

**LIONSBACK**

# **DRINKING WATER SOURCE PROTECTION PLAN**

For the

Lionsback Master Planned Development Project

Sand Flats Road

Moab, Utah

Revision #1  
January 2010

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# PREFACE

## Title

The official title of this document is *Drinking Water Source Protection Plan for the Lionsback Master Planned Development Project*. For convenience the terms “*Lionsback Drinking Water Source Protection Plan*”, “*Lionsback DWSPP*”, or the “*Plan*” may be used when referring to this document.

## Introduction

The Lionsback development project is situated in an area where surface activities may have an effect on the underlying groundwater, referred to as the Glen Canyon Aquifer. This aquifer yields very high quality water and is the sole source of drinking water serving the residents of the City of Moab and outlying unincorporated areas.

The risk of a negative impact on the aquifer from the Lionsback development is very low. However, the City of Moab, as the land use authority and the public drinking water provider, and the owners/ developers of the Lionsback project have both recognized the need to mitigate risks attributable to the use and development of the project to the best extent practicable. The *Lionsback Drinking Water Source Protection Plan* is designed to identify potential risks and provide specific mitigation measures and requirements.

## Development and Approval

The *Lionsback Drinking Water Source Protection Plan* has been developed jointly by the Lionsback design team and the City of Moab. The format and content are based on the requirements of the Lionsback Pre-Annexation Agreement (2008), and information provided by the *GROUND WATER SOURCE PROTECTION USERS’ GUIDE* (Utah Division of Drinking Water, 2005). The *Plan* has been approved and adopted by the Moab City Council by Resolution, and the requirements of the plan are binding on the current and future owners of all or any part of the Lionsback development. The components of the *Plan* will be deemed to be included in the Lionsback Development and Phasing Agreement and enforceable by the City in the manner provided for in the Development Agreement. In addition, the *Plan* will be referenced in the Lionsback Homeowners Association Declaration of Covenants, Conditions and Restrictions and will be monitored and enforced by the Lionsback HOA.

## Revision History

It is anticipated that corrections and revisions to the *Lionsback Drinking Water Source Protection Plan* may be required as the development progresses. All changes to the document must be formally approved by the City of Moab and with each approved modification; a new version shall be prepared. Each revised version shall be identified by a number and date. (e.g. Revision #1, January 2010)

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## PLAN SUMMARY

The Lionsback Master Planned Development project, (referred to as the “Lionsback Development”, the “Development”, or the “project”) is situated in an area where surface activities could potentially have an effect on the public drinking water supply for the City of Moab. The proposed development will involve some temporary and permanent activities and land uses that are considered to be a Potential Contamination Source (PCS). After careful study, the City determined that the threat of contamination from the proposed development is very low; however the City of Moab and the Developer have agreed that protective measures should be implemented in connection with the build-out of the Development to further minimize threats to the aquifer.

This document, *Lionsback Drinking Water Source Protection Plan*, (referred to as the “Lionsback DWSPP” or the “Plan”), has been developed for the primary purpose of identifying all possible potential contamination sources associated with the Development and establishing appropriate mitigation measures. The Lionsback DWSPP is specific to the development site and the associated improvements. The plan is *supplemental* to all other general drinking water source protection requirements that exist in City, County, State, and Federal regulations. Conformance with the Lionsback DWSPP is required for all activities and uses that occur on the project site, and are associated with the Development.

The Plan provides an explanation of how contamination of the aquifer could potentially occur, and the term *potential contamination source (PCS)* is defined and the concept explained. This background information should enable all plan users to gain a basic understanding of the groundwater protection issues associated with the project site.

The plan contains an inventory of all existing and future PCS’s anticipated for the Lionsback project and indentifies the specific mitigation measures that will be employed to minimize the small risk presented by the development. The primary responsibility for implementation, monitoring and maintenance of mitigation measures will initially be that of the Developer and the responsibility will be transferred to the Homeowners Association as the project is built out.

Chapters specific to the Infrastructure Construction phase and the Building Construction phase have been included that cover these activities in detail. Each chapter outlines the possible contamination sources anticipated and describes the specific mitigation measures that will be implemented. For each type of construction; individual roles and



responsibilities are specified and enforcement authorities and procedures are established.

In Chapter 8, the plan addresses the long term management and control of the ongoing potential contamination sources associated with the development. The planned management strategy includes measures such as design controls, special requirements, construction protocols, prohibited practices, maintenance requirements, and education. Procedures for periodic evaluation and updates to the overall plan have been included to ensure that the mitigation measures continue to be effective in their implementation and maintenance.

## How to Use This Plan

It is important that all parties who are required to comply with this plan understand their roles and responsibilities in the implementation of the overall mitigation plan. The plan has been broken down into Chapters and Sections to assist all plan users in quickly locating the information necessary for them to perform their roles. Some provisions of the plan apply only to specific parties, or persons engaged in specific activities. The following paragraphs should prove helpful in determining your role.

### **If you are a representative of the project Developer:**

You should become familiar with the entire plan as you play a key role in the monitoring and enforcement of many elements of the plan, especially if you have been assigned the role of Designated Person.

### **If you are a contractor performing infrastructure improvements (grading, roads, utilities) work on the project:**

You should read through Chapters 1 – 5, which provide information applicable to everyone, and you should become very familiar with Chapter 6, which outlines your specific responsibilities and provides detailed information on submittals, procedures, specific requirements, and record keeping.

### **If you are a contractor performing building construction work or site improvements on an individual lot within the Development:**

You should read through Chapters 1 – 5, which provide information applicable to everyone, and you should become very familiar with Chapter 7, which outlines your specific responsibilities and provides detailed information on submittals, procedures, specific requirements, and record keeping.

### **If you are the owner of an individual lot or unit within the development:**

You should read through Chapters 1 – 5, which provide information applicable to everyone, and you should become very familiar with Chapter 8, which covers mitigation measures that will apply to you.

### **If you are a representative of the Homeowners Association:**

You should become familiar with the entire plan as you play a key role in the monitoring and enforcement of many elements of the plan. Chapter 8 covers the HOA's specific roles and responsibilities.

**If you are a concerned citizen not directly involved in the Development in some manner:**

Chapters 1 - 5 provide a good overview of the overall mitigation plan for the Development. If you are interested in detailed requirements of the plan that apply to specific activities, refer to Chapters 6 – 8

## CHAPTER 1

### ADMINISTRATION

#### **Section 101 Applicability**

The provisions of this plan shall apply to all property owners and all activities associated with the Lionsback Development occurring on the project site. The plan applies to both permanent uses, such as the use and occupancy of a dwelling unit; and temporary uses such as construction activities and special events. Covered activities include but are not limited to the following: construction activities such as site grading, underground utility work, road construction, and building construction; landscaping, activities associated with residential uses such as painting, yard maintenance, car washing, and similar activities.

#### **Section 102 Designated Person**

Upon approval and adoption of this plan, by action of the City Council, the Developer shall designate a responsible party for the purposes of implementation and conformance with this plan (referred to as: the “Designated Person”). The Developer’s Designated Person must be someone who has the authority to direct activities on the site and must be able to be contacted within a reasonable amount of time. The assignment of the Designated Person shall be in writing submitted in accordance with Section 103. The designees may be changed over the course of the project; however any change will not be effective until the City receives a letter from the Developer requesting a change of designees.

#### **Section 103 Submittal Requirements**

**103.1 Initial Submittals** – Within 60 days following Council’s approval of this plan, the Developer shall submit to the City Public Works Director (with copies to the City Planning and Engineering Departments) a letter designating one person as Designated Person and one person as an alternate contact.

**103.2 Additional Submittals** – Further submittals providing specific information for particular activities will also be required. Information regarding the content, timing, and procedure for additional submittals can be found in the corresponding section of Chapters 6, 7, or 8 as applicable.

#### **Section 104 Review and Approval Procedures**

Procedures for the review and approval of required submittals are detailed in the corresponding sections of Chapters 6, 7, & 8.

## **Section 105**

### **Maintenance & Record Keeping**

All required mitigation measures and practices implemented on site shall be maintained or replaced as necessary to ensure that they function as intended. All mitigation measures shall be inspected on a regular periodic basis by the Designated Person. The appropriate length of time between inspections will vary depending on the actual measure and the nature of the hazard that is being mitigated, but in no case shall the time period between inspections exceed 30 days. For every round of inspections an inspection report shall be completed by the Designated Person on a standardized form. Copies of all inspection reports shall be retained by the Designated Person and made available to City or Building Department staff upon request. Records will be available for a period of 30 days following the termination of the particular mitigation measure or 90 days following the date of the inspection; whichever comes first.

## **Section 106**

### **Enforcement Provisions**

**106.1 Enforcement Entities** - All requirements of this Plan are enforceable by the City of Moab, the Building Official, the Developer, and/or the Lionsback Homeowners Association as applicable.

**106.2 Stop Work Order** - In the case of the City and the Building Department, compliance with the requirements of this plan may be enforced by the issuance of a Stop Work Order. If a Stop Work Order is issued, the Designated Person shall be notified in writing and a brief description of the violation will be provided. When the violation has been corrected to the satisfaction of the enforcing authority, the Stop Work Order shall be withdrawn and the work may proceed.

## CHAPTER 2

### DEFINITIONS

#### Section 201

##### General

For the purposes of interpreting and enforcing this Plan, the follow words or phrases shall have the meaning ascribed to them in this Chapter

#### Section 202

##### Definitions

**Building construction:** All construction activities associated with the construction of a building or other structure. Building construction includes only that site work (earthwork, utilities, surface improvements, etc.) directly associated with the building or structure. Building construction does not include site work intended to serve multiple buildings, or the entire development.

**Building Official:** The officer or other designated authority charged with the administration and enforcement of the building code, or a duly authorized representative.

**Contaminant:** An undesirable substance not normally present, or an unusually high concentration of a naturally occurring substance, in water or soil.

**Contamination:** The degradation of natural water quality as a result of man's activities.

**Designated Person:** The person appointed by the Developer, the Contractor, and/or the Homeowners Association to be the primary contact for all groundwater protection issues and who is responsible for the conformance with the provisions of this plan.

**Developer:** The Lionsback Development Company, LLC, their successors and assigns.

**DWSP program:** The program to protect drinking water source protection zones and management areas from contaminants that may have an adverse effect on the health of persons.

**DWSP Zone:** The surface and subsurface area surrounding a groundwater source of drinking water supplying a Public Water System, through which contaminants are reasonably likely to move toward and reach such groundwater source.

**Homeowners Association or HOA:** The duly created Lionsback Homeowners Association. (see also Property Owners Association)

**Infrastructure construction:** All construction activities associated with improvements that serve the project as a whole and not just an individual building. Includes grading, utility work, road construction, irrigation systems, and similar.

**Lionsback DWSPP or Plan:** This document.

**Management Controls:** Any action, other than structural mitigation measures, intended to mitigate the hazards associated with a potential contamination source. (Examples: educational brochures, contingency plan, policy prohibiting the use of herbicides or pesticides)

**Potential contamination source (PCS):** Any facility or activity that may potentially contaminate ground water.

**Project Site:** All land area included in the boundaries of the Lionsback Development.

**Property Owner:** Any record owner of real property located within the Lionsback development.

**Property Owners Association:** (see Homeowners Association)

**Source protection area:** see DWSP Zone

**Structural Mitigation Measure:** Physical mitigation measures such as fencing, containment areas, or similar. Term used to differentiate from non-physical mitigation measures such as education.

**Wellhead:** The physical structure, facility, or device at the land surface from or through which groundwater flows or is pumped from subsurface, water-bearing formations.

## CHAPTER 3

### DRINKING WATER SOURCE PROTECTION

#### Section 301

##### General

Public drinking water systems obtain the water that they provide to users from springs, wells, reservoirs, and/or rivers referred to as *sources*. State and federal regulations require that public drinking water systems protect their drinking water sources from degradation to the quality of the water it produces. The appropriate protective measures vary widely depending on whether the source is surface water or ground water, the location of the source, and many others. Protective measures come in many different forms and can be non-structural (such as land use ordinances, public education, etc.) or structural (such as fencing around wells & springs, enhanced requirements for sewer pipelines, containment areas for hazardous materials, etc.) In all cases the goal is to eliminate or minimize the risk of contamination of the source.

#### Section 302

##### Contamination Process Described

**302.1 Hydrogeologic Setting** - The Glen Canyon Aquifer is considered to be an unprotected aquifer. This means that no impervious layer (thick layer of clay, shale, or unfractured bedrock) is present between the ground surface and the ground water level that would prohibit surface water from percolating down to the aquifer. In addition, the rock formations that make up the aquifer (primarily the Navajo sandstone) are known to be highly fractured. Fractures (cracks or joints in the rock) can provide an easy route for water to flow through the bedrock. Therefore, the Glen Canyon Aquifer is described as *an unprotected, fractured bedrock aquifer*. This means that any liquid or dissolvable material present on the ground surface could flow downward to the aquifer with little or no filtering. Due to this “hydrogeologic setting”, the City has designated most of the land surface above the aquifer as a Drinking Water Source Protection Zone.

**302.2 Ingredients Required for Contamination** – There are four ingredients required for contamination of the aquifer to occur. There must be: 1) *A contaminant*, a substance that is hazardous to human health if present in drinking water. A list of the 87 drinking water contaminants currently identified by the EPA is provided in Appendix D.; 2) *a sufficient quantity* of the contaminant to cause elevated concentrations in the aquifer. (The amount that constitutes a significantly quantity varies greatly depending on the nature of the contaminant); 3) *a release* of the contaminant onto the ground surface or subsurface. Releases can be intentional (in the case of application of insecticides, herbicides, fertilizers, etc) or unintentional (in the case of leaking storage tanks, leaking sewers, spilled materials, etc.); and 4) *a method of transport* for the contaminant to be carried down to the saturated part of the aquifer (typically infiltrating rainwater,



snowmelt, or the contaminant itself if it is a large amount of liquid). This “ingredient list” is somewhat of an oversimplification, however these four ingredients are found in 95%+ of all contamination occurrences; and the concept is very useful in understanding and identifying potential contamination sources.

## **Section 303**

### **Potential Contamination Sources**

**303.1 Definition** – The State of Utah Division of Drinking Water defines a potential contamination source as:

*“...any facility or site that employs an activity or procedure that may potentially contaminate ground water; **and** a hazardous substance is usually associated with the procedures employed at the facility.”*

In other words a *potential contamination source* will have some or all of the ingredients described in the previous paragraph, usually Ingredients 1 and 2. Two examples of PCS’s are provided below.

