Groundwater Quality Monitoring and Assessment Plan along the Las Vegas Wash

Prepared for:

Las Vegas Wash Coordination Committee
Research and Environmental Monitoring Study Team

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ABSTRACT

Groundwater quality has been monitored in the Las Vegas Valley watershed by various agencies with different programs for many years. The formation of the Las Vegas Wash Coordination Committee (LVWCC) in 1998 facilitated an unprecedented level of water (surface water and groundwater) quality data collection, information exchange, and cooperation among the committee's stakeholders. The Las Vegas Wash Comprehensive Adaptive Management Plan (CAMP) was developed by the LVWCC to outline a path for achieving the community's water quality goals. Among the action items listed in the CAMP was a recommendation to develop a long-term shallow groundwater monitoring program.

The goal of this plan is to support sound management of the Las Vegas Wash (Wash) by sustaining an integrated, adaptive, and robust monitoring network that characterizes the groundwater quality along the Wash and the potential environmental impacts from shallow groundwater contributions. Previous and current groundwater monitoring programs conducted by various entities have been evaluated in this plan. Several important principles were considered in developing this plan, including: leveraging and integrating resources, focusing and monitoring shallow groundwater systems along the Wash, calculating mass/water balances, maintaining historical records, detecting groundwater quality improvements and its impacts on water quality of the Wash and Lake Mead, and addressing future unknowns.

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1.0 INTRODUCTION

There are two groundwater systems in the Las Vegas Valley (Valley) watershed, a local shallow groundwater system and a regional deep groundwater system. Located in the central and southeast part of the Valley, shallow groundwater is normally present at less than thirty feet below land surface. The local shallow groundwater system has been recharged by precipitation (rain and snow on the surrounding mountains), downward percolation of excess irrigation water, and upward moving groundwater from the deep groundwater system. Underlain by a confining layer of clay or caliche (soil cemented by calcium carbonate), the shallow groundwater zone (vadose zone) is composed primarily of silts, clay, and poorly sorted sands and gravels. The general flow direction of the shallow groundwater system is southeast toward the Las Vegas Wash (Wash).

Perchlorate has become a major water quality concern in the shallow groundwater system since it was detected in Lake Mead in 1997. The sources of perchlorate in Lake Mead are two industrial complexes (Kerr-McGee and American Pacific, formerly Pepcon) near Henderson, where most of the perchlorate was produced. Among other uses, perchlorate is used as an oxidizer for solid rocket propellant. Groundwater contaminated with perchlorate traveled to the Wash through the shallow groundwater system and subsequently entered the lake. Although perchlorate is no longer manufactured in the industrial complexes, contaminated groundwater remains. The Nevada Division of Environmental Protection (NDEP) has been diligently working with the responsible parties to capture this water and prevent additional perchlorate from entering the Wash with the installation of an interception system that uses wells to extract the contaminated water. This system has proven extremely effective, reducing the amount of perchlorate entering the Wash by approximately 90 percent.

Due to over-irrigation of landscapes, high evapotranspiration, and dissolution of minerals (such as gypsum) by shallow groundwater in the vadose zone, shallow groundwater in the Valley has high concentrations of total dissolved solids (TDS), ranging from 1,500 mg/L in the central part of the Valley to greater than 7,000 mg/L in the southeast Valley (LVWCC, 2000). Also, urban runoff water quality monitoring indicates that most tributaries have high concentrations of selenium (Se) (Zhou et al., 2004; Cizdziel and Zhou, 2005). Further studies suggested that resurfacing shallow groundwater is the major Se source.

Like any other rapidly-growing metropolitan area, land use changes due to urbanization have a direct impact on shallow groundwater quality. These changes have resulted in the detection of various pesticides, herbicides, and other anthropogenic contaminants (USGS, 1998). Landfills on both sides of the Wash, including Sunrise Mountain Landfill and Henderson Landfill, also have potential impacts to shallow groundwater quality near the Wash (City of Henderson, 2001; Golder Associates, 2013).

Although groundwater quality has been monitored in the Valley watershed by various agencies for many years, the data collected by these agencies was acquired sporadically

and not uniformly managed. Most of the monitored groundwater wells are either abandoned or difficult to locate for re-sampling.

2.0 PURPOSE AND SCOPE

The purpose of this plan is to characterize shallow groundwater quality along the Wash and to address the impacts of groundwater on Wash water quality. Another purpose of this plan is to meet an action item in the Las Vegas Wash Comprehensive Adaptive Management Plan (CAM)P). The formation of the Las Vegas Wash Coordination Committee (LVWCC) has facilitated an unprecedented level of water (surface water and groundwater) quality data collection, information exchange, and cooperation among the committee's stakeholders. The CAMP was developed by the LVWCC to outline a path for achieving the community's water quality goals. The following eight (8) recommendations (or Actions) were proposed by the Shallow Ground Water Study Team to facilitate understanding of the shallow groundwater system, its impact on the Wash, and interagency coordination to manage the Wash:

- Develop a central database
- Locate and inventory existing shallow monitoring wells
- Identify issues of concern
- Develop a long-term monitoring program
- Develop a method to identify the potential for future contaminant discovery
- Develop and implement a notification plan
- Promote interagency coordination
- Develop a bibliography

Most of these action items have been implemented or addressed by different entities since 1998. Until now, a long-term monitoring program near the Wash has not been developed. With participation from the different entities, this plan was developed to collect water quality and hydrogeologic data and limit duplication of effort. As recognized in the CAMP, the scope of this plan includes the following components:

- Measuring water quality
- Conducting aquifer testing
- Identifying the contribution of shallow groundwater inflow
- Identifying data gaps and the needs for additional monitoring wells
- Developing monitoring timeframes to ensure sufficient data collection
- Understanding the role of land use practices on shallow groundwater quality
- Reviewing historical photos for past land use practices

3.0 PREVIOUS AND CURRENT MONITORING PROGRAMS

3.1 U.S. Geological Survey

As part of the National Water-Quality Assessment (NAWQA) Program, the U.S. Geological Survey (USGS) collected water samples from 32 shallow monitoring wells and 22 public-supply wells in Las Vegas Valley during 1993-1995 (Neal and Schuster, 1996; Lico, 1998). The data collected from this program were used to evaluate whether water in the principal aquifer had been affected by the overlying shallow groundwater.

The USGS NAWQA data indicated that shallow groundwater in the Valley is moderately saline, and a magnesium, calcium-sulfate type. Concentrations of TDS in water samples collected from the shallow monitoring wells ranged from 351 to 5,700 mg/L with a median of 3,400 mg/L. The uranium concentration in water sampled from five shallow monitoring wells ranged from 7 to 56 µg/L and two of the samples exceeded the drinking-water standard of 30 µg/L.

Water from the 22 public-supply wells was a dilute calcium-sulfate type (Lico, 1998). TDS concentrations in samples from more than half of the 22 NAWQA public-supply wells exceeded the secondary drinking-water standard of 500 mg/L, with a median of 565 mg/L. Sulfate concentrations in water from these wells had a median concentration of 205 mg/L, and concentrations of dissolved arsenic ranged from 1 to 11 µg/L, with a median concentration of 2 µg/L.

The USGS NAWQA Program also monitored for pesticides in the Valley. A total of 11 shallow groundwater monitoring wells were sampled semiannually, starting from 1999. At least one pesticide was detected from 6 out of 11 wells. Pesticides were detected in shallow groundwater 100 feet or less below land surface in the urban areas (Bevans and others, 1998; Lico, 1998; USGS, 2009).

The NAWQA Program finished its first cycle of studies from 1991 to 2001 and its second cycle of studies from 2001 to 2012. The data collected by USGS provides very useful information on shallow groundwater quality in the Valley.

3.2. The BMI Complex Companies

The Black Mountain Industrial (BMI) Complex encompasses approximately 5,000 acres of vacant desert in the southeastern part of the Valley. It was deeded in 1941 by the U.S. government and was the site of the world's largest magnesium plant. This plant played a critical role in World War II. After the war, parts of the plant and adjacent land were leased to various industrial, governmental and business entities for the production of chemicals and other products. During the many years of operation, a variety of industrial and municipal effluent was disposed on-site to unlined evaporation ponds, transported off-site via ditches, or released on to the ground. Some of the waste migrated into the Wash. Under the supervision of NDEP, various parties and entities have been conducting groundwater and soil monitoring, remediation, and treatment on the BMI Complex since 1980.

Titanium Metals Corporation (TIMET) owns the eastern most section of the BMI Complex and has been operated since 1950. As a result of the release of contaminants from routine operations, compounds are found in the groundwater at or near the site, including uranium, TDS, tetrachloroethene (PCE), trichloroethene (TCE) and various semi-volatile organic compounds.

