

Summary of Concerns about the Probable Adverse Impacts of the Lions Back Development on Drinking Water Source quality and quantity and exacerbation of Downstream Flooding

The Lions Back Drinking Water Source Protection Plan (LBDWSPP) identifies four Built-in controls (pg 5-2), each of which warrants a closer look and review. It is important to note that this LBDWSPP was developed AFTER the Preliminary Design Guidelines and Preliminary Drainage report, and therefore these earlier documents do not fully address all issues laid out in the LBDWSPP.

1. "An overall site layout that accomplishes the desired density with minimal disturbance of the existing site"
 - a. The Lionsback Resort Preliminary Design Guidelines (1/28/2008), touts maintaining 73% Open Space with 27% Developed area.
 - i. This Open Space is then further clarified as containing 77% natural high desert, and 23% passive recreation (trails, sitting areas, gazebos) and 1% active recreation (tennis courts, volley ball etc). (pg4)
 - b. These recreation areas represent an additional 17.5% ($0.23 * 0.73$) of the total site that is designed for development related activities that will serve to alter the natural hydrology of the site by decreasing permeability, vegetative cover, concentrating stormwater flows, and introducing potential contaminants such as pet waste.
 - c. **The Developed portion of the site increases to 44.5% of the total owned property (27% + 17.5%).** To be fair, some portion of the 27% high density development will be landscaped areas that may not contribute significantly to stormwater runoff. However, as the Lions Back Preliminary Design Guidelines (pg 10-11) specifically allow discharging roof water onto landscaped areas to be drained offsite, and require all drainage improvements to be done at time of construction and "not later as part of the landscape plan implementation", it is probable that runoff quantities will exceed the landscapes capacity to hold and infiltrate this water, thus resulting in these areas contributing some amount of runoff volumes.
2. "Extension of the city sewer system to the project as opposed to using on-site wastewater systems such as septic systems"
 - a. Construction, operations, and maintenance of the sewer lines and associated infrastructure will be key to maintaining proper function and avoiding potential contamination. A detailed review of this infrastructure is not included in this synopsis.
3. "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".
 - a. This statement acknowledges that contaminants could accumulate as a result of this development.
 - b. A discussion needs to be had on what constitutes "preserves all of the existing natural drainages".
 - c. The Lions Back Preliminary Drainage Report divides the property into 3 Major Basins (A, B, and C), with each major basin containing sub-basins. Within this

plan, there are specifications for (10) constructed, sandy-bottom drainage swales (each being 1.5 ft deep, 2 feet of flat bottom, and 4:1 side slopes, making them 14 feet wide) and (66) culverts ranging in diameter from 18 inches to 48 inches. **This would appear to be an alteration of “existing natural drainages”**

- d. According to the NRCS Web Soil Survey (<https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm>), development within the Lions Back project is primarily on Mido loamy fine sand (“excessively drained”, “runoff class: low”). Seeing that the development is located on sandy soils with high infiltration rates, **the plan to use sandy-bottomed swales for conveyance of concentrated stormwater from roads, parking lots, buildings, and other altered areas poses a risk of contamination along the length of the swales.** Roads are listed as a Potential Contaminant Source #39, and any need or responsibility to mitigate this potential contaminant is dismissed in the LBDWSPP (p8-5)
- e. Each culvert is specified to have a sediment settling basin. The “Typical Swale Transition at Culvert” schematic (pg 20, appendix in the Drainage Plan) specifies the sediment basin to be 1ft deep and 10ft wide. **These (66) sediment basins each represent a location that is designed to hold water long enough for sediments to drop, and therefore pose a high risk of concentrating potential contaminants and introducing them to the drinking water aquifer via the high infiltration rates of the soils on top of “highly fractured bedrock” (EPA Memo). The water held in these basins has no place to go but infiltrating into the ground or evaporating to the sky.**
- f. An analysis of the “Storm Drainage System Design” provided in the LB Preliminary Drainage Report (starting pg 26) **indicates an increased runoff coefficient for developed areas as well as runoff flow rates (in CFS, or cubic feet per second) that vastly exceed runoff flow rates allowable under City Drainage Guidelines.**
 - i. Runoff Coefficients: Sub-basins described as undeveloped (e.g.B01) list a Runoff Coefficient of 0.20. Basins listed as developed (e.g. A01) list a Runoff Coefficient of 0.70. **This shows a development designed to increase runoff by 3.5 times pre-development runoff** (post development 0.70 / predevelopment 0.20 = 3.5 times more runoff. Post development 0.7 – pre development 0.2 = mitigation requirement of 0.50).
 1. It is unclear if the post-development runoff coefficient listed of 0.7 is the DIFFERENCE of a pre-development coefficient of 0.2 and a typical post-development coefficient of 0.9 to 0.98. **It may be that post-development runoff is actually designed to be 4.5 times greater than pre-development, which appears to be confirmed by a comparison of Developed vs Undeveloped flow rates listed in the LB Drainage Plan tables**
 - ii. While total runoff calculations are left blank in the Preliminary Drainage Report, a quick summation of Sub-Basin A totals are included in the table

