

SAMPLING PARAMETERS AND PROTOCOLS

A series of parameters were measured to test whether ISDS contribute fecal coliforms to the shallow groundwater, and ultimately, to the Las Vegas Wash tributary network. Parameters included fecal coliforms, PPCP, field chemistry, major cations and anions, trihalomethanes, and perchlorate.

Fecal Coliforms

Microbial samples were collected for plate counts at all sites on a monthly basis for the duration of this study. Fecal coliform samples were collected in 100 ml sterilized bottles. Vinyl or latex gloves were worn as a precaution to avoid contamination of the samples.

Pharmaceutical and Personal Care Products

PPCP collection was conducted for twenty-nine compounds (Appendix A). These compounds were selected because they are frequently used by humans. Traces of these compounds are routinely observed at the parts per trillion (ppt) levels in both untreated and treated sewage effluent, and therefore might be expected in ISDS outflow. Their presence in the surface water could thus indicate an influence from ISDS. Results are reported in ppt concentrations. PPCP samples were collected in 20 millilitre (ml) silinized amber glass vials. Silinization involves pre-rinsing a sample vessel with silane to prevent sorption of constituents to the walls. As a precaution, vinyl or latex gloves were worn to avoid contamination of the samples. Special consideration was afforded to the PPCP samples to avoid contamination from ambient air and exhalation.



Figure 12. Map of Sloan Channel detailing location of sample sites. Area of high ISDS density is located to the Northeast. Lined channel highlighted in yellow, natural channel highlighted in green.



Figure 13. Photo detailing surface water sampling site on Sloan Channel at Charleston Blvd. Sampling is conducted under the bridge above the spill over (SLOAN CHAR).



Figure 14. Photo detailing surface water sampling site above the confluence of Sloan Channel and the Orchard Area Conveyance (SLOAN ORCH).



Figure 15. Photo looking south (downstream) detailing the location of Sloan Borehole and the proximity to the Sloan Channel (SLOAN BH).



Figure 16. Photo looking Upstream (North) at the site of the Sloan Borehole (SLOAN BH).



Figure 17. Detailed photo of the Sloan Borehole (SLOAN BH).

Field Chemistry

Field chemistry was collected during each sampling event including: EC, pH, and temperature. EC is a measure of electrical resistance of water and is related to the amount of dissolved ions present. A change in EC along points in a flow path indicates a change in the concentration of ions present. An increase in EC along a flow path might result from mixing with a higher salinity water or evapoconcentration. A decrease in EC along a flow path might represent dilution through the addition of lower salinity water. EC is reported as $\mu\text{S}/\text{cm}$.

Major Ion Chemistry

Analysis of major cations and anions was conducted monthly to determine both the seasonal variability of water chemistry and for comparison to septic constituent concentrations. The comparison of conservative ion ratios to both indigenous groundwater and municipal supply water can demonstrate the degree each influences shallow groundwater chemistry and surface water chemistry in the tributaries. Results are reported in parts per million (ppm) concentrations. Samples for cations and anions are collected in clean styrene one pint bottles.

Trihalomethanes

Analysis was conducted for Trihalomethanes (THMs) as an additional tool to indicate a waters source. THMs are byproducts of drinking water disinfection. Their presences indicate that

municipal drinking water supplies contributed to the observed water. These compounds are contributed either through irrigation application or through ISDS leach fields. Attenuation and biodegradation of THMs in the vadose zone is poorly understood. Therefore, the lack of THM in a sample does not imply that municipally sourced water is not present. THM samples were collected in 40 ml borosilicate vials with hydrochloride acid (HCl) as a preservative.

Perchlorate

Analysis for the perchlorate ion was conducted as an additional confirmation of municipal water contribution. The three study areas are not located near known areas of perchlorate contamination and because, it is conservative, any perchlorate found probably originated in the municipal water supply. Perchlorate analysis was conducted from the samples collected for major cations and anions.

Sampling Protocol

Surface water samples were collected as grab samples. Groundwater samples were collected after three well volumes were purged with a disposable Teflon bailer. Samples were labeled and placed on ice as a primary form of preservation. Upon completion of a sampling event, samples were delivered to the SNWS laboratory at the Alfred Merrit Smith Water Treatment Facility for analysis of coliform bacteria, major cations and anions, perchlorate and THMs. A formal chain of custody protocol was followed. PPCP samples were delivered to the River Mountains Water Treatment Facility Research and Development laboratory for analysis under the supervision of Dr. Shane Snyder.