Tronox LLC (Tronox), formerly Kerr-McGee Chemical LLC, is located within the BMI Complex and is approximately 450 acres in size. Tronox filed for bankruptcy in 2009. As part of Tronox's reorganization, the Nevada Environmental Response Trust (NERT) was established in 2011 and became the owner of the property. Contaminants on the NERT site include metals (such as arsenic, chromium VI, manganese), perchlorate, dioxin, other semi-volatile organic compunds, PCBs, asbestos, and organochlorine pesticides. Groundwater has been extracted and treated to remove perchlorate and other contaminants at three discrete extraction well fields, including the Interceptor Well Field, Athens Road Well Field, and Seep Well Field (Appendix A). More than 300 groundwater wells have been monitored regularly for perchlorate, chromium, TDS, nitrate, and chlorate to determine the extent of the contamination.

Olin Chlor Alkali owns the western most portion of the BMI Complex. It occupied land that historically was used by Pioneer Americas LLC (Pioneer LLC), Stauffer Management Company and Montrose Chemical Corporation of California. A site-wide groundwater monitoring program was initiated in 2006 to characterize contaminants, their distribution and seasonal changes in groundwater on the site. Groundwater samples have been collected from three zones (shallow, middle, and deep) annually and analyzed for volatile organic compounds (VOCs), pesticides, metals (arsenic, barium, cadmium, chromium, lead, mercury, selenium, silver and uranium), TDS, organic acids, perchlorate, and other radiochemical constituents.

More details of the BMI Complex, including site history, responsible parties, chemicals and wastes, and monitoring and remediation programs conducted by various companies and entities, can be found at http://ndep.nv.gov/bmi/.

3.3 Bureau of Reclamation

As part of the Las Vegas Wash Unit Point Source Project, the Bureau of Reclamation (BOR) had monitored groundwater quality from 18 wells in the vicinity of the Las Vegas Wash between May 1980 and June 1986 (pers. comm., J. Kirsch). These wells include shallow observation wells (LG219, LG221, LG223, LG225, LG227, and LG231), deep observation wells (LG220, LG222, LG224, LG226, LG228, LG230, and LG232), and production wells (LG203, LG208, LG213, LG218, and LG237). Water samples were analyzed for cations, anions, hardness as $CaCO_3$, and TDS. Water temperature, pH, and electrical conductance (EC) were also measured during sample collection. The well information is listed in Table 1. More details on these wells, including locations, exploratory well schematics, and site plans, are included in Appendix B.

Table 1. BOR Groundwater Monitoring Wells Near the Wash (5/80-6/86)

Wells	Township	Range	Section	Well Type
LG203	22	62	8	Production Well
LG208	21	61	25	Production Well
LG213	21	62	7	Production Well
LG218	21	62	4	Production Well
LG219	21	62	22	Shallow Observation Well
LG220	21	62	22	Deep Observation Well
LG221	21	62	28	Shallow Observation Well
LG222	21	62	28	Deep Observation Well
LG223	21	62	24	Shallow Observation Well
LG224	21	62	24	Deep Observation Well
LG225	22	62	2	Shallow Observation Well
LG226	22	62	2	Deep Observation Well
LG227	22	62	14	Shallow Observation Well
LG228	22	62	14	Deep Observation Well
LG230	22	63	16	Deep Observation Well
LG231	22	63	32	Shallow Observation Well
LG232	22	63	32	Deep Observation Well
LG237	21	63	29	Production Well

3.4 Clean Water Coalition

More than 10 years ago, the Clean Water Coalition (CWC) initiated the Systems Conveyance and Operations Program (SCOP) project to address the need to provide alternative conveyance of wastewater discharge to Lake Mead. As part of their feasibility study, groundwater was monitored from 27 wells along the proposed alignment of the pipeline (Converse Consultants, 2009). The purpose of the groundwater monitoring was to characterize groundwater conditions in the vicinity of the SCOP alignment in order to support the design of facilities and to assist in construction planning and future operations. The monitoring results from these wells were also used as a reference tool for anticipated conditions regarding groundwater dewatering during the construction phase of the SCOP project.

Groundwater levels and water quality was monitored in selected wells throughout different phases of the SCOP project starting in 2001. Groundwater levels were measured using an electronic water level indicator (sounder probe). Water quality parameters, including temperature, pH, salinity, and electrical conductance, were recorded with a YSI-63. Based on the results reported by Converse Consultants (2009), groundwater from these wells was contained in either an unconfined or confined aquifer. Groundwater

levels from the monitoring wells along the proposed alignment of the SCOP project fluctuated from 1.3 feet to 51.1 feet during the monitoring year (2008-09). Water quality also varied from well to well.

Converse Consultants recommended long-term groundwater monitoring of all SCOP wells until the completion of the SCOP pipeline/tunnel construction. The monitoring was never implemented due to the suspension of the SCOP project in 2011. All of groundwater monitoring wells were plugged.

3.5 City of Henderson

The City of Henderson (COH) conducted as least two groundwater monitoring projects during 1993-2001, one was for the Henderson Landfill and another was for shallow groundwater seepage problems in northwestern Henderson. Currently, COH is monitoring several shallow groundwater wells at the COH wastewater treatment facility as part of the requirements for their wastewater discharge permit.

3.5.1 The Henderson Landfill

The Henderson Landfill is a 145.8-acre parcel of land in the northeast corner of the City of Henderson, near the residential developments Calico Ridge and Tuscany Hills (Figure 1). The Henderson Landfill was used for the disposal of municipal solid waste from 1957 until it was closed in the early 1970s. In 1997, the City of Henderson acquired ownership of the site from the federal government to facilitate the process of completing the environmental investigation of site conditions and permanently closed the landfill. Required by the Landfill Closure Agreement, the City of Henderson retained an environmental consulting firm, Camp Dresser & McKee (CDM), to conduct an Engineering Evaluation/Cost Analysis (EE/CA). In July 2001, the EE/CA for the site was completed. As part of the EE/CA study, surface and subsurface soil, soil gas and groundwater samples were collected and analyzed for contaminants that might have been leached and released from the landfill and could pose a potential risk to human health and the environment (CDM, 2001).

Based on the information collected from onsite monitoring wells, the near-surface (shallow) aquifer is estimated to occur at depth of 23 to 50 feet below ground surface. A deeper confined aquifer is located beneath the shallow aquifer and discharges upward into the shallow aquifer. Groundwater flow is generally from the south to north beneath the site toward the Wash. Water samples were collected from nine new groundwater wells and eight existing wells in locations that were hydraulically upgradient and off and on the site. They were analyzed for VOCs, SVOCs, pesticides, PCBs, total metals, cyanide, sulfate, nitrate plus nitrite, chloride and fluoride, chemical oxygen demand, carbonate and total alkalinity, methane, ethane, ethane, dioxins, and furans. The shallow groundwater beneath the site contains elevated concentrations of carbonate, bicarbonate, gypsum, and total dissolved solids and is considered unsuitable for domestic, agricultural, or industrial use. However, based on comparisons between concentrations of constituents detected in wells hydraulically upgradient of the site and in onsite wells, most constituents detected in onsite groundwater appear to be associated with either naturally occurring or offsite sources. There was no indication of the presence of landfill leachate

in groundwater. The EE/CA study also recommended prohibiting land uses that could damage the cap of the landfill and to control future groundwater use at the site.

Figure 1. Location map showing the Henderson Landfill

3.5.2 Shallow Groundwater Seepages

Numerous locations in northeastern Henderson, primarily within Whitney Ranch and Bluffs/Fox Ridge residential areas, were experiencing detrimental surface discharge (seepage) of shallow groundwater in the early 1990's (Figure 2). Near-surface groundwater seepages resulted in excessive soil saturation and ponded water in lawns, along curbs and gutters, and around houses. This posed numerous geotechnical, health/safety, and aesthetic concerns.

In order to address public concerns and complaints, the City of Henderson hired the environmental consulting firm SEA Inc., to investigate the shallow and surfacing groundwater in these residential areas during 1993-94. The study was done in two phases. The first phase of the study included identification of an appropriate study area, evaluation of the extent and magnitude of the problems, preliminary assessment of conditions responsible for the problems, recommendations for further investigation, and preliminary mitigation direction. The second phase of the study included: installation of groundwater monitoring wells, detailed hydrological and geochemical evaluations, and formulation of mitigation recommendations based on the understanding of the history, sources, and hydraulics of the shallow and surfacing groundwater.