Example 1: Dry Cleaners. The process used to dry clean fabrics requires the use of many chemical compounds. Many of by-products of these chemicals are drinking water contaminants. In addition, a busy dry cleaner will require the storage of sufficient quantities of these hazardous substances to cause concern. (Ingredients 1 & 2) If the chemicals are stored, used, and disposed of properly, contamination should not occur. However, if the chemicals are improperly stored, improperly disposed, or are otherwise mishandled, ingredients 3 and 4 can develop and a contamination hazard now exists. Therefore the facility, the dry cleaning business, is considered a PCS due to the hazardous substances associated with it.

Example 2: Active or Abandoned Wells. Wells, especially water wells, provide a direct conduit to the groundwater aquifer (Ingredient #4). Well equipment such as submersible pumps may contain potential contaminants such as lead or mercury that under sealed within the pump housing. (Ingredient #1) A corroding well pump can cause these materials to be release. Wells that are constructed, operated, maintained and secured properly present minimal risk. Wells that were improperly constructed and/or have not been properly maintained can result in the development of Ingredients 2 and 3. In addition wells provide such a direct conduit to the aquifer that they warrant special attention. There are many instances where a contaminant plume has been traced to an abandoned well. Therefore wells are considered a PCS because of the direct access to the aquifer that they provide.

**303.2 Managing PCS’s** - Any PCS located within a drinking water source area should be managed and controlled to reduce or eliminate the hazard. In order to manage the PCS, its location and properties must be known. All public drinking water systems

within Utah are required to maintain an inventory of all PCS's that are located within the protection zone.

**303.3 The Lionsback PCS Inventory** - The State of Utah Division of Drinking Water (DDW) has compiled a list of 59 PCS's that public drinking water systems should monitor. This list is attached as Appendix E. On the basis of the DDW list, together with the Phase I Environmental Assessment report, a site specific inventory of existing and future PCS's was compiled as shown in Tables 303.1 and 303.2 shown below and on the next page.

**TABLE 303.1:** Inventory of Existing PCS's for Lionsback Development

Name of PCS	PCS No. in DDW Guidance	Identified Hazards
Roadways – Sand Flats Rd. and Hells Revenge Rd.	#39	Hydrocarbons from leaking fluids, de-icing salts & chemicals, transport of hazardous materials
Water well	#1	Possible corroded submersible pump, direct conduit to groundwater

**TABLE 303.2:** Inventory of Future PCS's for Lionsback Development

<b>Name of <i>possible</i> PCS</b>	<b>PCS No. in DDW Guidance</b>	<b>Identified Hazards</b>
Roadways – Sand Flats Rd. and Hells Revenge Rd. and internal roads & parking lots serving development	#39	Hydrocarbons from leaking fluids, de-icing salts & chemicals, transport of hazardous materials
Water well	#1	Possible submersible pump, direct conduit to groundwater
Sewer system serving project including mains, service connections, manholes, and pumping stations	#43	Domestic wastewater
Residential pesticide, herbicide, and fertilizer storage and use.	#37	Pesticides, herbicides, and fertilizers, and/or their by-products.
Car wash area planned for Phase 4.	#6	Accumulated concentrations of hydrocarbons, salts, concentrated cleaning products and similar

## CHAPTER 4

### MANAGEMENT PLAN FOR EXISTING POTENTIAL CONTAMINATION SOURCES (PCS'S)

#### Section 401

##### General

This chapter covers the interim period from adoption date of the plan to the start of construction activities. The chapter includes only the management of PCS's that currently exist on the site. The management plan for future PCS's associated with the development activities is covered in Chapters 5 – 8.

#### Section 402

##### Existing PCS's

Two PCS's currently exist on the project site (See Table 303.1). They are:

1. The existing water well located near the existing building the in north-central portion of the site, and
2. The existing public roads traversing the site (Sand Flats Road and Hells Revenge Road).

#### Section 403

##### Preconstruction Controls

**403.1 Existing Water Well** - The well is of fairly recent construction (2001) and likely was cased and sealed in accordance with current requirements. The well will be inspected to verify that the annular space was sealed with grout, and that the wellhead is fitted with a locking cover. If these measures are not in place and cannot be safely retrofitted, the well will be abandoned in accordance with state regulations. If the grout seal and locking cover are in place, the area located within a 100-ft radius of the well will be kept clear of any parked vehicles, construction materials and waste materials of any type. With the described measures in place, the well, as a PCS, is considered adequately controlled. To ensure that the well continues to be adequately controlled, the Designated Person will inspect the existing well on a quarterly basis to make sure that the well pump is in operational condition and that the wellhead remains secured. Repairs will be made as necessary to maintain a secure wellhead.

**403.2 Existing Public Roads** – Sand Flats Road and Hells Revenge Road have been designated by Grand County as a Class B, and Class D county road respectively. As designated public roads there is a public right-of-way associated with each. The Lionsback Development exercises no control over the management of the roads and the roads have not been addressed in this plan. The Developer/Owner has installed a right-

of-way fence along each side of Hells Revenge road to eliminate the off road travel that used to occur.

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## **CHAPTER 5**

### **MANAGEMENT PLAN FOR FUTURE POTENTIAL CONTAMINATION SOURCES (PCS's)**

#### **Section 501**

##### **General**

This chapter outlines the management plan for the control of all PCS's associated with the development in general terms. Specific mitigation controls for each identified PCS will be covered in more detail in Chapters 7, 8, and 9.

#### **Section 502**

##### **Temporary PCS's**

Construction activities, both infrastructure and building construction, typically involve the use of some potential groundwater contaminants such as fuels, lubricants, adhesives, and finishes. The Division of Drinking Water does not include construction activities on their PCS list because the quantities of the contaminants are usually small and the duration of the activity is relatively short. However, given the relatively large scale of the Lionsback project and the anticipated duration of construction activities, the cumulative effects could occur. Therefore mitigation measures will be implemented for all construction activity. Detailed descriptions of the planned mitigation are found in Chapters 6 & 7.

#### **Section 503**

##### **Future PCS's**

Three new PCS's have been identified for the planned Lionsback development. Together with the two existing PCS's that will remain, there will be five future PCS's. These five PCS's are listed in Chapter 3, Table 303.2, and have been repeated below for convenience.

1. Roads – Sand Flats Rd. and Hells Revenge Rd. and all internal roads & parking lots serving development
2. Water well
3. Sewer system
4. Use of residential pesticides, herbicides and fertilizers
5. Centralized car wash area

#### **Section 504**

##### **Construction Controls and Long Term Measures**

It is the objective of the Developer to minimize or eliminate all hazards to the quality of the groundwater. Several controls for the protection of the groundwater have been built

into the actual design of the project. These built-in controls include the following:

Built-in Controls

- An overall site layout that accomplishes the desired density with minimal disturbance of the existing site,
- Extension of the city sewer system to the project as opposed to using on-site wastewater systems such as septic systems,
- A design that preserves all of the existing natural drainages on the site and eliminates the need for stormwater detention or retention areas where contaminants could accumulate, and
- Development of a site landscape design and landscaping standards that promote the use of disease resistant, low water plants and severely restrict lawns to minimize the need to use herbicides, pesticides, and fertilizers.

These and other similar features of the proposed development will minimize or eliminate some of the potential contamination sources that would usually be associated with more conventional developments.

All potential contamination sources cannot be eliminated by design alone. The site and proposed development plan have been carefully evaluated to identify all potential contamination sources. This inventory process is described in more detail in Chapter 3.

Each potential contamination sources identified will be mitigated through the use of management controls. A listing of the major management controls that will be implemented is provided below. Further detail on the implementation of the management controls can be found in Chapters 6, 7, and 8.

Management Controls

- Road salt or other de-icing chemicals will not be used on the development's private roads.
- Information intended to educate and raise awareness of the groundwater issue will be distributed to future home owners on a regular basis.
- The Homeowners Association will sponsor periodic household hazardous waste collection events to prevent the accumulation of unwanted pesticides, herbicides, stains & varnishes, heavy duty cleaners, and similar.

It has been determined that the risk of groundwater contamination due to the activities and uses associated with the development is very low. However, the Owner and subsequently the Homeowners Association will treat any and all potential contamination sources as if they were a major threat.

## CHAPTER 6

### INFRASTRUCTURE CONSTRUCTION REQUIREMENTS

#### Section 601

##### General

This chapter covers the specific contamination hazards and mitigation controls for infrastructure construction only. Any and all contractors involved in infrastructure construction should also read Chapters 1 – 3 in detail.

#### Section 602

##### Developer's Responsibilities

The Developer will be responsible for ensuring compliance with the provisions of this plan throughout the development process. All contractors bidding on the infrastructure work will be alerted to the sensitive nature of the site and requirements of this plan. The Developer is responsible for ensuring that the Contractor has submitted all required materials and received all necessary sign-offs prior to any work being performed on the project site.

#### Section 603

##### Contractor's Responsibilities

The Contractor shall be responsible for reading and understanding this plan and maintaining a copy of the plan on the job site at all times. The Contractor shall assign one Designated Person who will be the primary contact for the City and the Building Department. The Contractor's Designated Person will be responsible to see that all required submittals, sign-offs, site controls, and other measures required by this plan are completed, approved, and maintained in proper condition as applicable.

#### Section 604

##### Submittals

The following submittals shall be required of all Contractors performing any type of infrastructure work on the project. The submittal sign-off procedure is described in the Section 605.

1. DWSP Site Plan

- This shall be a simple plan showing the designated location of vehicle and equipment parking areas; material staging areas; storage area for fuel, lubricants, and all other fluids; trash dumpsters, and toilet facilities. (The plan should be as simple as possible, while still showing all required information.)



2. Sewer Pipe and Manhole Information

- Provide information on the source and exact type of pipe material to be used for all sewer lines.
- Provide shop drawings of all sewer manholes to be used.
- Provide shop drawings for all sewer pumping stations.
- Provide a construction schedule for the installation of all water and sewer mains associated with the project. (The schedules should include both an overall timeline and a more specific description of the work to be completed in the next three weeks. An updated schedule shall be submitted as necessary).

3. Spill Action Plan

- A spill action plan may be required depending on the Contractor's specific work activities and materials. If an action plan is required, it shall include pertinent contact information, MSDS sheets for material of concern, and a brief narrative of spill protocol. A simple plan template will be provided by the City Engineer.

## **Section 605**

### **Sign-off Procedures**

**605.1 Developer's Review** - Prior to the start of any construction activities, the Contractor shall provide all submittals to the Developer. Developer will perform an initial review of the submitted materials to ensure that the submittal package is complete and appears to be in conformance with this plan. The purpose of this initial review is to make the City review as efficient as possible.

**605.2 City Review** – Upon completion of the Developer's review, the package is to be submitted to the City Engineer. The City Engineer will not accept the submittal package until it has been reviewed and approved by the Developer. The City Engineer will review and take action on the submittal within a reasonable time period. Upon approval, a copy of the submittal package bearing a stamp of approval will be returned to the Developer and the Contractor, after which the Contractor may proceed with construction activities, *provided that all other necessary approvals such as grading permits, building permits, and similar* have been obtained. In the event that the City Engineer determines that all materials are not in compliance, those portions that are in compliance will be approved. The non-compliant submittals will be returned with written direction provided.

## **Section 606**

### **Potential Contamination Sources Identified**

There are two PCS's associated with infrastructure construction that have been identified:

**606.1 Sewer system** – The project sewer system is considered a PCS because leaks in the system could eventually lead to contamination. The sewer system is not a risk until it is put into service, however proper materials, careful installation, and thorough testing are the best defense against future leaks. Therefore the sewer system is addressed in this chapter.

**606.2 Fuels, lubricants, and other contaminants typically associated with construction** - Construction activities, both infrastructure and building construction, typically involve the use of materials such as fuels, lubricants, cleaning products, which can produce contaminant by-products. The Division of Drinking Water does not identify construction activities as a significant PCS because the quantities of the contaminants are usually small and the duration of the activity is relatively short. However, given the relatively large scale of the Lionsback project and the anticipated duration of construction activities, the cumulative effects could be significant.

## **Section 607**

### **Required Mitigation Measures**

The following mitigation measures are required:

**607.1 Mitigation for Sewer System** – All portions of the sewer system shall be constructed in conformance with the State of Utah, Department of Environmental Quality rules for sewer lines installed in drinking water source protection areas. The rules current at the date of this plan are provided below. In the event that the State rules are amended, whatever rules are current at the start of project construction shall be followed.

- a) Sewer lines both mains and service connections shall be ductile iron pipe with mechanical joints or fusion welded high density polyethylene plastic pipe (solvent welded joints shall not be accepted);
- b) Lateral to main connection shall be accomplished with shop fabricated full body wye fittings;
- c) The sewer pipe to manhole connections shall be made using a shop-fabricated sewer pipe seal-ring cast into the manhole base (a mechanical joint shall be installed within 12 inches of the manhole base on each line entering the manhole, regardless of the pipe material);
- d) Sewer pipe shall be laid with no greater than 2 percent deflection at any joint;
- e) Trench backfill shall be compacted to not less than 95 percent of maximum laboratory density as determined in accordance with ASTM Standard D-690;
- f) Sewer manholes shall meet the following requirements:
  - (i) The manhole base and walls, up to a point at least 12 inches above the top of the upper most sewer pipe entering the manhole, shall be shop-fabricated in a single concrete pour.

- (ii) The manholes shall be constructed of reinforced concrete.
- (iii) All sewer lines and manholes shall be air pressure tested after installation.
- g) Structures used in sewer lift stations shall be limited to manhole type structures that comply with the above provisions.

**Exception:** The provisions of paragraph 607.1 are not intended to prevent the use of materials or methods that are superior to those stipulated with respect to leak prevention. An alternative material or method may be approved by the City Public Works Director *at his discretion* provided that sufficient evidence documenting the superior performance of the proposed material or method is provided, and the City Engineer concurs.

**607.2 Mitigation for fuels, lubricants, and other contaminants associated with construction** – Methods of work and jobsite conditions shall comply with the following provisions:

- a) Fuel, lubricants, and other contaminants should be stored and handled offsite if reasonably practicable.
- b) If contaminants are stored on site, they must be located within a designated containment area. The containment area should be located on fairly level ground, lined with heavy duty plastic sheeting covered with sand, and surrounded by a berm at least 12” high.
- c) The volume of hazardous fluids stored on site shall never exceed 500 gallons aggregate total.
- d) All contaminants must be stored in durable water-tight containers when not being used.
- e) When a container is emptied it must be removed from the site within 24 hours. Empty containers shall be disposed of in accordance with all applicable regulations.

## **Section 608**

### **Record Keeping**

All structural mitigation measures must be maintained in good condition at all times. Contractor shall comply with all record keeping provisions specified in Chapter 1.

## **Section 609**

### **Contingency Plan**

If a spill action plan is required (See Section 604), the Contractor shall provide a copy to all personnel working on site. The contingency plan should be clearly explained to all personnel and a copy of the contingency plan must be posted near the containment area.