below. The narrative of Sub basin A-1 (pg 2) indicates that sub-basins A2 – A8, as well as OS-A2 all flow through A1 for a total 10 year return period flow of 38.94 cfs and 100 year return period flow of 56.69 cfs.

1. How are City Drainage Guidelines going to be enforced in light of Water Source Protection limitations to on-site retention/detention?

- a. Capture and treat/reuse of all stormwater may be the only option that meets both Water Source Protection and Stormwater management requirements.

	Acres	CFS - 10YR	CFS - 100YR
Developed (A01-A08)	25.42	38.94	56.69
Undeveloped (OS-A1-OS-A2)	23.7	8.4	12.16

- g. The designed increase in runoff from the development may adversely impact recharge in this area. While the USGS water study has indicated limited recharge from the Sand Flats area to the Glen Canyon Aquifer, the monitoring sites selected do not necessarily represent the Lions Back development area due to the fractured nature of the sandstone in this specific area on the outer edges of the formation. Further monitoring and testing should be requested to determine what, if any, recharge the proposed Lions Back development property contributes to the groundwater and spring systems below it. **Millions of gallons a year that may be recharging local springs will be discharged as a stormwater nuisance with potential adverse flooding impacts on downstream properties.**
 - i. How does this impact Water Rights of those depending on these springs for their culinary, irrigation and/or other economic uses?

- 4. “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.”
 - a. The Lionsback Preliminary Design Guidelines designate 3 main types of plantings areas (hydrozones) and provide a list of allowed and prohibit plants for each area. The Landscape Guidelines (section 3, pg 15) do not adequately reflect water conservation, nor are there any specified limits on the use of residential pesticide, herbicide, and fertilizers, Potential Contamination Source #37. The LBDWSPP does assign individual property owners the responsibility for “use of only those pesticides and herbicides approved by the Homeowners Association”, but fails to elaborate on which chemicals will be approved.
 - b. The Lionsback Drinking Water Source Protection Plan down plays the potential impacts that untrained, private citizen applications of bio-cides and chemical fertilizers may have on water quality. (pg 8-5) Applications of these chemicals at the Moab Golf Course is mentioned in the LB DWSPP as justification for use at LB. This neglects to differentiate between applicators such as the Golf Course using professional training, safe handling requirements, and carefully planned

applications compared to a homeowner who just grabbed something at the hardware store. **Having hundreds of individuals with no training or application plans, spraying as much and as frequently as they desire poses a threat to water quality.**

- c. Water Conservation is not adequately addressed in the Landscape Guidelines
 - i. Hydrozone 1, "Enclosed Areas" is designated to be "as lush and varied as desired by the owner", with the only limit being that high-water use grass and ground cover are limited to 400 square feet.
 - ii. Hydrozone 2, "Transition Areas" specify they "may be planted with a combination of plants that will require permanent watering"
 - iii. Water features are allowed at any private residence, with the only requirement being Committee approval of placement and screening. There are no specifications requiring recirculation, or proper design to minimize evaporative losses and consumption of drinking water resources.
 - iv. More stringent water conservation measures need to be incorporated to reflect the City Water Conservation Plan Update that identified a goal of 25% per capita reduction in usage.

References:

- Lionsback Resort Preliminary Design Guidelines, 1/28/2008
- Lionsback Resort Preliminary Drainage Report, 1/4/2008
- Lionsback Drinking Water Source Protection Plan, 1/2010
- Review of Proposed Lionsback Resort Development, EPA Memo, 9/2008
- NRCS Web Soil Survey
- Moab City Water Conservation Plan Update, 12/2016