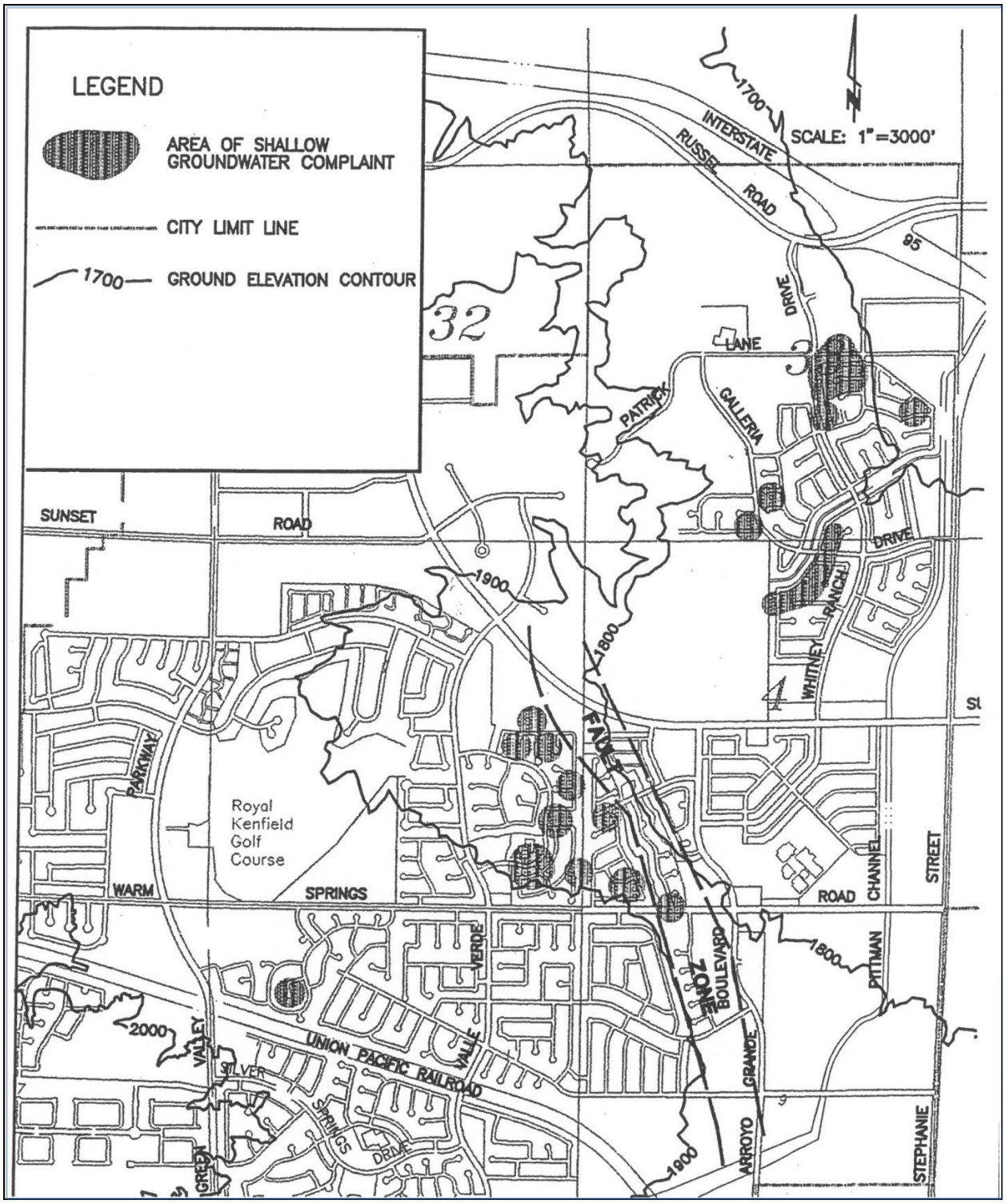

Figure 2. A map showing areas of concerns with near-surface groundwater (modified from SEA, 1994)

A total of 31 groundwater monitoring wells were constructed for the study. Groundwater samples were collected and analyzed for pH, electrical conductance, TDS, total alkalinity, major cations (sodium, potassium, calcium, and magnesium), major anions (bicarbonate, carbonate, sulfate, chloride, fluoride, and hydroxide), silica, nutrients (N and P), and isotopic constituents (oxygen, hydrogen, and tritium). A map showing groundwater sampling locations and a summary of the chemical constituents detected in the groundwater samples are attached in Appendix C.

3.5.3 Groundwater Monitoring for Discharge Permit

COH owns and operates two water reclamation facilities, the Kurt R. Segler Water Reclamation Facility (KRSWRF) and the Southwest Water Reclamation Facility (SWRF). The COH discharges a portion of their effluent to the Wash. They are also permitted under NDEP permit NEV80003 (Appendix D) to discharge tertiary treated, denitrified wastewater from the wastewater treatment and water reclamation facilities to: a) groundwaters of the State of Nevada from the KRSWRF via wetlands ponds at the Bird Viewing Preserve; or b) groundwaters of the State of Nevada via four outfalls for irrigation at the reuse sites in the greater Henderson area. Consequently, groundwater sampling and monitoring is required in addition to the influent and effluent sampling and monitoring at the wastewater treatment plants. The groundwater wells that are sampled and monitored by COH can be found in Figure 3. Table 2 and Table 3 list all monitoring well locations and all groundwater sampling and reporting requirements, respectively.

Figure 3. A map showing the locations of COH groundwater monitoring wells

Table 2. COH Groundwater Monitoring Well Coordinates

WELL	Decimal Degree		Degree-Minute-Second	
	LONGITUDE	LATITUDE	LONGITUDE	LATITIDE
BMI-1	-114.9859	36.0546	-114° 59' 9.37"	36° 3' 16.44"
BMI-2	-114.9827	36.0555	-114° 58' 57.68"	36° 3' 19.77"
BMI-3	-114.9854	36.0601	-114° 59' 7.38"	36° 3' 36.47"
MW-01	-114.9876	36.0765	-114° 59' 15.43"	36° 4' 35.27"
MW-02	-114.9860	36.0765	-114° 59' 9.45"	36° 4' 35.44"
MW-08	-114.9816	36.0859	-114° 58' 53.76"	36° 5' 9.41"
MW-09	-114.9847	36.0857	-114° 59' 4.85"	36° 5' 8.41"
MW-13	-115.0028	36.0813	-115° 0' 9.98"	36° 4' 52.81"
MW-14	-115.0046	36.0808	-115° 0' 16.52"	36° 4' 50.82"
MW-16	-115.0049	36.0725	-115° 0' 17.76"	36° 4' 21.12"
MW-17	-114.9823	36.0550	-114° 58' 56.32"	36° 3' 18.15"
MW-18	-114.9863	36.0536	-114° 59' 10.58"	36° 3' 12.85"
MW-21	-114.9767	36.0530	-114° 58' 36.26"	36° 3' 10.68"
MW-22	-114.9985	36.0723	-114° 59' 54.57"	36° 4' 20.34"

Table 3. COH Groundwater Sampling and Reporting Requirements

Parameters	Units	Effluent Limitation		Monitoring Requirements		
				Sampling Locations	Monitoring Frequency	Monitoring Type
Depth to water[1]	ft	---	M&R	All	Annually	Meter
Static Water Elevation[1]	ft amsl	---	M&R	All	Annually	Meter
Chlorides[2]	mg/l	---	M&R	All	Annually	Discrete
TDS[2]	mg/l	---	M&R	All	Annually	Discrete
Nitrate as N[2]	mg/l	---	M&R	All	Annually	Discrete
Total Nitrogen[2]	mg/l	---	M&R	All	Annually	Discrete
Ammonia as N[2]	mg/l	---	M&R	All	Annually	Discrete

Notes; All = monitoring wells: 13, 14, 16, and others that may be added.

amsl: above mean sea level
mg/l: milligrams per liter
M&R: Monitor & Report
TDS: Total Dissolved Solids

1. Measure annually, the depth to groundwater, and static water elevation, for each well, at the time of sampling, and report for each calendar year 4th quarter on January DMR forms.
2. Sample and analyze annually and report for each of the parameters. Report annually in January for each calendar year 4th quarter.

3.6 Environmental Protection Agency

The Sunrise Mountain Landfill is a closed municipal landfill that operated from 1951 through 1994. In January 2013, the construction of a final cover system including stormwater control features was completed. The final cover system includes a gravel admix/gravel veneer erosion layer. The gravel fraction minimizes erosion and the fine fraction allows for water storage and evaporation. The stormwater control features were designed to minimize stormwater flow onto the cover and optimize flow off the cover. Included in the stormwater control system are an up-canyon dam and detention basin and approximately three miles of stormwater channels and an additional three detention basins.

As the requirement of Tasks 4.3.6 and 4.3.8 of the Consent Decree between Republic Services of Southern Nevada and the Environmental Protection Agency (EPA), groundwater monitoring at the landfill has been conducted to determine background water quality and downgradient water quality. A statistical comparison of groundwater at the landfill in comparison to regional aquifers and an evaluation of whether the landfill or other source is the cause for statistically significant increases is also included. The Groundwater Characterization Report on the Sunrise Mountain Landfill was submitted to the EPA in 2013 (Golder Associates, 2013). This report presents the findings of nine quarters of groundwater sampling along with an interpretation of the results. This report meets the requirements of Task 4.3.8 of the Consent Decree by proposing groundwater monitoring parameters and groundwater protection standards.