## CHAPTER 7

### BUILDING CONSTRUCTION REQUIREMENTS

#### Section 701

##### General

This chapter covers the specific contamination issues and mitigation controls for building construction only. Any and all contractors involved in building construction should also read Chapters 1 – 3 in detail.

#### Section 702

##### Design Review Committee Responsibilities

The Design Review Committee is an entity that will be created by the Owner and/or HOA for the purpose of enforcing design guidelines for all buildings on the project. Since this committee performs a complete review of building plans, it is logical that the committee play a role in ensuring conformance to this plan. The Design Review Committee will be responsible for ensuring compliance with the provisions of this plan for all building activities conducted on the project site. The committee shall provide all builders a copy of this plan and explain the applicable sections.

#### Section 703

##### Contractor Responsibilities

The General Contractor shall be responsible for reading and understanding this plan and maintaining a copy of the plan on the job site at all times. The General Contractor shall assign one staff member as the Designated Person who will be the primary contact for the City, the Building Department, and the Homeowners Association if applicable. The General Contractor shall be responsible for compliance with all specific requirements of this chapter, and all other applicable provisions of this plan, by all personnel including Sub-Contractors.

#### Section 704

##### Submittals

Prior to the start of any building activity on any lot or parcel the following submittals shall be required of all Contractors performing any type of building work or site work directly associated with a particular building. The sign-off procedure shall be as described in this Chapter.

1. Site Housekeeping

- a) A housekeeping site plan showing the designated location of vehicle and equipment parking areas; material staging areas; storage area for all job

site fluids such as paints, stains, cleaning products, solvents, and similar; trash dumpsters, and temporary toilet facilities.

2. Building Sewer

- a) Information on the source and exact type of pipe material to be used for all exterior sewer lines.
- b) Plan drawing showing the location and depth of the sewer service stub to the property, the proposed alignment of the building sewer, the location of all planned cleanouts, and the general alignment of all other underground utilities.
- c) Detail drawing showing how the proposed connection of the building sewer to the stubbed service line.
- d) Approximate timeline for the installation of the building sewer and connection to the sewer main.
- e) Name and license information for Subcontractor who will be performing the site utility work.

**Section 705**

**Sign-off Procedures**

The review and approval procedure for the required submittals is a two step process outlined as follows:

**705.1 Initial Review** - The Contractor shall provide all required submittals to the Lionsback Design Review Committee. The committee shall perform an initial review of the submitted materials to ensure that the submittal package is complete and appears to be in conformance with this plan. The committee shall return the package to the Contractor with a brief letter stating that the package was found to be compliant, or if not compliant, a list of items that need to be added or changed.

**705.2 City Review** – Upon completion of the initial review by the Committee, the Contractor shall make any changes or add additional materials as necessary in response to the Committee’s comments. The Contractor shall then provide a copy of the submittal package to the City of Moab Public Works Director. The City will not accept the submittal package until it has received initial review per paragraph 705.1. The Public Works Director or his authorized staff will review the submittals for conformance with this plan, and accepted design practices. The Public Works Director may, at his discretion, require modifications to the design based on the specific facts and circumstances. Upon approval, a copy of the submittal package bearing a stamp of approval will be returned to the Contractor. A building permit will not be issued until the Public Works Director has reviewed and approved the submittal package.

**Section 706****Potential Contamination Sources Identified**

The building sewer connection is the only PCS associated with building construction that has been identified. Most contaminant containing products that were used in the past on residential construction sites have been phased out and replaced with safer products. Studies have confirmed that residential construction and demolition waste can be considered inert, which is why such waste is still permitted to be disposed of in unlined landfills.

**706.1 Building Sewer Connection** – Service connection sewer lines are more likely to develop leaks than sewer mains. Leaks are often the result of poor installation and backfilling practices; the use of improper materials; interference from trees, foundations, and other buried utilities; and similar causes. A leak may not develop until months or even years after the installation, but the cause of the leak usually originates from the installation. Proper materials, careful installation, and thorough testing are the best defense against future leaks.

**Section 707****Required Mitigation Measures**

The following mitigation measures are required:

**707.1 Mitigation for Sewer System** – All building sewer lines within the project shall be constructed in conformance with the following provisions:

- a) Pipe material shall be ductile iron pipe with mechanical joints or fusion welded high-density polyethylene plastic pipe (solvent welded joints shall not be accepted).
- b) Pipe shall be carefully bedded using small competent material with a maximum particle diameter of  $\frac{3}{4}$ ".
- c) Sewer pipe shall be laid with no greater than two percent deflection at any joint.
- d) Pipe trenches must be inspected and approved by the Building Official or Public Works Director prior to the placement of any backfill.
- e) Trench backfill shall be compacted to not less than 95 percent of maximum laboratory density as determined in accordance with ASTM Standard D-690;
- f) Provisions shall be made so that the building sewer, (with the exception of the final joint(s), can be pressure tested after the pipe is backfilled..

**Section 708**

**Record Keeping**

Contractor shall retain copies of all reports for compaction testing of sewer trench backfill and pressure testing of building sewer line.

**Section 709**

**Contingency Plan**

Not required.

## CHAPTER 8

### PROPERTY OWNERS' REQUIREMENTS

#### Section 801

##### General

This chapter covers the specific contamination issues and corresponding mitigation controls associated with the long term uses planned for the development; specifically single and multi-family residences and typical resort type activities. This chapter is applicable to the Developer, individual property owners, Homeowners Association, resort staff, and guests.

#### Section 802

##### Developer Responsibilities

The Developer is assigned the following responsibilities by this plan:

1. The assignment of an individual to act as Designated Person for all matters pertaining to groundwater contamination; (see also Section 103)
2. The compliance of all unplatted future phases, platted but unsold lots, and all common parcels that have not yet been officially accepted by the Lionsback Homeowners Association;
3. All responsibilities assigned to the Homeowners' Association, until such time as the association becomes an effective body politic, has held at least one annual meeting, and has assigned a Designated Person as defined herein;
4. The periodic evaluation and update of this plan as outlined in Chapter 9;
5. The reporting, to the City Public Works Department, of any situation, intentional or otherwise, that has the potential to cause groundwater contamination; and
6. All submittals specified in Section 805.

#### Section 803

##### Homeowners Association Responsibilities

The HOA is assigned the following responsibilities by this plan:

1. The assignment of an HOA officer to serve as the Designated Person for all matters pertaining to groundwater protection; (see also Section 805)
2. The compliance of all property within the development, including common and individually owned parcels, except for property still under the ownership of the Developer;
3. The preparation and updating of a list of commonly available residential herbicides and pesticides that may be used by property owners.



4. The annual distribution of groundwater protection information to all property owners.
5. The performance of required maintenance for the common car wash facility, and keeping records of such maintenance for a period of two years to be made available to City upon request.
6. The periodic evaluation and update of this plan as outlined in Chapter 9.
7. The reporting, to the City Public Works Department, of any situation, intentional or otherwise, that has the potential to cause groundwater contamination.

#### **Section 804**

##### **Property Owner (Individual) Responsibilities**

Individual property owners are assigned the following responsibilities by this plan:

1. Educating themselves about groundwater quality protection through the reading of this document and any other information publically available.
2. The use of only those pesticides and herbicides approved by the Homeowners Association and the proper storage and disposal thereof.
3. The proper use of all stains, paints, sealers, preservatives, and similar liquids; and the proper storage and expedient disposal thereof;
4. The reporting, to the City Public Works Department, of any situation or activity, intentional or otherwise, that has the potential to cause groundwater contamination.

Any owner of real property located within the Lionsback Development shall be responsible for compliance, on the part of themselves, their guests, and anyone performing services on their property. Owners should bear in mind that the purpose of this plan is to protect the quality of the Moab's drinking water, including the water that supplies the Lionsback Development.

#### **Section 805**

##### **Submittals**

The submittals required by this chapter are outlined in the following table.

**TABLE 805.1:** Submittals Required by Chapter 8

<b>Party(s) Responsible</b>	<b>Description of Submittal</b>	<b>Submitted to:</b>	<b>Due Date/ Frequency</b>
Developer	Letter with name and contact information for Developer's <u>Designated Person</u>	City Engineering Department	Any time there is a change in the designee.
Developer	Map showing all <u>recorded</u> lots and tracts with Record Owner of each parcel identified.	City Engineering Department	Submit annually by January 31, starting the 1 <sup>st</sup> calendar year following the approval of the first Final Plat
Developer	Operation & Maintenance plan covering all watershed protection measures to be implemented with the central car wash facility.	Building Department	One time submittal required prior to a Certificate of Occupancy for car wash structure.
Developer	Letter notification of any common parcels that have been turned over to the HOA, together with the HOA's written acceptance of such parcel.	City Engineering Department	Any time common parcels are officially turned over to the HOA.
Property Owner (Individual)	None	NA	NA
Homeowners Association	Letter with name and contact information for <u>Designated Person</u>	City Engineering Department	Any time there is a change in the designee.
Homeowners Association	Letter verifying the annual distribution of informational materials to all property owners. A copy of the distributed materials shall be included.	City Engineering Department	Submit annually by February 15.

**Section 806****Potential Contamination Sources Identified**

The PCS's that will continue after the completion of construction were identified previously in Table 303.2. The table is copied below for convenience. Following the table, each PCS is described in more detail.

**TABLE 303.2:** Inventory of Future PCS's for Lionsback Development

<b>Name of <i>possible</i> PCS</b>	<b>PCS No. in DDW Guidance</b>	<b>Identified Hazards</b>
<u>Roadways</u> – Sand Flats Rd. and Hells Revenge Rd. and internal roads & parking lots serving development	#39	Hydrocarbons from leaking fluids, de-icing salts & chemicals, transport of hazardous materials
<u>Water well</u>	#1	Possible submersible pump, direct conduit to groundwater
<u>Sewer system</u> serving project including mains, service connections, manholes, and pumping stations	#43	Domestic wastewater
<u>Residential pesticide, herbicide, and fertilizer storage and use.</u>	#37	Pesticides, herbicides, and fertilizers, and/or their by-products.
<u>Car wash</u> area planned for Phase 4.	#6	Accumulated concentrations of hydrocarbons, salts, concentrated cleaning products and similar

**806.1 Roadways** – All roads can accumulate hazardous materials such as hydrocarbons from vehicles leaking fluids, salts & other deicing products, striping paint residue, and similar. Rainfall washes these accumulated materials into the storm drain system or roadside ditches. If the contaminated runoff infiltrates into the soil, hazardous materials can be carried down to the aquifer. This threat is directly proportional to the amount of traffic, the frequency of precipitation, and the amount of road salt or similar applied. In Moab, the low traffic volumes, infrequent rains and rare snowfalls mean that this possible contamination threat is extremely small. The City considers the contamination threat from roadways with much more traffic than Lionsback, and located much closer to sources in other parts of the valley adequately controlled without mitigation.

**806.2 Water well** – Water wells are a threat because, by design, they provide a direct conduit to the groundwater aquifer. Hundreds of wells already exist in the aquifer with no known contamination. Wells that are properly constructed, maintained, and secured will not cause adverse effects.

Mitigation measures:

- 1) Keep wellhead securely locked.
- 2) Perform period well maintenance as recommended by Utah Division of Drinking Water.

**806.3 Sewer system** – The most frequent cause of groundwater quality problems is septic system leach field effluent. Sewer systems counter this threat by collecting all wastewater and transporting it to a centralized wastewater treatment facility. However, improperly installed and/or damaged sewer systems can leak and if the leak is large enough effluent could affect the aquifer. This threat is quite small. In fact miles of sewer lines currently exist in DWSP zones, some in place as long as 30 years, with no measureable effect. A properly installed sewer is considered adequately controlled.

**806.4 Use of pesticides, herbicides and fertilizers** – The use of these products by large agricultural operations is the leading cause of groundwater contamination in the Midwest. The massive scale of use, heavily concentrated products, and the frequency of rainfall are the leading factors, however. When approved pesticides, herbicides and fertilizers are used properly, they are considered adequately controlled. In fact, the Moab golf course, likely the area's heaviest user of these products, surrounds the City's primary drinking water sources and no measureable effects have occurred. Nonetheless, precautions are easy to follow and will be implemented for the development.

**806.5 Community vehicle wash facility** – Washing vehicles can produce contaminants such as hydrocarbons from oils & greases, organic compounds from solvents and other cleaning products, and similar. The best way to deal with water from vehicle washing is to collect it, give it some pretreatment, and then dispose of in the sanitary sewer system. This is the purpose of the community car wash facility.

## **Section 807**

### **Required Mitigation Measures**

For each of the five identified PCS's, mitigation measures have been developed. Some of these measures pertain to the overall plan and design of the project and are already reflected by the Preliminary Site Plan. Specific mitigation measures are listed below by the PCS that they address.

**807.1 Roadways** – Includes only the private roads internal to the development; does not include Sand Flats Road and Hell's Revenge Road, which are public roads.

Mitigation measures:

- 1) The use of road salt and/or other deicing agents will be prohibited on the Lionsback road system.
- 2) The HOA will contract for regular periodic street sweeping to occur a minimum of one time per year.

**807.2 Water Well** – Refers to the existing water well located on the site.

Mitigation measures:

- 1) Keep wellhead securely locked.
- 2) Perform period well maintenance as recommended by Utah Division of Drinking Water.

**807.3 Sewer system** – All mitigation measures for the sewer system take place during the initial installation of the sewer. These measures are covered in Chapters 6 & 7.

**807.4 Use of pesticides, herbicides and fertilizers** – This refers to products used by the HOA on the common areas, and products used by private individuals on their own lots.

Mitigation measures:

- 1) The project has been designed to minimize site disturbance thus preserving as much native vegetative cover as possible and reducing the need for product application.
- 2) All landscaping shall be in conformance with the project design standards, which restrict landscapes such as grass lawns that require the use of fertilizers and herbicides.
- 3) The HOA will maintain a list of approved products; and will provide education to increase awareness of their proper use.

**807.5 Community vehicle wash facility** – The washing of vehicles on site is prohibited by the covenants with the exception of the community car wash facility.

Mitigation measures:

- 1) Creation of centralized was facility with rinse water containment and capture system.
- 2) Disposal of rinse water to sanitary sewer system.
- 3) Regular periodic maintenance of car wash facility by HOA.

**Section 808****Record Keeping**

The HOA is responsible for keeping records of all maintenance activities on the well and the car wash facility, and all informational mailings. The Designated Person shall be responsible for the record keeping, and records must be kept in good order and made available to City staff upon request. Maintenance records must be kept for a minimum of two years.

**Section 809****Contingency Plan**

A simple one page document should be produced and distributed to all homeowners on an annual basis. The document should include names and contact info for City Public Works, City Police, Fire Department, and HOA Designated Person. In addition the document should contain some brief procedures for homeowners to follow.

