh, 1974).

Methanol has caused birth defects in rats exposed by the oral (Infurna et al, 1981) and inhalation (Nelson et al, 1984; Nelson et al, 1985) routes. Exencephaly (a defect in the skull bone structure that leaves the brain exposed) and cleft palate (a fissure or unformed bone structure in the roof of the mouth (palate), lip, or facial area, occurring during the embryonic stage of development) were increased in fetal mice exposed to methanol at an airborne concentration of 5,000 ppm or higher for 7 hours/day on days 6 to 15 of gestation.

Embryotoxicity and fetotoxicity were seen with maternal exposure to airborne concentrations of 7,500 ppm and above, and reduced fetal weights with concentrations of 10,000 ppm or greater. The NOAEL was 1,000 ppm. Effects similar to those seen in the 10,000 ppm dosage group were also seen in offspring of mice given a dose of 4 g/kg orally (Rogers et al, 1993).

2) Aluminum salt

Not available.

12. Ecological information

Aquatic ecotoxicity

Conclusion/Summary

: Not available.

Biodegradability

Conclusion/Summary

: Not available.

13. Disposal considerations

Waste disposal

: The generation of waste should be avoided or minimized wherever possible. Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe way. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Disposal of this product, solutions and any byproducts should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

Disposal should be in accordance with applicable regional, national and local laws and regulations.

Refer to Section 7: HANDLING AND STORAGE and Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION for additional handling information and protection of employees.

14. Transport information

14. Transport information

gulatory	UN number	Proper shipping name	Classes	PG*	Label	Additional information
DOT Classification	UN1993	FLAMMABLE LIQUID, N.O.S. (Contains: Methanol)	3	III		-
TDG Classification	UN1993	FLAMMABLE LIQUID, N.O.S. (Contains: Methanol)	3	III		-
IMDG Class	UN1993	FLAMMABLE LIQUID, N.O.S. (Contains: Methanol)	3	111		Emergency schedules (EmS) F-E S-D

PG*: Packing group

DOT Reportable Quantity Methanol, 2215 gal of this product.

Marine pollutant

Not applicable.

North-America NAERG

: 128

15. Regulatory information

HCS Classification

: Flammable liquid Irritating material

Target organ effects

U.S. Federal regulations

: United States inventory (TSCA 8b): All components are listed or exempted.

SARA 302/304/311/312 extremely hazardous substances: No products were found. SARA 302/304 emergency planning and notification: No products were found.

SARA 302/304/311/312 hazardous chemicals: methanol

SARA 311/312 MSDS distribution - chemical inventory - hazard identification: TRETOLITE™ RBW843 REVERSE BREAKER: Fire hazard, Immediate (acute) health

hazard, Delayed (chronic) health hazard

CERCLA: Hazardous substances.: methanol: 5000 lbs. (2270 kg);

Clean Water Act (CWA) 307: No products were found. Clean Water Act (CWA) 311: No products were found.

Clean Air Act (CAA) 112 accidental release prevention: No products were found.
Clean Air Act (CAA) 112 regulated flammable substances: No products were found.
Clean Air Act (CAA) 112 regulated toxic substances: No products were found.

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Clean Air Act Section 112(b) Hazardous Air Pollutants (HAPs) : Not listed

SARA 313

Product name

CAS number

Concentration

Supplier notification

: Methanol

67-56-1

10 - 30

United States inventory

: All components are listed or exempted.

(TSCA 8b)

anada

15. Regulatory information

WHMIS (Canada) : Class B-2: Flammable liquid

Class D-1B: Material causing immediate and serious toxic effects (Toxic).

Class D-2A: Material causing other toxic effects (Very toxic). Class D-2B: Material causing other toxic effects (Toxic).

Canada (CEPA DSL): : At least one component is not listed in DSL but all such components are listed in NDSL.

16. Other information

Label requirements

: FLAMMABLE LIQUID AND VAPOR. INHALATION CAUSES HEADACHES, DIZZINESS, DROWSINESS AND NAUSEA AND MAY LEAD TO UNCONSCIOUSNESS. CAUSES RESPIRATORY TRACT IRRITATION. MAY BE HARMFUL IF SWALLOWED. MAY CAUSE BLINDNESS IF SWALLOWED. MAY CAUSE EYE AND SKIN IRRITATION. PROLONGED OR REPEATED CONTACT MAY DRY SKIN AND CAUSE IRRITATION. CONTAINS MATERIAL THAT MAY CAUSE TARGET ORGAN DAMAGE. BASED ON ANIMAL DATA.

National Fire Protection Association (U.S.A.)

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Date of printing : 3/21/2010.

▼ Indicates information that has changed from previously issued version.

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