Three separate water zones have been identified at the landfill based primarily on major cation and anion geochemistry. The First Water Zone is the shallowest of the three zones, the Second Water Zone is the middle zone, and the Third Water Zone is the deepest. The evaluation of groundwater quality in each zone is dependent upon the number of wells screened in each zone and the presence or absence of background/upgradient wells. Three monitoring wells, including MW-10A at the northernmost area of the site and MW-17A and MW-17B at the west of the site, have been used as upgradient or background wells for the assessment of water quality conditions in the First Water Zone. Downgradient monitoring wells in the First Water Zone include wells MW-1A, MW-1C, MW-2A2, MW-2B, MW-2C2, MW-3E, MW-4A, MW-5C, MW-6B, MW-6C, MW-7D, MW-7E, MW-8A, MW-8B, MW-9A, MW-9B, MW-11B, MW-12A, MW-13C, MW-14A, MW-14B, and MW-15B. The Second Water Zone wells are downgradient of the First Water Zone and include MW-2D, MW-2D2, MW-2E3, MW-3F, MW-11A2, and MW-13D. The Third Water Zone wells are downgradient of the Second Water Zone and include MW-2E, MW-3G, MW-4B, MW-4C, MW-5B4, MW-11C, MW-12B2, and MW-12D (Table 4).

Based on data collected during nine quarters of groundwater sampling, groundwater at the site has been impacted locally by volatile organic compounds (VOCs) via fugitive landfill gas. The analytical results, including VOCs, inorganics, isotopes, and carbon dioxide, indicate that landfill gas is the source of limited impact to groundwater. The Groundwater Characterization Report (Golder Associates, 2013) also concluded that the potential for the Sunrise Mountain Landfill to impact regional aquifers is low.

Table 4. Well zone summary at the Sunrise Mountain Landfill

Well ID	Top of Casing Elevation (ft)	Top of Screen Elevation (ft)	Bottom of Screen Elevation (ft)	Geochemical Zone
Hydrostratigraphic Zone 1 Wells				
MW-1A	1971.85	1886.85	1876.85	N/A
MW-2A-2"	1889.70	1684.7	1674.7	1
MW-2A	1888.8	1708.8	1693.8	1
MW-2B	1897.32	1697.323	1682.323	1
MW-2C2	1918.43	1660.43	1655.43	1
MW-3E-2"	1888.51	1686.51	1676.51	1
MW-4A	1864.57	1679.57	1659.57	1
MW-5C	1901.19	1762.19	1747.19	1
MW-6B-2"	1972.08	1770.58	1745.58	1
MW-7E	2011.53	1772.53	1752.53	1
MW-8A	2152.60	1769.601	1754.601	1
MW-8B	2151.67	1674.667	1659.667	1
MW-9A	2214.22	1704.223	1679.223	1
MW-9B	2214.90	1764.896	1739.896	1
MW-10A	2433.29	1728.29	1713.29	1
MW-11B	1891.82	1646.82	1631.82	1
MW-12A	1880.83	1638.83	1628.83	1
MW-13C	1880.33	1716.33	1706.33	1
MW-14A	1910.74	1699.74	1684.74	1
MW-14B	1960.71	1726.71	1706.71	1
MW-15B	2039.52	1767.52	1757.52	1
MW-17A	1836.99	1774.99	1754.99	1
Hydrostratigraphic Zone 2 Wells				
MW-2D	1917.53	1409.53	1384.53	2
MW-2D2	1919.06	1494.06	1479.06	2
MW-2E3	1920.51	1478.51	1463.51	2
MW-3F	1889.93	1631.93	1611.93	2
MW-4C	1865.33	1410.33	1395.33	3
MW-6C	1972.35	1566.35	1541.35	1/2
MW-7D	2012.23	1542.23	1532.23	1
MW-11A-2"	1892.05	1500.05	1485.05	2
MW-12B2	1882.86	1413.86	1398.86	3
MW-13D	1878.54	1618.54	1608.54	2
MW-17B	1835.83	1592.83	1567.83	1
Hydrostratigraphic Zone 3 Wells				
MW-1C	2009.79	1352.79	1327.79	1
MW-2E	1918.59	1241.59	1231.59	3
MW-3G	1886.60	1367.6	1337.6	3
MW-4B	1865.15	1090.15	1065.15	3
MW-5B4	1902.40	1302.402	1277.402	3
MW-11C	1887.74	1084.74	1059.74	3
MW-12D	1879.04	1084.04	1069.04	3

3.7 Southern Nevada Water Authority

The Southern Nevada Water Authority (SNWA) has been monitoring shallow groundwater wells in the southeast part of the Valley (near the Wash) since the late 1990s. Monitoring was conducted to characterize the shallow groundwater contamination plume (perchlorate and other contaminants) migrating from the BMI (BMI) complex to the Wash. Twenty shallow groundwater wells near the Wash were monitored and sampled on a regular basis. These wells include: WMW7.8N, W06, W04, W03, W02, 3KGBHSN (WMW3.5N), W08, 3KGBHSS (WMW3.5S), WMW6.2N, COH-1, COH-1A, COH-2, COH-2A, CCSD-2, WMW5.5S, LG030, WMW4.9S, W07, USGS-SE, and G13202. Water quality data, including general chemistry, field measurements, cations, anions, and metals, were collected.

Another shallow groundwater monitoring program has been conducted and it was first started as part of the revegetation project at the Wash. A series of shallow groundwater wells were drilled to provide irrigation water to revegetation sites. Shallow groundwater was pumped to irrigate the newly-planted trees and shrubs. In order to ensure the groundwater from these irrigation wells was suitable for the growth of plants, water quality was monitored. Beginning in April 2001, groundwater quality from two irrigation wells located downstream of the Pabco Road Weir, Pabco South Well (WMW6.0S) and Pabco North Well (WMW6.0N), have been monitored regularly. Since June 2002, the program was expanded to include four more wells around Pabco Road Weir, WMW5.58S, WMW5.85S, WMW6.15S and WMW5.7N. Based on the hydrogeological and water quality data collected, the quantity and quality of groundwater pumped from these wells is either limited or unsuitable for irrigation. Water quality and hydrologic data collection continued and these data are available since 2001.

More than a dozen erosion control structures (i.e., weirs) and miles of bank protection have been built across and along the Wash. Before and during the construction of these erosion control structures, shallow groundwater was pumped from wells and discharged into the Wash. As required by the NDEP dewatering permits, groundwater quality samples and flow data were monitored and collected to evaluate any impacts of the dewatering on water quality in the Wash, Lake Mead, and the adjacent shallow groundwater system. Data were collected from these shallow groundwater wells from the late 1990s to 2010. The wells owned by the CWC were plugged and abandoned in 2010 and a few wells (such as WMW6.2N and LG030) no longer existed. Water level data from two wells (USGS-SE and CCSD-2) are still collected on a semi-annul basis.

The current shallow groundwater monitoring program not only collects water quality data from the shallow groundwater wells, but also provides information on pollutant (such as perchlorate and others) loading rates from the shallow groundwater system into the Wash and Lake Mead and interactions between groundwater and surface water along the Wash. Groundwater samples are collected from the monitoring wells regularly (monthly or quarterly). All shallow groundwater monitoring wells are shown in Figure 4.

Field water quality parameters including water temperature, pH, DO, and EC are measured using a Hydrolab at each monitoring well. The following water quality parameters are analyzed: major ions, TDS, silica (SiO_2), boron, perchlorate, and metals. Water quality and hydrologic data collected from the irrigation wells have been summarized in a project report (Zhou, 2012).