Example language:

*In the event that an entire container of herbicide, pesticide or similar is spilled, take action as follows:*

*DO NOT RINSE the spilled material into the ground with a water hose,*

*TAKE QUICK ACTION to limit infiltration as follows:*

- *If spilled on paved surface: Surround spill with absorbent towels and rags, use as many as necessary to absorb all the material. Hang wet clothes to air dry, then dispose of with household waste.*
- *If spilled on ground: Immediately dig up the saturated soil and place it in a container or on a plastic tarp. Dispose of contaminated soil with household waste.*

## CHAPTER 9

### PLAN REVISIONS

#### Section 901

##### General

The Lionsback project is a relatively large project that will be built out over several years. It is anticipated that the plan may require amendments and/or updates as the project progresses. Unforeseen situations may become apparent, and construction methods and materials may change. The plan will be reviewed on a periodic basis, and amended if warranted in accordance with Section 902.

#### Section 902

##### Plan Revision Procedure

The following procedure shall be followed in the review and amendment of this plan.

**902.1 Periodic Review** – The start of each new project phase will trigger a review of the plan. (A total of five project phases are currently proposed.) The Developer and the City will meet to discuss the implementation of the plan up to that date. If either party determines that changes are necessary to make the plan effective, then a revised plan will be produced and submitted to the City Council for approval. The current version of the plan remains in full effect until a revised version is adopted by both the City Council, and the Developer.

**902.2 As-Needed Revision** – All minor plan changes should be accomplished by the periodic review process. If, however, it is determined that a more immediate revision is necessitated in order to fulfill the intent of the plan, then an “as-needed” revision process will commence. Only the Developer’s Designated Person and the City Public Works Director have the authority to initiate an as-needed revision. An “as-needed” revision becomes effective upon approval by both of these parties. The revision will remain in effect until the next Periodic Review, at which time the revision must be ratified by the City Council. If the revision is not ratified by the council, the revision language is nullified and is no longer effective from that point forward.

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# APPENDICES

- Appendix A:** Lionsback Pre-Annexation Agreement – Section 8 Drinking Water Source Protection (2009)
- Appendix B:** Map of DWSP Zones for Skakel Spring  
(Copied from Skakel Spring, Drinking Water Source Protection Plan, City of Moab, January 2001)
- Appendix C:** Lionsback Resort Preliminary Site Plan
- Appendix D:** EPA National Primary & Secondary Drinking Water Standards  
(Copied from U.S. EPA's website, [www.epa.gov/OGWDW/](http://www.epa.gov/OGWDW/))
- Appendix E:** List of the Most Common Potential Contamination Sources  
(Copied from GROUND WATER SOURCE PROTECTION USER'S GUIDE, State of Utah, Department of Environmental Quality, Division of Drinking Water, November 2005)
- Appendix F:** Phase 1 Environmental Site Assessment, selected sections  
(Buckhorn/Geotech, 2007)
- Appendix G:** Lionsback Resort Preliminary Drainage Report, selected sections  
(Foley & Associates, 2007)
- Appendix H:** Preliminary Geologic and Geotechnical Site Assessment, selection sections  
(Buckhorn/Geotech, 2007)
- Appendix I:** Well Log Information for Water Well #\_\_\_  
(Source: Utah Division of Water Rights)

## Appendix A

### Lionsback Pre-Annexation Agreement – Section 8, Drinking Water Source Protection

#### 8. **Drinking Water Source Protection.**

8.1. **General.** The Parties acknowledge that portions of the Property and other lands covered by this Agreement are situated within or adjacent to areas which are subject to drinking water source protection zones, as established in Chapter 13.26 of the Moab Municipal Code. It is agreed that all drinking water source protection zones shall be clearly identified and demarcated on the Final Master Development Plan and each subsequent plat for each phase of the Project under this Agreement and that the Company will adhere to Zone Two Drinking Water Source Protection Standards, as defined by Chapter 13.26 of the Municipal Code, for the entirety of the Property and the Adjoining Property. All such standards will be finalized in conjunction with the approval of the Final Master Development Plan. A plat note shall be appended specifying that all development within such zones shall comply with Zone Two design standards and mitigation measures as may be required by the City to comply with Chapter 13.26 and assure no degradation of existing ground water sources.

8.2. **Source Protection Plan.** The materials submitted with the Final Master Plan Development Plan shall include a site specific Drinking Water Source Protection Plan for the Project (excluding the uses and activities associated with Hells Revenge, which is not the responsibility of Company) containing, at minimum, the following elements:

A. A compilation of all hydrologic information pertaining to the Project site, including maps, well information, geotechnical reports, and the like;

B. A list of new Potential Contamination Sources that may be created by the development, including any temporary sources that may be associated with construction;

C. A description of all proposed mitigation measures, including: 1) construction housekeeping practices for all contractors; 2) specifications for sewer line construction; 3) description of storm water best management practices to be applied to the site; 4) detailed inspection, maintenance, and operations plans for all mitigation measures; and 5) other control measures, including covenant declarations, etc.;

D. A sample informational brochure for homeowners explaining drinking water source protection measures, potential contaminants, proper handling procedures, emergency contact information, and reference sources;

E. A detailed action plan covering a potential contamination occurrence;

F. An identification of the Designated Person for the Company's drinking water source protection program; and

G. A record keeping section with appropriate report forms for use by City staff in monitoring compliance with the plan.

8.3. **Utility Specifications.** In addition to all other applicable standards and requirements, the sewer collection system for the Project shall comply with the standards for sewer lines within water protection areas as set forth in U.A.C. R309-515-6(4). In the case of conflicting requirements, the more stringent requirement shall apply.

8.4. **Stormwater Management.** In addition to all other applicable standards and requirements, the stormwater collection system for the Project shall incorporate applicable best management practices that reduce or eliminate the potential for contaminant infiltration into groundwater beneath or adjacent to the Project, as specified in the Stormwater BMP Database (<http://www.bmpdatabase.org/>).

## **Appendix B**

### **Map of DWSP Zones for Skakel Spring**

(Copied from Skakel Spring, Drinking Water Source Protection Plan, City of Moab, January 2001)

[Document begins on next page.]

3025 gpm Streamflow measurement along Mill Creek (Blanchard 1990)



**MONTGOMERY WATSON**

Source: Base map from USGS Moab, Utah (1985) 7.5 minute topographic map.

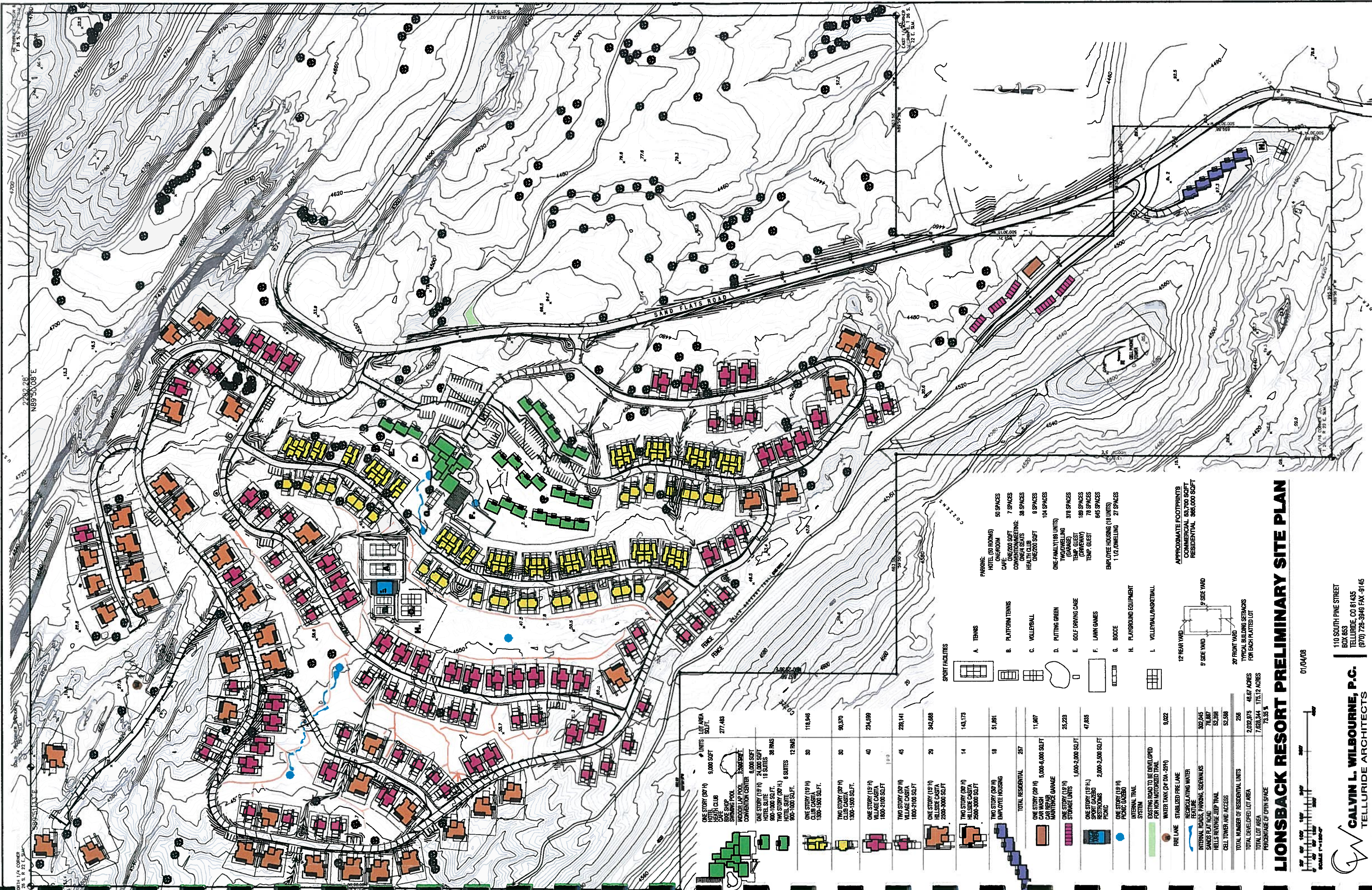
**SKAKEL SPRING**  
**DRINKING WATER SOURCE PROTECTION**  
**DWSP ZONES**  
**FIGURE 2-3**

## **Appendix C**

Lionsback Resort Preliminary Site Plan -

[Document begins on next page.]





ONE STORY (20' H) HOTEL CLUB BINE SHOP SHOWER POOL INDOOR LAP POOL CONVENTION CENTER 3,000 SQ FT	277,483	9,000 SQ FT	277,483
ONE STORY (19' H) HOTEL SUITE 15 SUITES 900-1,000 SQ FT	38,785	24,000 SQ FT	38,785
TWO STORY (20' H) HOTEL SUITE 6 SUITES 900-1,000 SQ FT	12,785	12,000 SQ FT	12,785
ONE STORY (19' H) CLUB CASTA 1,800-2,000 SQ FT	30	118,946	30
TWO STORY (20' H) CLUB CASTA 1,800-2,000 SQ FT	30	90,370	30
ONE STORY (19' H) VILLAGE CASTA 1,800-2,000 SQ FT	40	234,569	40
TWO STORY (20' H) VILLAGE CASTA 1,800-2,000 SQ FT	45	228,141	45
ONE STORY (19' H) VILLAGE CASTA 1,800-2,000 SQ FT	29	942,888	29
TWO STORY (20' H) VILLAGE CASTA 1,800-2,000 SQ FT	14	143,173	14
TWO STORY (20' H) EMPLOYEE HOUSING	18	51,881	18
TOTAL RESIDENTIAL	267	11,907	267
ONE STORY (20' H) CLUB CASTA 1,800-2,000 SQ FT	11,907	5,000-6,000 SQ FT	11,907
ONE STORY (19' H) STORAGE UNITS 1,600-2,000 SQ FT	25,223	1,600-2,000 SQ FT	25,223
ONE STORY (19' H) SPORT GAZEBO 2,000-2,500 SQ FT	47,885	2,000-2,500 SQ FT	47,885
INTERNAL TRAIL SYSTEM	3,022	3,022	3,022
EXISTING ROAD TO BE DEVELOPED FOR NON-MOTORIZED TRAIL	3,022	3,022	3,022
WATER TANK (24' DIA., 25' H)	3,022	3,022	3,022
STABILIZED FIRE LINE	3,022	3,022	3,022
RECREATING WATER FEATURE	3,022	3,022	3,022
INTERNAL ROADS, PARKING, SIDEWALKS	3,022	3,022	3,022
SANDS FLAT ROAD	3,022	3,022	3,022
HELLS REVENUE LEAP TRAIL	3,022	3,022	3,022
CELL TOWER AND ACCESS	3,022	3,022	3,022
TOTAL NUMBER OF RESIDENTIAL UNITS	267	267	267
TOTAL DEVELOPED LOT AREA	2,092,375	48.67 ACRES	2,092,375
TOTAL LOT AREA	7,628,344	175.12 ACRES	7,628,344
PERCENTAGE OF OPEN SPACE	73.35 %	73.35 %	73.35 %

- SPORT FACILITIES**
- A. TENNIS
  - B. PLATFORM TENNIS
  - C. VOLLEYBALL
  - D. PUTTING GREEN
  - E. GOLF DRIVING CAGE
  - F. LAWN GAMES
  - G. BOCCE
  - H. PLAYGROUND EQUIPMENT
  - I. VOLLEYBALL/BASKETBALL
- APPROXIMATE FOOTPRINTS**
- COMMERCIAL 83,700 SQ FT
  - RESIDENTIAL 365,000 SQ FT
- TYPICAL BUILDING SETBACKS FOR EACH PLATTED LOT**
- 12' REAR YARD
  - 5' SIDE YARD
  - 9' SIDE YARD
  - 20' FRONT YARD

# LIONSBACK RESORT PRELIMINARY SITE PLAN



## **Appendix D**

### **EPA National Primary & Secondary Drinking Water Standards**

(Copied from U.S. EPA's website, [www.epa.gov/OGWDW/](http://www.epa.gov/OGWDW/))

[Document begins on next page.]