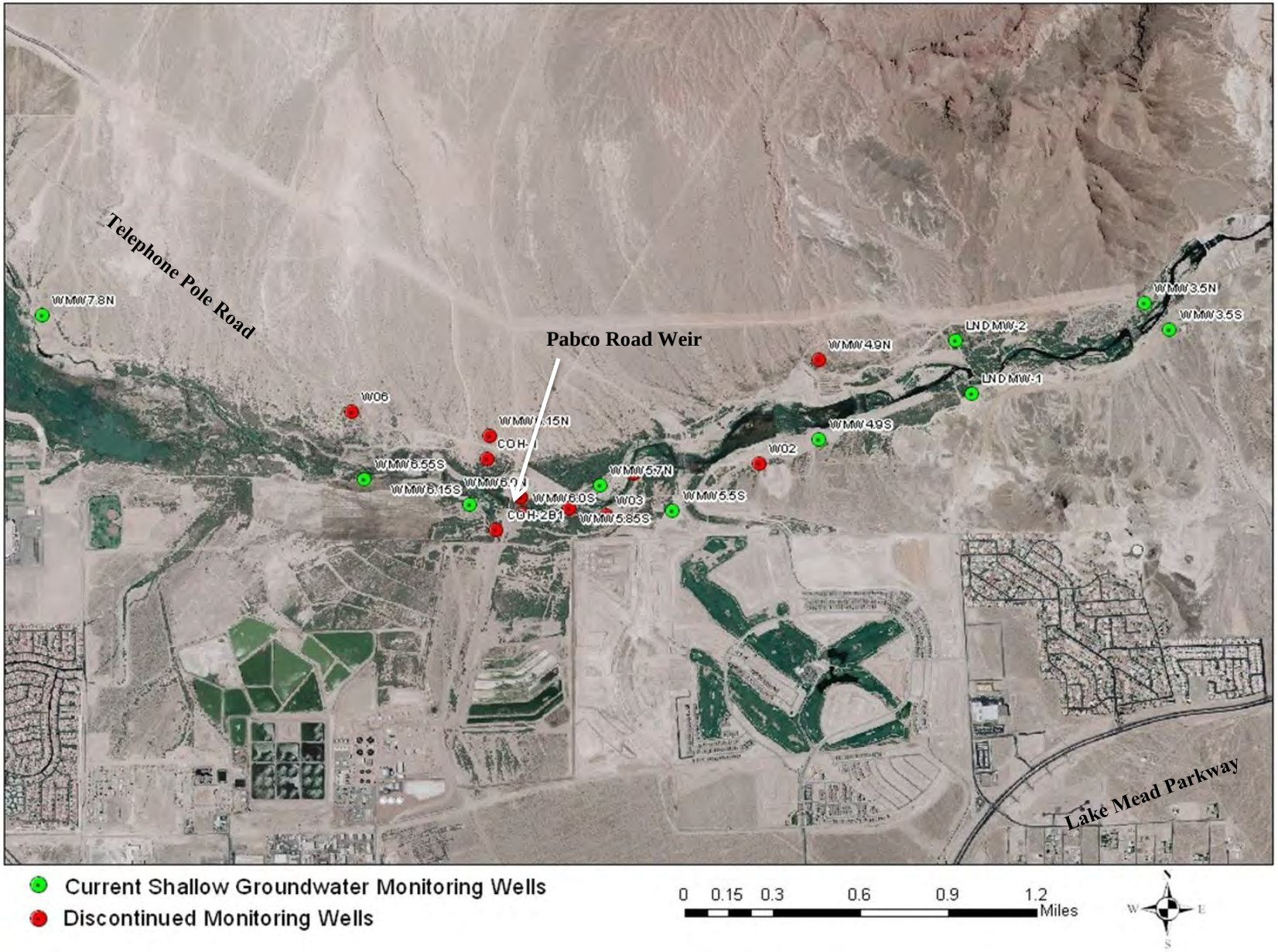

Figure 4. Location map showing current and discontinued monitoring wells along the Las Vegas Wash

4.0 MONITORING NETWORK

4.1 Groundwater Monitoring Program Evaluation

The goal of this groundwater monitoring plan will be achieved by developing a lasting network of monitoring locations that are sampled or measured by multiple entities rather than by a single entity. If the network is reliable, this approach can be a more efficient alternative to a single entity sampling approach. Certainly, the monitoring network inherently relies upon its participants for its success. The entities identified in Section 3.0 are considered potential monitoring network partners and are critical to its success. Since many of these partners are required to monitor groundwater because of various permits, the foundation of the monitoring network will rely upon the non-discretionary monitoring activities of the partners. These activities are considered relatively permanent and are an ideal starting point for building the monitoring network.

Most groundwater monitoring programs summarized in Section 3 were conducted by different entities for their own purposes. Most of these groundwater monitoring programs lasted for a defined period of time and were discontinued after the entities were satisfied with the data they collected or the funding for the programs ended. Unlike the surface water quality monitoring programs in the Wash and its tributaries, most groundwater monitoring programs in the Valley are short-term projects. Consulting firms (for example, those working with NDEP on the Henderson BMI Complex), the COH, and SNWA are among the few entities currently performing long-term groundwater monitoring near or along the Wash. Due to funding concerns, it is more realistic to use the long-term groundwater monitoring program currently conducted by SNWA to fulfill the groundwater monitoring goals set in the CAMP. The program can be expanded and modified to better meet the requirements of the CAMP if necessary.

4.2 Maintain Historical Record

Most of the groundwater quality monitoring activities near or along the Wash have been on-going or completed during the last several decades. Most of the historic data are collected and maintained by the responsible entity. This groundwater monitoring plan proposes to build a central database focusing on the current available groundwater quality data with an expansion to the historic data in the future.

4.3 Detect Improvements

The mission of the LVWCC is to stabilize and enhance the Wash. The groundwater monitoring program was developed to generate data that could be used to measure the improvements or detrimental impacts of activities. There is approximately $200 million worth of facilities that have been or will be built along the Wash. Considering the tremendous cost of the facilities, derived benefits are important attributes to measure. Another important role of the shallow groundwater monitoring program is to delineate groundwater contamination (such as perchlorate, trace metals, and other organic contaminants) plumes that may migrate from the Henderson BMI Complex to the Wash. The data can be used to estimate mass flux rates of contaminants contributing to the Wash and Lake Mead and to evaluate the effectiveness of on-site removal activities in the Henderson BMI complex.

4.4 Monitoring Well Naming

Nomenclature consistency is one of the most important components of the network. It is ideal to have the same naming convention for the monitoring wells near the Wash. This may be difficult because the monitoring wells were named with several different systems by various partners. Since 2005, site naming has followed a few simple rules that were developed by the Interagency Sampling and Coordination Committee and these rules were adopted for the Las Vegas Wash Surface Water Quality Monitoring and Assessment Plan. This naming convention is also in place for most of the monitoring wells in this plan. In brief, alphanumeric codes are given to sample sites based on the well name and distance along a reference line (river channel). The reference line for the Wash Monitoring Wells (acronym = WMW) begins at the high pool elevation of Lake Mead (elevation 1,221 above mean sea level) and follows the Wash channel to where it originates. Consequently, a monitoring well at Wash mile 3.5 would be named WMW3.5. To distinguish monitoring wells that are respectively located on the south (S) or north (N) bank of the Wash, S or N will be added to the name (such as WMW3.0S or WMW3.0N).

There are some exceptions for several monitoring wells near the Wash with different naming systems, including W02, W03, W06, COH-2A, COH-2B1, LNDMW1, and LNDMW2. These wells were built and monitored by sampling entities for their own purposes. However, unlike the surface water sample sites, the monitoring wells near the Wash are fixed with their locations. These sites will be renamed in the Lower Colorado River Regional Water Quality Database (the database) and the original names will be provided as an alias. This groundwater monitoring plan requires that all monitoring wells (historic, current or future) be measured with the global positioning system in Decimal Degrees coordinates and North American Datum 1983 format. Coordinates will be uploaded with sample results. SNWA and the entity collecting the data will review uploaded coordinate data to check for accurate well locations.

4.5 Well Locations, Analytical Parameters and Sample Frequency

This groundwater monitoring and assessment plan mainly focuses on the shallow groundwater system adjacent to the Wash and addresses potential impacts of groundwater on the Wash and Lake Mead water quality. Therefore, this Plan only addresses the groundwater monitoring wells near and along the Wash. The monitoring wells that are currently monitored by SNWA are included in this plan and will be used as the official monitoring locations of the plan (Appendix E). Starting in 2014, three more monitoring wells will be added to the plan and more wells can be included if needed. The other shallow groundwater monitoring in the area was used for other purposes and therefore will not be used. Strategically located along both banks of the Wash, these wells were or will be developed to characterize the shallow groundwater aquifer near the Wash and its potential environmental impact on the Wash. In addition, a large amount of water quality and hydrogeological data has been collected from most of these wells, which can be used to understand the variation and trend of shallow groundwater quality near the Wash. In order to be consistent with the previous monitoring programs and in consideration of funding availability, groundwater quality samples will be collected from these wells and analyzed for inorganic parameters on a quarterly basis and for organic parameters [including Pharmaceuticals and Personal Care Products (PPCPs)/Steroids Group, Priority Pollutant List (PPL) Group, and PPL+ Group in Appendix F] on a semi-annual basis. Adding organic parameters to the program will: 1) fill the data gaps for shallow groundwater monitoring along the Wash because most of previous

or current programs did not analyze organic parameters; 2) allow us to compare with the results collected from the surface water quality monitoring programs in the wash and tributaries.

4.6 Sampling/Measurement Methods

A pre-cleaned battery operated pump should be used to withdraw samples from each monitoring well. Generally, the pump should run approximately 15 minutes and pump at least 3 well volumes of water before the water sample is collected. This process allows groundwater to flow around the well and guarantees the water samples taken are "fresh" and representative. Water samples are directly collected from a clean tube, which is connected to the pump, into acid-washed bottles. For cation and trace metal analyses, preservatives, such as nitric acid, are pre-added to the bottles.

Field water quality parameters including water temperature, pH, DO, and EC will be measured using a multi-parameter probe at each monitoring well. The following water quality parameters will be analyzed by a laboratory: major ions, TDS, silica (SiO_2), boron, perchlorate, metals, and selected organic contaminants. Also, groundwater level and depth from each monitoring well will be measured during every sample event.

4.7 Data Repository and Sharing Guidelines

SNWA maintains a database that can be accessed through a password protected website (accessed via www.lvwash.org). The database contains an extensive amount of surface water quality data for the Wash and Lake Mead. These data have been added by many partners including Clark County Regional Flood Control District (CCRFCD), Bureau of Reclamation, the wastewater agencies, SNWA, and the USGS. The database is a central component of the monitoring network and the value of it increases as data are added. Current and historic groundwater quality data near the Wash collected by different agencies will be compiled and uploaded into the database. To continue to improve the usefulness of the database, data contributors need to regularly share their data (i.e. upload data to the database).

Upon request, SNWA provides pre-submission support to contributing entities by formatting their data. If site and parameter names are not consistently labeled then the database may not recognize the input. To remedy this issue, SNWA uses alias names and other links to be sure that the data are input seamlessly. SNWA must link these names so that the database recognizes them as the same parameter.

5.0 MEASURE PROGRESS AND ADAPT PLAN

5.1 Analyze Monitoring Data and Share Results

Monitoring data can be evaluated by the user for any intended purpose, however, to better meet the goal of this plan certain evaluations will be regularly conducted and will be conducted by SNWA. Data assessments will be shared regularly at the quarterly LVWCC and Research and Environmental Monitoring Study Team meetings and periodic reports will be generated. Data should be compared to known benchmarks, if they are available (e.g., water quality standards, levels of concern, toxicity thresholds, etc.). Descriptive statistics will be used such as reporting the minimum, maximum, mean, and standard error of the mean. More advanced data analysis tools (e.g., AquaChem and MODFLOW) will be used when appropriate.

Parameter Status and Trends – The most fundamental goal of this plan will be achieved by simply characterizing groundwater quality status and trends. This activity is a core component of this monitoring plan and should include simple graphical and/or tabular displays of monitoring data organized across time or monitoring wells. At a minimum, data will be analyzed at each well to show concentration changes over time. Every parameter will be evaluated. Parameters that pose water quality concerns (e.g., contaminants from the BMI Complex) will be investigated more closely. Because most of these monitoring wells are located near the Wash, status and trends at these wells will provide more specific and important information on potential contamination risk to the Wash and Lake Mead from the adjacent shallow groundwater system.

Groundwater Base Flow – The base flow (without storm flow) in the Wash includes effluent from the wastewater treatment facilities, urban runoff, and shallow groundwater. It is a challenge to quantify the shallow groundwater flow without collecting extensive hydrogeological data (e.g., average linear groundwater flow velocity and hydraulic conductivity). However, with flow data in the Wash, urban tributaries, and wastewater effluent discharge points, shallow groundwater base flow to the Wash can be estimated with a mass balance calculation.

Mass Balance for Key Parameters – Parameters on the impaired waters list or contaminants from the BMI Complex (e.g., perchlorate) are key parameters and a mass balance will be calculated. Two of these parameters, selenium and perchlorate, are already tracked closely by different agencies because of their potential impacts on wildlife in the Wash and drinking water quality in Lake Mead and downstream. These data and others like it will be obtained to construct a mass balance for key parameters.

Characterize Improvements – NDEP has been supervising extensive on-site remediation activities conducted by various consulting firms at the BMI Complex. These on-site treatment projects have removed a large amount of contaminants (mainly perchlorate) from the shallow groundwater system, resulting in much less loading to the Wash. In addition, erosion control structures built in the Wash affect groundwater flow and quality by changing surface / groundwater interaction patterns and minimizing active down-cuts. Characterizing these improvements and changes in shallow groundwater along the Wash is an essential component of this plan. Data that are used to assess status and trends and to construct mass/water balances provide crucial information to track shallow groundwater flow systems and potential environmental impacts to the Wash from adjacent areas.

5.2 Make Adjustments

A simple series of adaptive management steps govern this groundwater monitoring plan: (1) develop plan, (2) implement plan, (3) evaluate plan, (4) make changes, and (5) repeat steps 2-5. At the regularly scheduled meeting each January, the Research and Environmental Monitoring Study Team will begin to formally evaluate this plan and make changes if needed. At the April meeting, potential changes will be adopted by the partnering entities. Other adjustments can and should be made at any time based on new or better information.

5.2.1 Sampling Frequency and Parameter

Monitoring is a simple tool to keep track of a potential problem. Therefore, it is often difficult to justify the continuation of discretionary monitoring activities when the results of monitoring show that the potential problem has not changed. Too often though, monitoring data are lost when the frequency of data collection is inappropriately reduced because of the lack of institutional support. Moreover, the adage that "the more, the better" does not, nor should it, hold sway when resources are limited. A quarterly sampling frequency, which has been adopted by SNWA for the current shallow groundwater monitoring program, is proposed for this plan. Between July and October of each year, the Research and Environmental Monitoring Study Team will evaluate groundwater quality data collected based on this plan and make changes in sampling frequency and analytical parameters if necessary.

5.2.2 Reassess Monitoring Wells

Unlike the surface water sampling sites in the Wash, shallow groundwater monitoring wells along the Wash are generally considered immovable locations because of the cost associated with drilling new wells. Current monitoring wells can be dropped or new wells may have to be added to better meet the goal of the plan. For example, if two wells show similar water quality and trends, one of them can be eliminated from the program. New well(s) can be added to the program if there is a data gap or a new groundwater quality concern. Between July and October of each year, each monitoring well will be reassessed to see if changes are needed.

6.0 Literature Cited

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Appendix A
Monitoring Wells and Influent/Effluent Sample Locations
On the BMI Complex

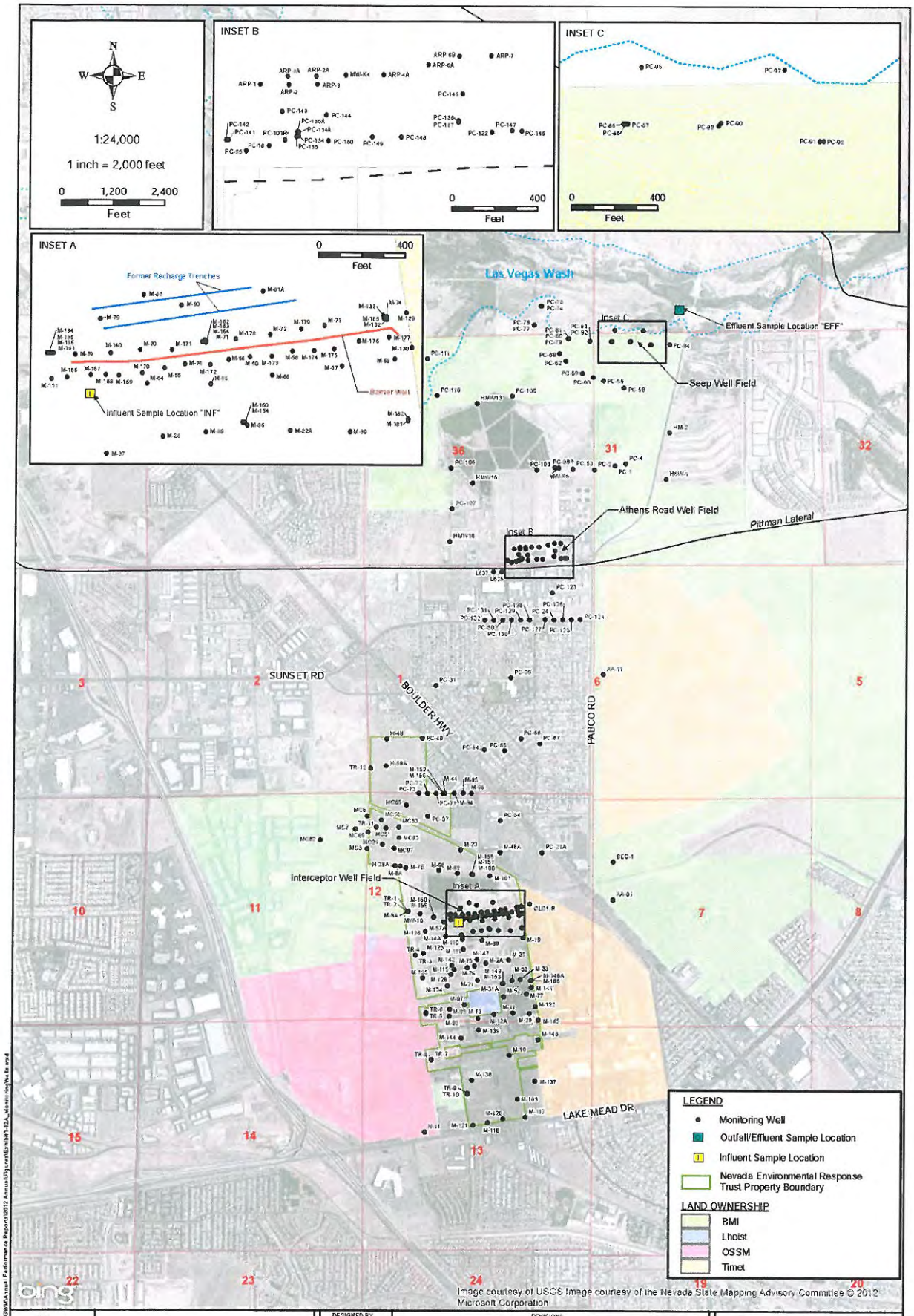


Figure 5

Exhibit 1.14a: Monitoring Wells and Influent/Effluent Sample Locations
Nevada Environmental Response Trust Site (NERT)
Henderson, Nevada