# EPA National Primary Drinking Water Standards

	Contaminant	MCL or TT <sup>1</sup> (mg/L) <sup>2</sup>	Potential health effects from exposure above the MCL	Common sources of contaminant in drinking water	Public Health Goal
OC	Acrylamide	TT <sup>8</sup>	Nervous system or blood problems;	Added to water during sewage/wastewater increased risk of cancer treatment	zero
OC	Alachlor	0.002	Eye, liver, kidney or spleen problems; anemia; increased risk of cancer	Runoff from herbicide used on row crops	zero
R	Alpha particles	15 picocuries per Liter (pCi/L)	Increased risk of cancer	Erosion of natural deposits of certain minerals that are radioactive and may emit a form of radiation known as alpha radiation	zero
IOC	Antimony	0.006	Increase in blood cholesterol; decrease in blood sugar	Discharge from petroleum refineries; fire retardants; ceramics; electronics; solder	0.006
IOC	Arsenic	0.010 as of 1/23/06	Skin damage or problems with circulatory systems, and may have increased risk of getting cancer	Erosion of natural deposits; runoff from orchards, runoff from glass & electronics production wastes	0
IOC	Asbestos (fibers >10 micrometers)	7 million fibers per Liter (MFL)	Increased risk of developing benign intestinal polyps	Decay of asbestos cement in water mains; erosion of natural deposits	7 MFL
OC	Atrazine	0.003	Cardiovascular system or reproductive problems	Runoff from herbicide used on row crops	0.003
IOC	Barium	2	Increase in blood pressure	Discharge of drilling wastes; discharge from metal refineries; erosion of natural deposits	2
OC	Benzene	0.005	Anemia; decrease in blood platelets; increased risk of cancer	Discharge from factories; leaching from gas storage tanks and landfills	zero
OC	Benzo(a)pyrene (PAHs)	0.0002	Reproductive difficulties; increased risk of cancer	Leaching from linings of water storage tanks and distribution lines	zero
IOC	Beryllium	0.004	Intestinal lesions	Discharge from metal refineries and coal-burning factories; discharge from electrical, aerospace, and defense industries	0.004
R	Beta particles and photon emitters	4 millirems per year	Increased risk of cancer	Decay of natural and man-made deposits of certain minerals that are radioactive and may emit forms of radiation known as photons and beta radiation	zero
DBP	Bromate	0.010	Increased risk of cancer	Byproduct of drinking water disinfection	zero
IOC	Cadmium	0.005	Kidney damage	Corrosion of galvanized pipes; erosion of natural deposits; discharge from metal refineries; runoff from waste batteries and paints	0.005
OC	Carbofuran	0.04	Problems with blood, nervous system, or reproductive system	Leaching of soil fumigant used on rice and alfalfa	0.04
OC	Carbon tetrachloride	0.005	Liver problems; increased risk of cancer	Discharge from chemical plants and other industrial activities	zero
D	Chloramines (as Cl <sub>2</sub> )	MRDL=4.0 <sup>1</sup>	Eye/nose irritation; stomach discomfort, anemia	Water additive used to control microbes	MRDLG=4 <sup>1</sup>

## LEGEND

<b>D</b>	Disinfectant	<b>IOC</b>	Inorganic Chemical	<b>OC</b>	Organic Chemical
<b>DBP</b>	Disinfection Byproduct	<b>M</b>	Microorganism	<b>R</b>	Radionuclides

	Contaminant	MCL or TT <sup>1</sup> (mg/L) <sup>2</sup>	Potential health effects from exposure above the MCL	Common sources of contaminant in drinking water	Public Health Goal
OC	Chlordane	0.002	Liver or nervous system problems; increased risk of cancer	Residue of banned termiticide	zero
D	Chlorine (as Cl <sub>2</sub> )	MRDL=4.0 <sup>1</sup>	Eye/nose irritation; stomach discomfort	Water additive used to control microbes	MRDLG=4 <sup>1</sup>
D	Chlorine dioxide (as ClO <sub>2</sub> )	MRDL=0.8 <sup>1</sup>	Anemia; infants & young children: nervous system effects	Water additive used to control microbes	MRDLG=0.8 <sup>1</sup>
DBP	Chlorite	1.0	Anemia; infants & young children: nervous system effects	Byproduct of drinking water disinfection	0.8
OC	Chlorobenzene	0.1	Liver or kidney problems	Discharge from chemical and agricultural chemical factories	0.1
IOC	Chromium (total)	0.1	Allergic dermatitis	Discharge from steel and pulp mills; erosion of natural deposits	0.1
IOC	Copper	TT7; Action Level = 1.3	Short term exposure: Gastrointestinal distress. Long term exposure: Liver or kidney damage. People with Wilson's Disease should consult their personal doctor if the amount of copper in their water exceeds the action level	Corrosion of household plumbing systems; erosion of natural deposits	1.3
M	<i>Cryptosporidium</i>	TT3	Gastrointestinal illness (e.g., diarrhea, vomiting, cramps)	Human and animal fecal waste	zero
IOC	Cyanide (as free cyanide)	0.2	Nerve damage or thyroid problems	Discharge from steel/metal factories; discharge from plastic and fertilizer factories	0.2
OC	2,4-D	0.07	Kidney, liver, or adrenal gland problems	Runoff from herbicide used on row crops	0.07
OC	Dalapon	0.2	Minor kidney changes	Runoff from herbicide used on rights of way	0.2
OC	1,2-Dibromo-3-chloropropane (DBCP)	0.0002	Reproductive difficulties; increased risk of cancer	Runoff/leaching from soil fumigant used on soybeans, cotton, pineapples, and orchards	zero
OC	o-Dichlorobenzene	0.6	Liver, kidney, or circulatory system problems	Discharge from industrial chemical factories	0.6
OC	p-Dichlorobenzene	0.075	Anemia; liver, kidney or spleen damage; changes in blood	Discharge from industrial chemical factories	0.075
OC	1,2-Dichloroethane	0.005	Increased risk of cancer	Discharge from industrial chemical factories	zero
OC	1,1-Dichloroethylene	0.007	Liver problems	Discharge from industrial chemical factories	0.007
OC	cis-1,2-Dichloroethylene	0.07	Liver problems	Discharge from industrial chemical factories	0.07
OC	trans-1,2-Dichloroethylene	0.1	Liver problems	Discharge from industrial chemical factories	0.1
OC	Dichloromethane	0.005	Liver problems; increased risk of cancer	Discharge from drug and chemical factories	zero
OC	1,2-Dichloropropane	0.005	Increased risk of cancer	Discharge from industrial chemical factories	zero
OC	Di(2-ethylhexyl) adipate	0.4	Weight loss, live problems, or possible reproductive difficulties	Discharge from chemical factories	0.4
OC	Di(2-ethylhexyl) phthalate	0.006	Reproductive difficulties; liver problems; increased risk of cancer	Discharge from rubber and chemical factories	zero
OC	Dinoseb	0.007	Reproductive difficulties	Runoff from herbicide used on soybeans and vegetables	0.007
OC	Dioxin (2,3,7,8-TCDD)	0.00000003	Reproductive difficulties; increased risk of cancer	Emissions from waste incineration and other combustion; discharge from chemical factories	zero
OC	Diquat	0.02	Cataracts	Runoff from herbicide use	0.02
OC	Endothall	0.1	Stomach and intestinal problems	Runoff from herbicide use	0.1

#### LEGEND

D	Disinfectant	IOC	Inorganic Chemical	OC	Organic Chemical
DBP	Disinfection Byproduct	M	Microorganism	R	Radionuclides

	Contaminant	MCL or TT <sup>1</sup> (mg/L) <sup>2</sup>	Potential health effects from exposure above the MCL	Common sources of contaminant in drinking water	Public Health Goal
OC	Endrin	0.002	Liver problems	Residue of banned insecticide	0.002
OC	Epichlorohydrin	TT <sup>8</sup>	Increased cancer risk, and over a long period of time, stomach problems	Discharge from industrial chemical factories; an impurity of some water treatment chemicals	zero
OC	Ethylbenzene	0.7	Liver or kidneys problems	Discharge from petroleum refineries	0.7
OC	Ethylene dibromide	0.00005	Problems with liver, stomach, reproductive system, or kidneys; increased risk of cancer	Discharge from petroleum refineries	zero
IOC	Fluoride	4.0	Bone disease (pain and tenderness of the bones); Children may get mottled teeth	Water additive which promotes strong teeth; erosion of natural deposits; discharge from fertilizer and aluminum factories	4.0
M	<i>Giardia lamblia</i>	TT <sup>3</sup>	Gastrointestinal illness (e.g., diarrhea, vomiting, cramps)	Human and animal fecal waste	zero
OC	Glyphosate	0.7	Kidney problems; reproductive difficulties	Runoff from herbicide use	0.7
DBP	Haloacetic acids (HAA5)	0.060	Increased risk of cancer	Byproduct of drinking water disinfection	n/a <sup>6</sup>
OC	Heptachlor	0.0004	Liver damage; increased risk of cancer	Residue of banned termiticide	zero
OC	Heptachlor epoxide	0.0002	Liver damage; increased risk of cancer	Breakdown of heptachlor	zero
M	Heterotrophic plate count (HPC)	TT <sup>3</sup>	HPC has no health effects; it is an analytic method used to measure the variety of bacteria that are common in water. The lower the concentration of bacteria in drinking water, the better maintained the water system is.	HPC measures a range of bacteria that are naturally present in the environment	n/a
OC	Hexachlorobenzene	0.001	Liver or kidney problems; reproductive difficulties; increased risk of cancer	Discharge from metal refineries and agricultural chemical factories	zero
OC	Hexachlorocyclopentadiene	0.05	Kidney or stomach problems	Discharge from chemical factories	0.05
IOC	Lead	TT <sup>7</sup> ; Action Level = 0.015	Infants and children: Delays in physical or mental development; children could show slight deficits in attention span and learning abilities; Adults: Kidney problems; high blood pressure	Corrosion of household plumbing systems; erosion of natural deposits	zero
M	<i>Legionella</i>	TT <sup>3</sup>	Legionnaire's Disease, a type of pneumonia	Found naturally in water; multiplies in heating systems	zero
OC	Lindane	0.0002	Liver or kidney problems	Runoff/leaching from insecticide used on cattle, lumber, gardens	0.0002
IOC	Mercury (inorganic)	0.002	Kidney damage	Erosion of natural deposits; discharge from refineries and factories; runoff from landfills and croplands	0.002
OC	Methoxychlor	0.04	Reproductive difficulties	Runoff/leaching from insecticide used on fruits, vegetables, alfalfa, livestock	0.04
IOC	Nitrate (measured as Nitrogen)	10	Infants below the age of six months who drink water containing nitrate in excess of the MCL could become seriously ill and, if untreated, may die. Symptoms include shortness of breath and blue-baby syndrome.	Runoff from fertilizer use; leaching from septic tanks, sewage; erosion of natural deposits	10
IOC	Nitrite (measured as Nitrogen)	1	Infants below the age of six months who drink water containing nitrite in excess of the MCL could become seriously ill and, if untreated, may die. Symptoms include shortness of breath and blue-baby syndrome.	Runoff from fertilizer use; leaching from septic tanks, sewage; erosion of natural deposits	1

#### LEGEND

D	Disinfectant	IOC	Inorganic Chemical	OC	Organic Chemical
DBP	Disinfection Byproduct	M	Microorganism	R	Radionuclides

	Contaminant	MCL or TT <sup>1</sup> (mg/L) <sup>2</sup>	Potential health effects from exposure above the MCL	Common sources of contaminant in drinking water	Public Health Goal
OC	Oxamyl (Vydate)	0.2	Slight nervous system effects	Runoff/leaching from insecticide used on apples, potatoes, and tomatoes	0.2
OC	Pentachlorophenol	0.001	Liver or kidney problems; increased cancer risk	Discharge from wood preserving factories	zero
OC	Picloram	0.5	Liver problems	Herbicide runoff	0.5
OC	Polychlorinated biphenyls (PCBs)	0.0005	Skin changes; thymus gland problems; immune deficiencies; reproductive or nervous system difficulties; increased risk of cancer	Runoff from landfills; discharge of waste chemicals	zero
R	Radium 226 and Radium 228 (combined)	5 pCi/L	Increased risk of cancer	Erosion of natural deposits	zero
IOC	Selenium	0.05	Hair or fingernail loss; numbness in fingers or toes; circulatory problems	Discharge from petroleum refineries; erosion of natural deposits; discharge from mines	0.05
OC	Simazine	0.004	Problems with blood	Herbicide runoff	0.004
OC	Styrene	0.1	Liver, kidney, or circulatory system problems	Discharge from rubber and plastic factories; leaching from landfills	0.1
OC	Tetrachloroethylene	0.005	Liver problems; increased risk of cancer	Discharge from factories and dry cleaners	zero
IOC	Thallium	0.002	Hair loss; changes in blood; kidney, intestine, or liver problems	Leaching from ore-processing sites; discharge from electronics, glass, and drug factories	0.0005
OC	Toluene	1	Nervous system, kidney, or liver problems	Discharge from petroleum factories	1
M	Total Coliforms (including fecal coliform and <i>E. coli</i> )	5.0% <sup>4</sup>	Not a health threat in itself; it is used to indicate whether other potentially harmful bacteria may be present <sup>5</sup>	Coliforms are naturally present in the environment as well as feces; fecal coliforms and <i>E. coli</i> only come from human and animal fecal waste.	zero
DBP	Total Trihalomethanes (TTHMs)	0.10 0.080 after 12/31/03	Liver, kidney or central nervous system problems; increased risk of cancer	Byproduct of drinking water disinfection	n/a <sup>6</sup>
OC	Toxaphene	0.003	Kidney, liver, or thyroid problems; increased risk of cancer	Runoff/leaching from insecticide used on cotton and cattle	zero
OC	2,4,5-TP (Silvex)	0.05	Liver problems	Residue of banned herbicide	0.05
OC	1,2,4-Trichlorobenzene	0.07	Changes in adrenal glands	Discharge from textile finishing factories	0.07
OC	1,1,1-Trichloroethane	0.2	Liver, nervous system, or circulatory problems	Discharge from metal degreasing sites and other factories	0.20
OC	1,1,2-Trichloroethane	0.005	Liver, kidney, or immune system problems	Discharge from industrial chemical factories	0.003
OC	Trichloroethylene	0.005	Liver problems; increased risk of cancer	Discharge from metal degreasing sites and other factories	zero
M	Turbidity	TT <sup>3</sup>	Turbidity is a measure of the cloudiness of water. It is used to indicate water quality and filtration effectiveness (e.g., whether disease-causing organisms are present). Higher turbidity levels are often associated with higher levels of disease-causing micro-organisms such as viruses, parasites and some bacteria. These organisms can cause symptoms such as nausea, cramps, diarrhea, and associated headaches.	Soil runoff	n/a
R	Uranium	30 ug/L as of 12/08/03	Increased risk of cancer, kidney toxicity	Erosion of natural deposits	zero

#### LEGEND

<b>D</b>	Disinfectant	<b>IOC</b>	Inorganic Chemical	<b>OC</b>	Organic Chemical
<b>DBP</b>	Disinfection Byproduct	<b>M</b>	Microorganism	<b>R</b>	Radionuclides

	Contaminant	MCL or TT <sup>1</sup> (mg/L) <sup>2</sup>	Potential health effects from exposure above the MCL	Common sources of contaminant in drinking water	Public Health Goal
OC	Vinyl chloride	0.002	Increased risk of cancer	Leaching from PVC pipes; discharge from plastic factories	zero
M	Viruses (enteric)	TT <sup>3</sup>	Gastrointestinal illness (e.g., diarrhea, vomiting, cramps)	Human and animal fecal waste	zero
OC	Xylenes (total)	10	Nervous system damage	Discharge from petroleum factories; discharge from chemical factories	10

## NOTES

### 1 Definitions

- Maximum Contaminant Level Goal (MCLG)—The level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety and are non-enforceable public health goals.
- Maximum Contaminant Level (MCL)—The highest level of a contaminant that is allowed in drinking water. MCLs are set as close to MCLGs as feasible using the best available treatment technology and taking cost into consideration. MCLs are enforceable standards.
- Maximum Residual Disinfectant Level Goal (MRDLG)—The level of a drinking water disinfectant below which there is no known or expected risk to health. MRDLGs do not reflect the benefits of the use of disinfectants to control microbial contaminants.
- Maximum Residual Disinfectant Level (MRDL)—The highest level of a disinfectant allowed in drinking water. There is convincing evidence that addition of a disinfectant is necessary for control of microbial contaminants.
- Treatment Technique (TT)—A required process intended to reduce the level of a contaminant in drinking water.