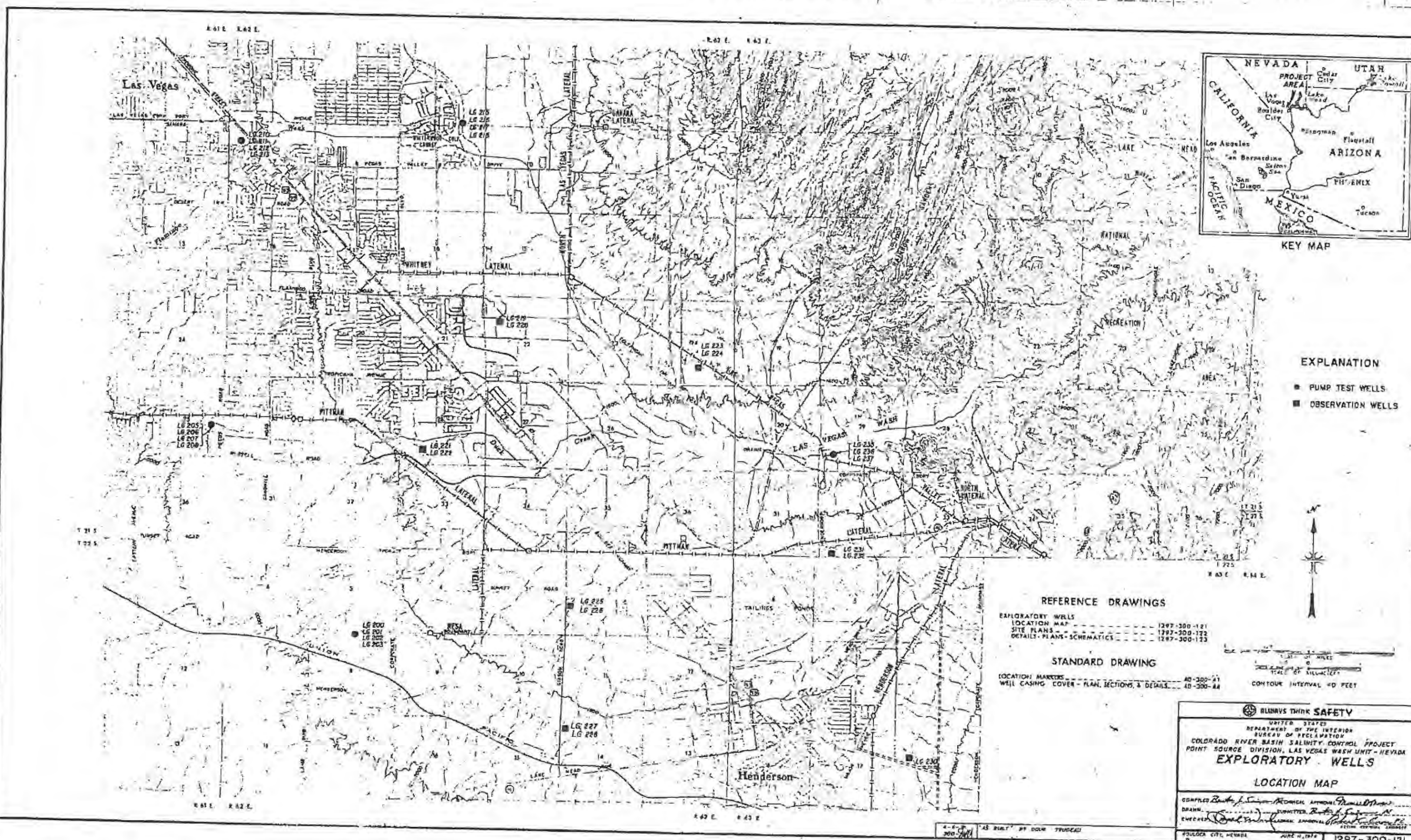
Project No.: 21-29100

DESIGNED BY:	REVISIONS			
EJK	No.	DESCRIPTION:	DATE:	BY:
DRAWN BY:	0	GENERATE APPROVED MAP	11/29/2012	RS
RS				
CHECKED BY:				
CJR				
APPROVED BY:				
CJR				

ENVIRON

Path: H:\LaProjects\NERT\GW\Annual Performance Reports\2012 Annual\Figures\Exhibit1-12A_MonitoringWells.mxd

Appendix B
Locations, Exploratory Well Schematics, and Site Plans
Of BOR Groundwater Monitoring Wells


Las Vegas
Henderson
LG 205
LG 206
LG 207
LG 208
LG 200
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LG 203
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LG 215
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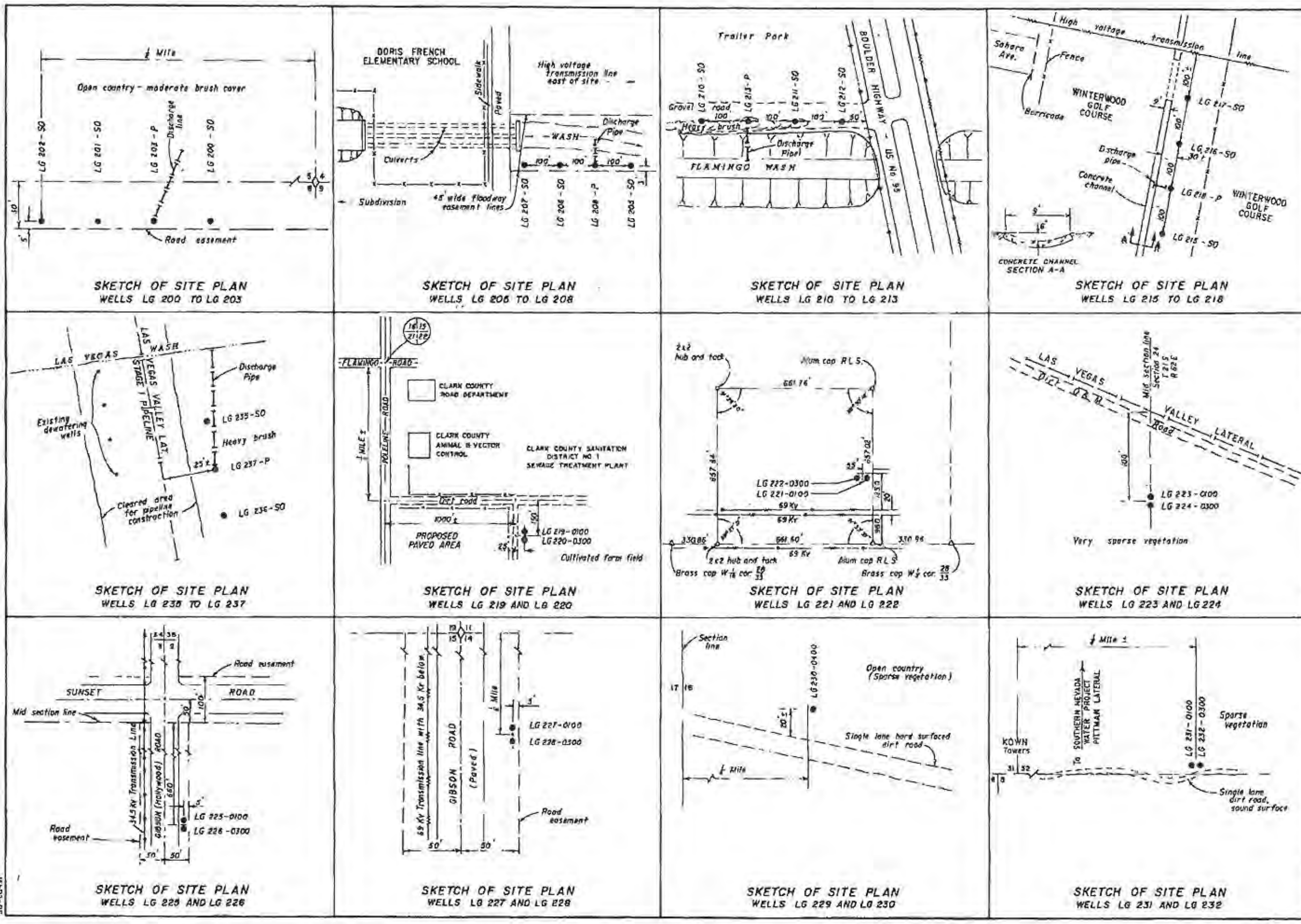
LG 221
LG 222
LG 223
LG 224
LG 225
LG 226
LG 227
LG 228
LG 231
LG 232
LG 235
LG 236
LG 237
LAS VEGAS WASH
PITTMAN
NORTH LATERAL
WHITNEY
LATERAL
NEVADA
UTAH
PROJECT AREA
CALIFORNIA
ARIZONA
MEXICO
PACIFIC OCEAN
Los Angeles
San Bernardino
San Diego
Cedar City
Flagstaff
Phoenix
Tucson
Kingman
Yuma
KEY MAP
EXPLANATION
PUMP TEST WELLS
OBSERVATION WELLS
REFERENCE DRAWINGS
EXPLORATORY WELLS
LOCATION MAP - - - - 1297-300-121
SITE PLANS - - - - 1297-300-122
DETAILS-PLANS-SCHEMATICS - - - - 1297-300-123
STANDARD DRAWING
LOCATION MARKERS - - - - 40-300-41
WELL CASING COVER - PLAN, SECTIONS, & DETAILS - - - 40-300-44
CONTOUR INTERVAL 40 FEET
ALWAYS THINK SAFETY
UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
COLORADO RIVER BASIN SALINITY CONTROL PROJECT
POINT SOURCE DIVISION, LAS VEGAS WASH UNIT - NEVADA
EXPLORATORY WELLS
LOCATION MAP
"AS BUILT" BY DOUR TRUDEAU
BOULDER CITY, NEVADA
1297-300-121