### 2 Units are in milligrams per liter (mg/L) unless otherwise noted. Milligrams per liter are equivalent to parts per million (ppm).

### 3 EPA's surface water treatment rules require systems using surface water or ground water under the direct influence of surface water to (1) disinfect their water, and (2) filter their water or meet criteria for avoiding filtration so that the following contaminants are controlled at the following levels:

- Cryptosporidium* (as of 1/1/02 for systems serving >10,000 and 1/14/05 for systems serving <10,000) 99% removal.
- Giardia lamblia*: 99.9% removal/inactivation
- Viruses: 99.99% removal/inactivation
- Legionella*: No limit, but EPA believes that if *Giardia* and viruses are removed/inactivated, *Legionella* will also be controlled.
- Turbidity: At no time can turbidity (cloudiness of water) go above 5 nephelometric turbidity units (NTU); systems that filter must ensure that the turbidity go no higher than 1 NTU (0.5 NTU for conventional or direct filtration) in at least 95% of the daily samples in any month. As of January 1, 2002, for systems servicing >10,000, and January 14, 2005, for systems servicing <10,000, turbidity may never exceed 1 NTU, and must not exceed 0.3 NTU in 95% of daily samples in any month.
- HPC: No more than 500 bacterial colonies per milliliter
- Long Term 1 Enhanced Surface Water Treatment (Effective Date: January 14, 2005): Surface water systems or (GWUDI) systems serving fewer than 10,000 people must comply with the applicable Long Term 1 Enhanced Surface Water Treatment Rule provisions (e.g. turbidity standards, individual filter monitoring, *Cryptosporidium* removal requirements, updated watershed control requirements for unfiltered systems).
- Filter Backwash Recycling: The Filter Backwash Recycling Rule requires systems that recycle to return specific recycle flows through all processes of the system's existing conventional or direct filtration system or at an alternate location approved by the state.

### 4 No more than 5.0% samples total coliform-positive in a month. (For water systems that collect fewer than 40 routine samples per month, no more than one sample can be total coliform-positive per month.) Every sample that has total coliform must be analyzed for either fecal coliforms or *E. coli* if two consecutive TC-positive samples, and one is also positive for *E. coli* fecal coliforms, system has an acute MCL violation.

### 5 Fecal coliform and *E. coli* are bacteria whose presence indicates that the water may be contaminated with human or animal wastes. Disease-causing microbes (pathogens) in these wastes can cause diarrhea, cramps, nausea, headaches, or other symptoms. These pathogens may pose a special health risk for infants, young children, and people with severely compromised immune systems.

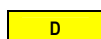
### 6 Although there is no collective MCLG for this contaminant group, there are individual MCLGs for some of the individual contaminants:

- Haloacetic acids: dichloroacetic acid (zero); trichloroacetic acid (0.3 mg/L)
- Trihalomethanes: bromodichloromethane (zero); bromoform (zero); dibromochloromethane (0.06 mg/L)

### 7 Lead and copper are regulated by a Treatment Technique that requires systems to control the corrosiveness of their water. If more than 10% of tap water samples exceed the action level, water systems must take additional steps. For copper, the action level is 1.3 mg/L, and for lead is 0.015 mg/L.

### 8 Each water system must certify, in writing, to the state (using third-party or manufacturers certification) that when it uses acrylamide and/or epichlorohydrin to treat water, the combination (or product) of dose and monomer level does not exceed the levels specified, as follows: Acrylamide = 0.05% dosed at 1 mg/L (or equivalent); Epichlorohydrin = 0.01% dosed at 20 mg/L (or equivalent).

## LEGEND



Disinfectant



Inorganic Chemical



Organic Chemical



Disinfection Byproduct



Microorganism



Radionuclides

# National Secondary Drinking Water Standards

National Secondary Drinking Water Standards are non-enforceable guidelines regulating contaminants that may cause cosmetic effects (such as skin or tooth discoloration) or aesthetic effects (such as taste, odor, or color) in drinking water. EPA recommends secondary standards to water systems but does not require systems to comply. However, states may choose to adopt them as enforceable standards.

Contaminant	Secondary Standard
Aluminum	0.05 to 0.2 mg/L
Chloride	250 mg/L
Color	15 (color units)
Copper	1.0 mg/L
Corrosivity	noncorrosive
Fluoride	2.0 mg/L
Foaming Agents	0.5 mg/L
Iron	0.3 mg/L
Manganese	0.05 mg/L
Odor	3 threshold odor number
pH	6.5-8.5
Silver	0.10 mg/L
Sulfate	250 mg/L
Total Dissolved Solids	500 mg/L
Zinc	5 mg/L

## **Appendix E**

### **List of Possible Potential Contamination Sources**

(Source: GROUND WATER SOURCE PROTECTION USER'S GUIDE, State of Utah, Department of Environmental Quality, Division of Drinking Water, November 2005)

[Document begins on next page.]

**Possible Potential Contamination Sources**(List Adapted from the State of Utah DEQ, DDW *Source Protection User's Guide*)

1. Active and abandoned wells	2. Agricultural pesticide, herbicide, and fertilizer storage, use, filling, and mixing areas
3. Airport maintenance and fueling sites	4. Animal feeding operations with more than ten animal units
5. Animal watering troughs located near unfenced wells and springs that attract livestock	6. Auto washes
7. Beauty salons	8. Boat builders and refinishers
9. Chemical reclamation facilities	10. Chemigation wells
11. Concrete, asphalt, tar, and coal companies	12. Dry cleaners
13. Farm dump sites	14. Farm maintenance garages
15. Feed lots	16. . Food processors, meat packers, and slaughter houses
17. Fuel and oil distributors and storers	18. Furniture strippers, painters, finishers, and appliance repairers
19. Grave yards, golf courses, parks, and nurseries	20. Heating oil storers
21. . Industrial manufacturers: chemicals, pesticides, herbicides, paper and leather products, textiles, rubber, plastic, fiberglass, silicone, glass, pharmaceutical, and electrical equipment, etc.	22. Industrial waste disposal/impoundment areas and municipal wastewater treatment plants, landfills, dumps, and transfer stations
23. Junk and salvage yards	24. Laundromats
25. Machine shops, metal platers, heat treaters, smelters, annealers, and descalers	26. Manure piles
27. Medical, dental, and veterinarian offices	28. Mortuaries
29. Mining operations	30. Muffler shops
31. Pesticide and herbicide storers and retailers	32. Photo processors
33. Print shops	34. Radiological mining operations
35. Railroad yards	36. Research laboratories
37. Residential pesticide, herbicide, and fertilizer storage, use, filling and mixing areas	38. Residential underground storage tanks
39. Salt and sand-salt piles	40. Sand and gravel mining operations
41. School vehicle maintenance barns	42. Sewer lines
43. Single-family septic tank/drain-field systems	44. Sites of reported spills
45. Small engine repair shops	46. Stormwater impoundment sites and snow dumps
47. Subdivisions using subsurface disposal systems (large and individual septic tank/drain-field systems)	48. Submersible pumps used to pump wells
49. Taxi cab maintenance garages	50. Tire shops
51. Toxic chemical and oil pipelines	52. Vehicle chemical supply storers and retailers
53. Vehicle dealerships	54. Vehicle quick lubes
55. Vehicle rental shops	56. Vehicle repair, body shops, and rust proofers
57. Vehicle service stations and terminals	58. Wood preservers



**PHASE 1 – PRELIMINARY SITE ASSESSEMENT  
SITLA PROPERTY SAND FLATS ROAD  
GRAND COUNTY, UTAH  
May 1, 2006**

### **Method and Purpose**

This site investigation and report has been prepared in accordance with the “*Standard Practice Environmental Site Assessments: Phase I Environmental Site Process*” as outlined by ASTM E 1527. The purpose of this investigation is to identify recognized environmental conditions that may pose a threat to health. The identification of these conditions is made through review of existing documentation, on-site observation (April 25, 2006) and discussion with past owners, neighbors and/or agency personnel.

This investigation and report is site specific and prepared for the exclusive use by Michael Badger and Michael Lawler only and is valid for 30 days from the date of issue. *Use by any other party is unauthorized without written consent of Buckhorn Geotech, Inc.* This investigation is intended to reduce potential uncertainty, regarding environmental conditions, to the extent feasible using customary practices and data available at the time of the investigation but cannot wholly eliminate uncertainty.

### **Site Description**

The subject property is owned by the State of Utah School and Institutional Trust Lands Administration (SITLA) and is on Sand Flats Road, in an unincorporated part of Grand County, Utah. The property is located in Section 6, Township 26 South, Range 22 East, Salt Lake Base and Meridian as shown on the attached location map. The north portion of the property is abutted on the west, north and east by the Sand Flats Recreation Area administered by the Bureau of Land Management (BLM) and Grand County as a fee area for recreational activities. The southern portion of the property is abutted by residential use, vacant land, and public property in use for the County landfill.

The property on the west side of Sand Flats Road is in use as a campground facility and has an on-site water well and fully contained chemical toilets and no sanitary waste facility. There are numerous primitive roads and trails crossing the campground area. There is overhead power on the west side of the road that services the campground and also crossing the property on the east side of the road. There is a communications tower on the ridge at the south end of the property. There is public land access through the property. The property on the east side of Sand Flats Road is vacant and has a walking

trail that appears to be open to the public. There is a drainage culvert under Sand Flats Road allowing runoff from the west to continue southeast in a natural drainage.

## **Physical Setting**

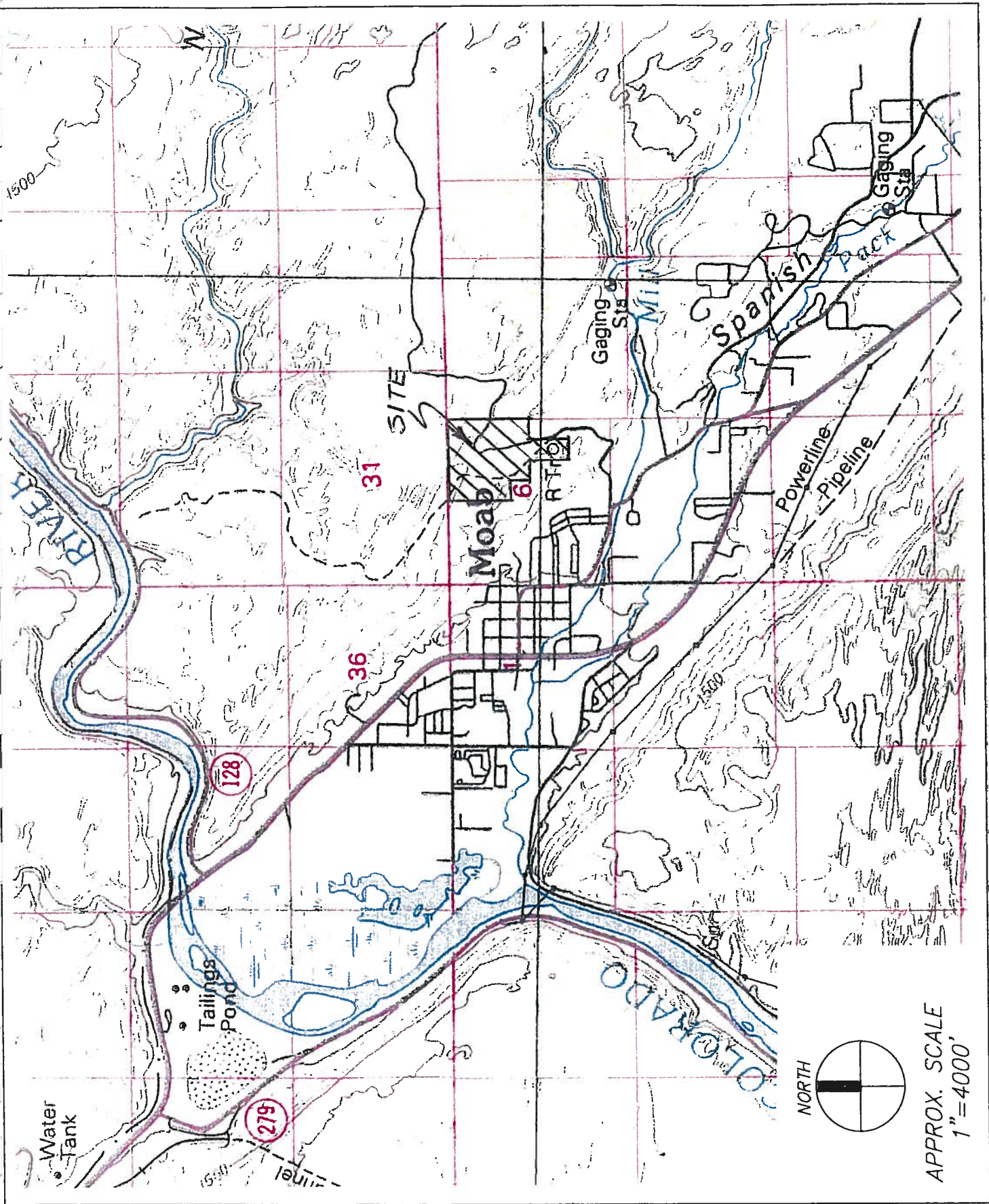
The site is located above the east side of the City of Moab at an elevation ranging from approximately 4440 feet (above mean sea level) at the southeast corner of the property to an elevation of approximately 4600 feet (above mean sea level) on ridgelines. This area is considered part of the high desert of the Colorado Plateau. On the west side of Sand Flats Road two ridges are dominant, one runs northwest to southeast along the southwest property lines, and the other, also running northwest to southeast, is across the northeast corner of the property. There is a wide valley in between these two ridge lines that slopes to the southeast and continues as a natural drainage on the east side of Sand Flats Road, draining to Mill Creek approximately 1 mile to the southeast. The ridge lines are Navajo Sandstone and the valley is sand with low desert type vegetation, overlying sandstone. There are numerous rock features and small natural drainage paths across the property. The data base search conducted for this report notes the site to be outside any regulatory 100-year flood plain.

## **Historic Landuse and Ownership**

From discussions with Mike Hill on site on April 25, 2006, Mr. Hill has operated the recreational campground on the west side of Sand Flats Road for close to 20-years. This is a "primitive" campground with no electrical, water or sewer hook-ups for campers. There are fully contained chemical toilets and dumpsters available, shower facilities were added more recently (Title Report shows the well in 2001).

From discussions with Brian Torgerson, Resource Specialist for SITLA, the property has been owned by the State of Utah for over 50-years and has been leased for campground use for approximately 20-years. Prior to use for a campground the property may have been leased for livestock grazing or was vacant. No record search of ownership was completed due to the extensive period of ownership by the current owner as reported by local agencies. Mr. Torgerson contacted the Minerals Department of SITLA and determined that although a lease for Oils, Gas and Hydrocarbons was granted to a second part, no investigation related to this lease has been conducted on the property.

Dan Stenta, City Engineer for City of Moab, noted that there had been a communications tower on site for a long time that was replaced around 2002 or 2003. The tower appears on a USGS map dated 1983.



APPROX. SCALE  
1"=4000'

DRAWING  
NUMBER

1

OF 1

PROJ. NO. 06-132 ENV

DESIGNER JDK

DRAFTER JDK

DATE 5/01/06

LIONSBACK PROPERTY  
LOCATION MAP  
GRAND COUNTY, UTAH

**BUCKHORN GEOTECH**

Civil, Structural & Geotechnical Engineering  
222 South Park Ave. Montrose, Colorado 81401  
970-249-6828 Fax. No. 970-249-0945

## Site Observations

### West side of Sand Flats Road:

- The west part of the property was observed to have an active campground in operation with designated primitive sites (no-hookups). Roads had no imported surfacing and were native rock and sand. Fire pits were designated at each site.
- The campground facility has an office located at the access point with several out buildings clustered around the office. The campground operator noted that all buildings were temporary and on skids and examination of these buildings was not included in the scope of this report. The campground operator noted the well site located near the office. One of the buildings was observed to hold showers and one held storage of dry goods, gasoline containers and other fluids pertinent to small vehicle maintenance and campground maintenance. A propane tank was noted near the office facility.
- An engine and vehicle battery was observed, apparently in use for a log splitter.
- Fully contained chemical toilets and roll-off trash dumpsters were observed clustered through out the campground.
- The shower waste was observed to go to a storage tank that is labeled "grey water not for drinking" it was not apparent where or if excess waste water is discharged.
- There is a pole mounted transformer near the office that was noted to have a "NON PCB" sticker visible.
- Small amounts of trash were observed on the surface in areas around the campground.
- A water storage tank was observed toward the west end of the campground.
- There are areas that have been fenced off and/or posted evidently to restrict off-road vehicles.
- The site for the communications tower to the south of the campground was not accessed.
- There are areas of the campground that have been treated for soil stabilization with rock retaining walls and other measures including bags (labeled rice) used like sand-bags.
- Small amounts of trash were observed partially buried in the designated fire pits.

- A natural drainage was observed at the low area on the west side of Sand Flats Road with a drainage culvert discharging to the east side of the road.

East side of Sand Flats Road:

- No buildings or development are apparent on the property on the east side of Sand Flats road.
- There is a pull-out from the road that allows for parking adjacent to a trail that runs south east on the property.
- The natural drainage from the culvert observed at Sand Flats Road continues south easterly.
- Minor surface trash and several abandoned vehicle tires were observed.
- There is an area of trash accumulated on the property that is below a road pull-out on Sand Flats Road adjacent to the entrance station to Sand Flats Recreation Area. Random items were observed including the case for a television, the shell of a household oven, several items that appeared to be fuel filters, pieces of a vehicle and other items.



## **EPA Regulated Facilities**

A database search for State and EPA Regulated Facilities was conducted by Environmental Data Resources (EDR) for the subject property and adjacent properties within the ASTM E 1527-00 search radius (plus ½ mile due to size of site) on April 18, 2006. This database includes facilities with the following documented environmental conditions:

- Permitted discharge to waters
- Report of toxic release
- Hazardous waste handler
- Active or Archived Superfund Report
- Reported Air Release
- 

The property was not identified as any of the listed regulated facilities. Two sites were found within the ASTM E 1527-00 search radius plus ½ mile.

- An archived CERCLIS site identified as the "Ore Buying Station" was noted at 158 N 400 E, Moab, Utah and is approximately ¾ miles southwest and down gradient from the subject property.
- A solid waste facility/landfill site was noted on Sand Flats Road approximately ¾ miles south and down gradient from the subject property.

No other superfund or hazardous waste sites or other regulated facilities were found within an approximate one mile radius of the property.

Superfund Sites: The Superfund query retrieves data from the CERCLIS database, a query on archived sites was also performed. One site was found and as noted above is an archived site identified as the "Ore Buying Station". This site was identified in 1980 and archived in 1990 with a finding of "No Further Remedial Action Planned (NFRAP)". As stated above, this site is approximately ¾ miles southwest of the site and downgradient at an elevation of approximately 4000 feet.

Hazardous Waste RCRIS database: The Hazardous Waste query retrieves data from the RCRIS database which lists hazardous waste handlers. No sites were listed within the radius search.

### State Regulated Storage Tanks

The database for State regulated storage tanks was reviewed for facilities within one mile of the property. The database includes underground storage tanks (UST's) "in use" and "out of use", closed and active leaking underground storage tanks (LUST's), above ground storage tanks (AST's) "in use" and "closed". No listing was found for the subject property and no sites were found within the search radius. Please note that tanks for agricultural use may not be listed on the database.

### Orphan Sites

Orphan sites are sites found in the database search which do not have an address that allows for the search to determine distance from the property. The addresses for these sites were reviewed and they were determined to be along Highway 191, Highway 160 or in the developed area of the City of Moab and not within 1 mile of the property.

### **Utilities**

Overhead utilities were observed along Sand Flats Road and crossing the easterly part of the property. The pole mounted transformer near the campground entrance was noted to have a sticker stating "PCB Free". The campground site is serviced by an on-site water well and there is no sewage system. The campground has a propane tank.

### **Wells**

The database search conducted by Environmental Data Resources (EDR) for the subject property included review of permitted wells within 1 mile of the subject property. The database returned 69 well permit applications within the 1 mile radius which included denied and expired well permits along with monitoring wells and in use wells. There was one well permit within approximately one quarter mile, which is the on-site well at the campground owned by SITLA. No wells were found between  $\frac{1}{4}$  and  $\frac{1}{2}$  mile, the remainder of the wells are generally clustered in and around the City of Moab between  $\frac{1}{2}$  and 1 mile from the property. Seven of the wells listed were from the Federal United States Geological Survey (USGS) data base and may be monitoring wells. Well use is primarily noted as irrigation with a few permits noting domestic and other use.

### **Landfills**

The City of Moab landfill is located immediately to the southeast of the southerly property line. No other landfills exist within one mile of the property. Ms. Mary von Kuch, Realty Specialist with the Bureau of Land Management (BLM) in Moab for 20-years, noted that the BLM had sold land adjacent to the landfill and the new Owner found areas of buried trash on that land that was outside the permitted landfill area. This is a potential concern for areas along the south of the property. Mr. John Adamson with the Southeast Utah Health Department noted that the original landfill management included Grand County and the landfill was a receptor of municipal waste with little regulation and any type of waste may be present. Currently the landfill only accepts construction debris and waste tires for recycling with municipal waste is taken to the Grand County landfill north of town.

## Personal Contacts

Mr. Mike Hill: Manager of the campground on the property for 18-years, Mr. Hill provided general information regarding past use and activities on the site.

Ms. Maggie Wyatt: Manager of the BLM Field Office in Moab for 7-years, has no knowledge of potential environmental concerns related to the property. Ms. Wyatt noted that the water in Mill Creek is classified as impaired for fisheries but that may be due to warm temperatures. Ms. Wyatt noted that the campground area used to be a problem due to lack of management and this has been mitigated by fencing of areas to prevent access, regular trash pick-up and policing.

Ms. Mary von Koch: Realty Specialist with BLM Field Office in Moab for 20-years, has no knowledge of environmental concerns related to the property. Ms. Koch noted two potential concerns in the area; buried trash was found on another property adjacent to the landfill site outside of the permitted landfill area, and there is a shooting range on property south of the landfill that may have potential environmental concerns.

Mr. Brian Torgerson: Resource Specialist with SITLA, has no knowledge of potential environmental concerns related to the property. Provided information regarding past use of the property. Mr. Torgerson also verified that no oil, gas or hydrocarbon activities had taken place at the site and provided the name of the lease holder for the communications tower which is Royce's Electronics in Moab, Utah.

Dan Stenta: City Engineer for City of Moab, provided general information.

Mr. John Adamson: Southeast Utah Health Department, noted historically the landfill adjacent to property was not regulated and types of waste materials are unknown. Mr. Adamson had no knowledge of environmental concerns on the subject property. Mr. Adamson noted there is a grey water rule in Utah that allows for the shower water to be discharged above ground provided it is settled in a tank prior to discharge.

## Reference Documents:

- Title Report by South Eastern Utah Title Company received 4/28/06.
- USGS topographic maps.
- Sand Flats Recreation Area Visitors Guide
- Environmental Data Resources data search report April 18, 2006.
- Geotechnical investigation by Buckhorn Geotech April 2006.



## Summary and Conclusions

From on-site observations of the property (conducted on April 25, 2006) and from review of available documents and personal contacts described in this report, there is no apparent potential for environmental contamination at the property. The only apparent potential for environmental concerns would be related to the stored maintenance chemicals for the campground, the dumping of trash on the east side of the property below the pull-out on Sand Flats Road, and potential environmental concerns related to the adjacent landfill. These potential concerns are summarized as follows:

- There was no surface staining or other evidence observed to indicate maintenance chemicals has been disposed of improperly on site, all such chemicals were stored in a storage shed with a wood floor and no spillage was observed.
- The trash observed on the east part of the property was not spread over a large area and appeared to be on the surface only.
- The potential concerns related to the landfill would include potential historic disposal of hazardous waste in an unregulated landfill and potential disposal of waste outside of the permitted landfill area. The landfill site is generally down gradient of the property which will minimize risk to the property.

The Southeast Utah Health Department Officer, Mr. John Adamson stated there are no known environmental concerns at the property.

This report was based on the guidelines presented the "*Standard Practice Environmental Site Assessments: Phase I Environmental Site Process*" as outlined by ASTM E 1527. No testing of air, water or soil was performed as part of the Phase 1 Environmental Assessment.

## **Acronyms/Abbreviations**

ASTM	American Society for Testing and Materials
BLM	United States Bureau of Land Management
USFS	United States Forest Service
EPA	United States Environmental Protection Agency
NPL	National Priority List
PUD	Planned Unit Development
CERCLIS	Comprehensive Environmental Response, Compensation and Liability Information System
RCRIS	Resource Conservation and Recovery Information System
UST	Underground Storage Tank
LUST	Leaking Underground Storage Tank
AST	Above Ground Storage Tank

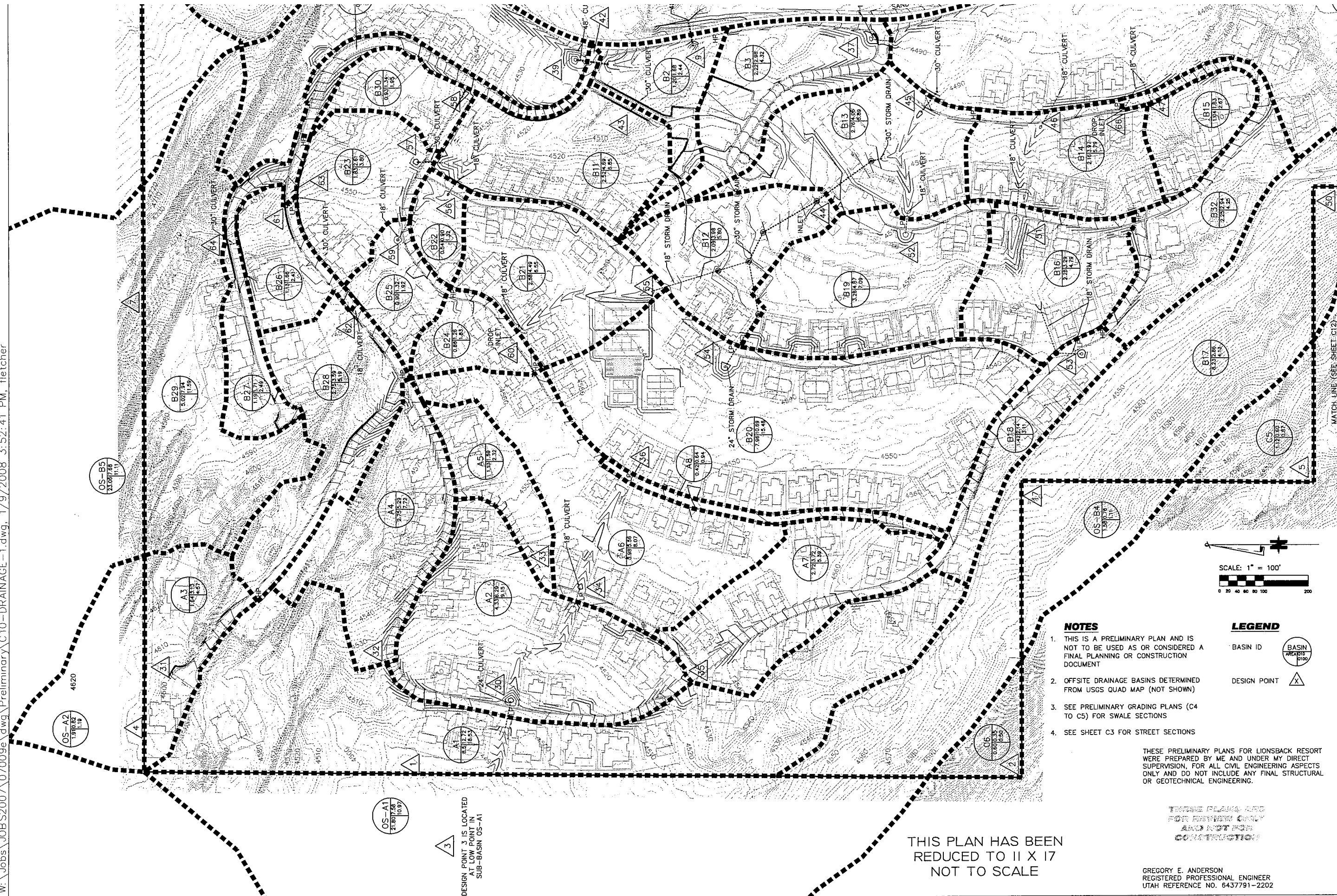
## **Appendix G**

### **Lionsback Resort Preliminary Drainage Report – Map of Drainage Basins**

(Copied from LIONSBACK RESORT, MOAB, UTAH, PRELIMINARY DRAINAGE REPORT, Foley Associates, Inc., January 4, 2008)

[Document begins on next page.]

W:\Jobs\JOBS2007\07009e\dwg\Preliminary\C10-DRAINAGE-1.dwg, 1/9/2008 3:52:41 PM, fletcher



THIS PLAN HAS BEEN  
REDUCED TO 11 X 17  
NOT TO SCALE


THESE PRELIMINARY PLANS FOR LIONSBACK RESORT  
WERE PREPARED BY ME AND UNDER MY DIRECT  
SUPERVISION, FOR ALL CIVIL ENGINEERING ASPECTS  
ONLY AND DO NOT INCLUDE ANY FINAL STRUCTURAL  
OR GEOTECHNICAL ENGINEERING.

TECHNICAL PLANS ARE  
FOR REVIEW ONLY  
AND NOT FOR  
CONSTRUCTION

GREGORY E. ANDERSON  
REGISTERED PROFESSIONAL ENGINEER  
UTAH REFERENCE NO. 6437791-2202

**Lionsback Resort**  
PRELIMINARY DRAINAGE

**Foley**  
ASSOCIATES, INC.



**ENGINEERING • PLANNING • SURVEYING**

P.O. Box 1385 125 W. Pacific Ave. Suite B1  
Telluride, Colorado, 81435  
phone 970-728-6153 fax 970-728-6050

**Contact:**  
Michael H. Badger  
PH: 970-728-5474  
Fax: 970-728-6217

[illegible]

## **Appendix H**

### **Preliminary Geologic and Geotechnical Site Assessment, selection sections**

(Copied from report entitled, PRELIMINARY GEOLOGIC AND GEOTECHNICAL SITE ASSESSMENT, LIONSBACK VILLAGE, MOAB, UTAH, Buckhorn Geotech, May 10, 2006)

[Document begins on next page.]

**PRELIMINARY GEOLOGIC AND  
GEOTECHNICAL SITE ASSESSMENT  
LIONSBACK RESORT  
MOAB, COLORADO**

**Executive Summary**

The proposed Lionsback Village development near Moab, Utah is suitable for the intended construction with special attention to foundation design, site preparation, erosion control, and management of drainage. We drilled 9 boreholes and excavated 11 test pits in April 2006 at the property. The following is a summary of our findings:

- Geology of the site consists of Navajo Sandstone covered by a thin mantle of silty eolian sand. Depth to the Navajo Sandstone was mostly less than 5 feet across the property.
- No groundwater was observed in any of the shallow explorations.
- Several small ephemeral drainages cross the property. A portion of the property drains southeast to Mill Creek, while a portion of the property drains northwest to the City of Moab.
- Minor rockfall areas were observed adjacent to some of the Navajo Sandstone fins. However, rockfall areas are not extensive and can be easily avoided.

Below is a summary of our conclusions and recommendations. See the *Conclusions and Recommendations* section of this report for more detailed explanations.

- Spread footing foundations are considered suitable for the proposed development. Footings and foundation components should be extended to or into the sandstone bedrock. Erosion and settlement are concerns for foundations placed on silty sand soils.
- Slabs on-grade may be used for garage and interior floor slabs. Slabs on grade should be placed on bedrock or on compacted fill placed on the bedrock.
- The native sandy soils may be used as structural fill if they are properly moisture conditioned and are laterally confined.
- All of the recommendations presented in the *Conclusions and Recommendations* section of this report should be incorporated into design and construction at this site.

Road is vacant and has a walking trail that appears to be open to the public. There is a drainage culvert under Sand Flats Road allowing runoff from the west to continue southeast in a natural drainage.

The site located above the east side of the City of Moab at elevations ranging from approximately 4,440 feet at the southeast corner of the property to an elevation of approximately 4,600 feet on ridges at the northwest corner of the property. On the west side of Sand Flats Road, two northwest – southeast trending ridges border a wide central valley. A saddle divides the drainage of the valley; with a portion sloping southeast at approximately 5 to 20% and a portion sloping northwest at similar grades. Drainage to the southeast enters Mill Creek approximately 1 mile downgradient. Sparse low desert type vegetation was observed on the property. The attached Site Plan shows the topography of the property and the approximate locations of our borings and test pits with respect to the proposed development.

We drilled 9 boreholes and excavated 11 test pits across the property. The explorations were intended to broadly characterize the property, but were tailored to the proposed development. The findings of our field and laboratory testing are discussed in the *Subsurface Conditions* section of this report.

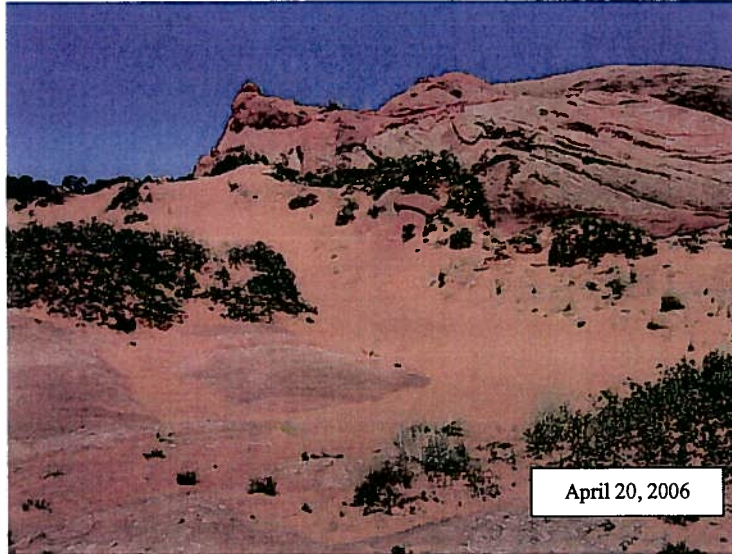
### **Geologic Setting**

According to Doelling et al. (2002), Moab is located in the northwest-trending, fold and fault belt of the salt-cored anticline region in the northern Paradox Basin. The Moab-Spanish Valley is a salt diapir structure, where the overlying brittle strata of the anticlinal fold have been ruptured by injection of the plastic salt core. Salt dissolution and erosion through the late Cenozoic contributed to the collapse and removal of the overlying rocks, leaving behind the linear Moab-Spanish Valley. Most of the exposed bedrock in the vicinity of Moab ranges from Pennsylvanian to Jurassic in age and consists of sandstone, siltstone, limestone, and some evaporites. The formation underlying the valley is the Pennsylvanian Paradox Formation, deposited in a marine basin at the southwestern edge of the ancestral Uncompahgre Uplift in the late Paleozoic. The Paradox Formation consists of interbedded evaporites (halite, potash, and anhydrite), dolomite, gypsiferous mudstone and carbonaceous shale.

The proposed Lionsback Village is located on a bench above the City of Moab on the east side of the Moab-Spanish Valley and north of the Mill Creek drainage. According to Doelling et al. (2002), there are two units identified on the subject property. One unit is the Jurassic Navajo Sandstone Formation (*Jn*) and the other unit is a surficial deposit of Quaternary Eolian (dune) sand (*Qes*). The Navajo Sandstone is “pale-orange to light-gray to red-orange, fine-grained, quartzose eolian (i.e., wind-blown) sandstone; calcareous and silica cemented; fine-grained and well-sorted; medium to massively bedded, commonly with large-scale sweeping cross-beds; locally contains thin, gray, cherty, sandy carbonate beds; forms smooth vertical cliffs and rounded knolls.” This unit is well-cemented and forms the dominant features that the region is famous for such as fins, massive monoliths (“slick rock” areas), rounded cliffs and domes, and arches. The locally known “Lionsback”, an undulating fin on the north edge of the property, is composed of Navajo Sandstone, as are the many other red-colored sandstone outcrops



throughout the parcel. The photograph below, taken looking north in the northwestern portion of the proposed Lionsback Village, shows a typical outcropping of the Navajo Sandstone as fins (upper right) and low rounded surfaces poking up through the dune sand (lower left and foreground).



The deposit overlying the Navajo Sandstone throughout much of the property is Quaternary eolian sand dunes. These Holocene (geologically recent) deposits are “well-sorted, fine- to medium-grained, quartzose sand with silt; light red-orange to light red-brown; typically form thin, discontinuous sheets and small dunes, and locally fill hollows; sand is derived from nearby outcrops of Lower and Middle Jurassic sandstone formations (e.g., Wingate, Kayenta, Navajo, Entrada); generally less than 6 feet thick, but can be up to 30 feet thick.” Where stabilized by vegetation, the eolian sand is generally at least several feet thick. However, where not protected by vegetation, such as along disturbed areas or roads, the dune sand is thinner.

It is worth noting that the contact of the Navajo Sandstone with the older Kayenta Formation outcrops immediately outside of the southern edge of the proposed Lionsback Village. The Kayenta is described as orange- to red-brown, fluvial sandstone with some conglomerate interbedded with weaker strata of siltstone and mudstone forming stepped slopes of alternating resistant and weak layers.

### **Geologic Hazards**

The geologic hazards of the Lionsback Village proposed development were identified during our field investigation and by review of available publications such as Doelling et al. (2002), Hylland and Mulvey (2003), and other publications as discussed below. According to the Hylland and Mulvey (2003), the principal hazards in the Moab-Spanish Valley area are expansive soil and rock, gypsiferous soil and rock, stream and alluvial-fan flooding and debris flows, collapsible soils, soil susceptible to piping and erosion, rockfall, shallow groundwater, fractured rock, and to a lesser extent, earthquakes, subsidence due to salt dissolution, landslides, and indoor radon. Of



## **Appendix I**

Well Information for Water Well #UT10053476

(Source: Utah Division of Water Rights)

[Document begins on next page.]

Select Related Information

**(WARNING: Water Rights makes NO claims as to the accuracy of this data.)** RUN DATE: 01/12/2010

WATER RIGHT: **05-2190** APPLICATION/CLAIM NO.: **A62197** CERT. NO.: CERTIFICAT

OWNERSHIP\*\*\*\*\*

NAME: Utah School and Institutional Trust Lands Admin.  
 ADDR: 675 East 500 South, 5th Floor  
 Salt Lake City UT 84102

DATES, ETC.\*\*\*\*\*

LAND OWNED BY APPLICANT? No COUNTY TAX ID#:  
 FILED: 12/03/1986 PRIORITY: 02/29/1996 PUB BEGAN: 01/01/1987 PUB ENDED:  
 ProtestEnd: 02/14/1987 PROTESTED: [No] HEARING HLD: SE ACTION: [Approved] | ActionDate: 02/27/1987 | PROOF DUE: 02/28/20  
 EXTENSION: ELEC/PROOF: [Proof] ELEC/PROOF: 01/05/2000 CERT/WUC: 05/04/2001 LAP, ETC: LAPS LETTER:  
 RUSH LETTR: RENOVATE: RECON REQ: TYPE: [ ]  
 PD BOOK: [ 05- ] MAP: [ ] PUB DATE:  
 Type of Right: Application to Appropriate Source of Info: Certificate Status: Certificate

LOCATION OF WATER RIGHT\*\*\* (Points of Diversion: Click on Location to access PLAT Program.)\*\*\*\*\* [MAP VIEWER](#)\*\*\*\*\*

FLOW: 0.015 cfs OR 1.6 acre-feet SOURCE: Underground Water Well  
 COUNTY: Grand COMMON DESCRIPTION: Moab

POINT OF DIVERSION -- UNDERGROUND: (Click Well ID# link for more well data.)

[\(1\) S 689 ft W 1007 ft from NE cor, Sec 06, T 26S, R 22E, SLBM](#)

DIAMETER OF WELL: 6 ins. DEPTH: 435 to ft. YEAR DRILLED: 1992 WELL LOG? Yes [WELL ID#: 1217](#)  
 Comment:

USES OF WATER RIGHT\*\*\*\*\* **ELU -- Equivalent Livestock Unit (cow, horse, etc.)** \*\*\*\*\* **EDU -- Equivalent Domestic Unit or 1 Fami**  
 SUPPLEMENTAL GROUP NO. 1367.

IRRIGATION: 0.08 acres Div Limit: 0.4 acft. PERIOD OF USE: 04/01 TO 10/  
 DOMESTIC: 1.0000 EDUS Div Limit: 0.45 acft. PERIOD OF USE: 01/01 TO 12/  
 OTHER: Small campground PERIOD OF USE: 03/01 TO 10/  
 Acre Feet Contributed by this Right for this Use: 0.75

***PLACE OF USE:	*-----NORTH WEST QUARTER-----*				*-----NORTH EAST QUARTER-----*				*-----SOUTH WEST QUARTER-----*				S
	NW	NE	SW	SE	NW	NE	SW	SE	NW	NE	SW	SE	NW
<a href="#">Sec 06 T 26S R 22E SLBM</a>	*				*		0.0800		*				*

OTHER COMMENTS\*\*\*\*\*

Water Right 05-2190 is limited to an annual diversion for campground purposes of 0.75 acre-feet.

APPLICATIONS FOR EXTENSIONS OF TIME WITHIN WHICH TO SUBMIT PROOF\*\*\*\*\*

FILED: 02/02/1999 PUB BEGAN: PUB ENDED: NEWSPAPER:  
 ProtestEnd: PROTESTED: [No] HEARING HLD: SE ACTION: [Approved] | ActionDate: 07/15/1999 | PROOF DUE: 02/28/20

\*\*\*\*\*END OF DATA\*\*\*\*\*

## WELLPRT Well Log Information Listing

Version: 2003.09.18.00 Rundate: 10/08/2003 10:00 PM

Utah Division of Water Rights

### Water Well Log

---

**LOCATION:**

S 600 ft W 1000 ft from NE CORNER of SECTION 6 T 26S R 22E BASE SL Elevation: feet

**DRILLER ACTIVITIES:**

ACTIVITY # 1 WELL ABANDONMENT

DRILLER: D&H DRILLING INC

LICENSE #: 541

START DATE: / / COMPLETION DATE: 02/08/1992

**BOREHOLE INFORMATION:**

Depth(ft)	Diameter(in)	Drilling Method	Drilling Fluid
From	To		
0	435		