NOTES

All locations shown are schematic
Discharge pipes may be steel or rigid plastic; and shall have a minimum diameter of 8 inches for wells LG 218-P and LG 237-P; and a minimum diameter of 4 inches for wells LG 203-P, LG 208-P and LG 213-P.
All discharge pipes shall be located to prevent erosion and shall be approved by the contracting officer prior to development or testing

4-6-81	AS BUILT DWG BY DOUG TRUDEAU
8-15-79	ADDED SECTION NUMBERS ON SKETCH OF SITE PLAN, WELLS LG-200 TO LG-203
8-8-79	REVISED SKETCH OF SITE PLAN, WELLS LG 219 AND LG 220

ALWAYS THINK SAFETY

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
COLORADO RIVER BASIN SALINITY CONTROL PROJECT
POINT SOURCE DIVISION - LAS VEGAS WASH UNIT - NEVADA

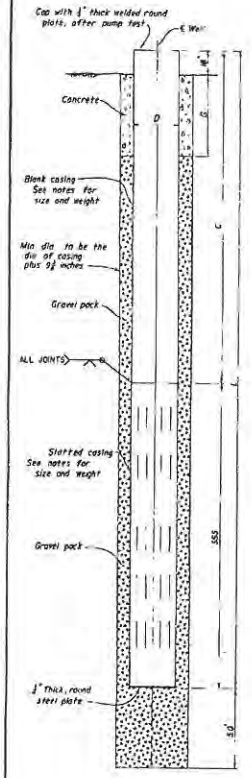
EXPLORATORY WELLS

SITE PLANS

DESIGNED ... TECHNICAL APPROVAL ...
DRAWN ... SUBMITTED ...
CHECKED ... APPROVED ...

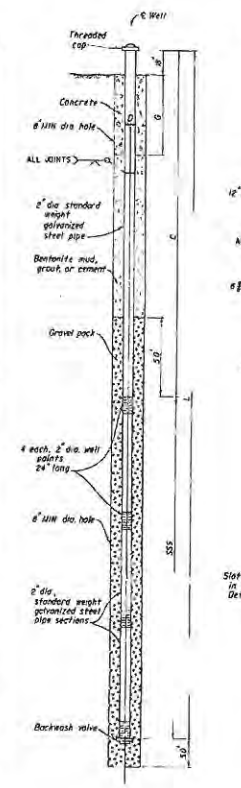
BOULDER CITY, NEVADA JUNE 15, 1979 1297-300-122

21" x 36"



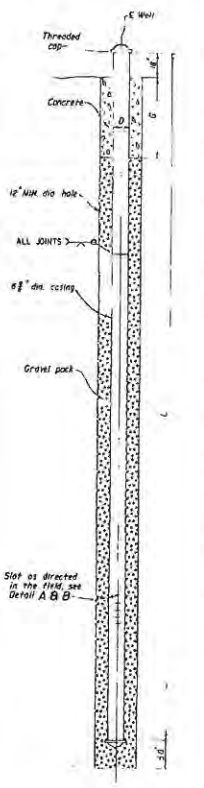
SCHEMATIC

PRODUCTION WELL
LGEXX-P



SCHEMATIC

SATELLITE OBSERVATION WELL
LGEXX-SO

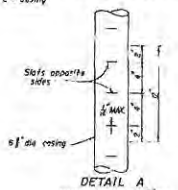


SCHEMATIC

DEEP OBSERVATION & SHALLOW OBSERVATION WELL
LGEXX-0100
LGEXX-0300

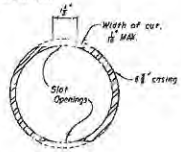
AREA	WELL NUMBER	LOCATION TOWNSHIP	LOCATION RANGE	LOCATION SECTION	ELEVATIONS (DATUM) GROUND SURFACE	ELEVATIONS (DATUM) WATER SURFACE	DIMENSIONS* L (FEET)	DIMENSIONS* SSS (FEET)	DIMENSIONS* C (FEET)	DIMENSIONS* D (INCHES)	DIMENSIONS* G (FEET)	LOCATION MARKERS REQUIRED	DESIGN FLOW GALLONS PER MINUTE
1	LG200-SO	22	62	08	1940	1910	85	23	60	2	5		
	LG201-SO	22	62	08			85	23	60	2	5		
	LG202-SO	22	62	08			85	23	60	2	5		
	LG203-P	22	62	08			85	30	50	6	5	YES	100
2	LG205-SO	21	61	25	1965	1935	103	23	80	2	5		
	LG206-SO	21	61	25			103	23	80	2	5		
	LG207-SO	21	61	25			103	23	80	2	5		
	LG204-P	21	61	25			103	30	75	6	5		100
3	LG210-SO	21	62	07	1795	1745	63	23	40	2	5		
	LG211-SO	21	62	07			63	23	40	2	5		
	LG212-SO	21	62	07			63	23	40	2	5		
	LG213-P	21	62	07			63	30	35	6	5		100
4	LG215-SO	21	63	04	1710	1690	118	68	50	2	5		
	LG216-SO	21	63	04			118	68	50	2	5		
	LG217-SO	21	63	04			118	68	50	2	5		
	LG218-P	21	63	04			118	70	45	3	5		1,000
5	LG235-SO	21	63	29	1528	1527	98	68	20	2	5		
	LG236-SO	21	63	29			89	68	20	2	5		
	LG237-P	21	63	29			100	70	30	3	5	YES	1,000
6	LG219-0100	21	62	22	1645	1640	100			6	5		
	LG220-0300	21	62	22			300			6	100	YES	
7	LG221-0100	21	63	29	1720	1700	100			6	5		
	LG222-0300	21	62	28			300			6	100	YES	
8	LG223-0100	21	62	24	1660	1580	100			6	5		
	LG224-0300	21	62	24			300			6	100	YES	
9	LG225-0100	22	62	02	1710	1690	100			6	5		
	LG226-0300	22	62	02			300			6	100	YES	
10	LG227-0100	22	63	18	1840	1780	100			6	5		
	LG228-0300	22	62	13			300			6	100	YES	
11	LG229-0100	22	63	16	1920	1860	100			6	5		
	LG230-0300	22	63	16			300			6	100	YES	
12	LG231-0100	21	63	12	1680	1600	100			6	5		
	LG232-0300	21	63	32			300			6	100	YES	

* L = Total length of casing and screen
SSS = Slotted steel casing or well point section
C = Casing
D = Pipe or casing outside diameter
G = Depth of concrete or grout



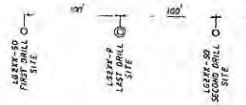
DETAIL A

FIELD SLOTS FOR 6⅝" DIA CASING – 6 SLOT / FT.



DETAIL B

FIELD SLOTS FOR 6⅝" DIA CASING – 6 SLOT / FT.



NOTE: Layout of Satellite Observation Wells (SO) and Production Wells (P) and sequence of drilling. Spacing and relative location may vary to fit field conditions and shall be determined by the Contracting Officer.

PLAN

NOTE: Layout of Deep Observation (0300) and Shallow Observation (0100) Wells and sequence of drilling

PLAN

NOTES

7⅝"-inch dia casing shall weigh 29.1 lb/ft. 8⅝"-inch slotted casing shall weigh 32.3 lb/ft. If (1) estimated that 24 rows of 5/32-inch by 100 mesh slots with two rows per foot and a net open area of 12.0 square inches per foot will be required.

6⅝"-inch dia casing shall weigh 17.02 lb/ft. 6⅝"-inch dia slotted casing shall weigh 20 lb/ft. It is estimated that 24 rows of 3/16-inch by 50 mesh slots with two rows per foot and a net open area of 6.0 square inches per foot will be required.

The slots in well points shall have the same mesh as adjacent production well.

After drilling one hole in any area, the Contracting Officer may at his option, direct that no further work be performed in that area.

Centering guides may be welded or provided with bolted clamping devices. Centering guide on slotted casing shall be placed on 20-foot centers. Centering guides on all other casing and pipe shall be placed on 40-foot centers.

Slotted casing, gravel pack, blank section and centering guides shall be delivered to the construction site not less than one working day prior to commencement of drilling holes for production wells. Any material rejected must be replaced and approved prior to the commencement of drilling.

ALWAYS THINK SAFETY

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

COLORADO RIVER BASIN SALINITY CONTROL PROJECT
POINT SOURCE DIVISION, LAS VEGAS WASH UNIT—NEVADA

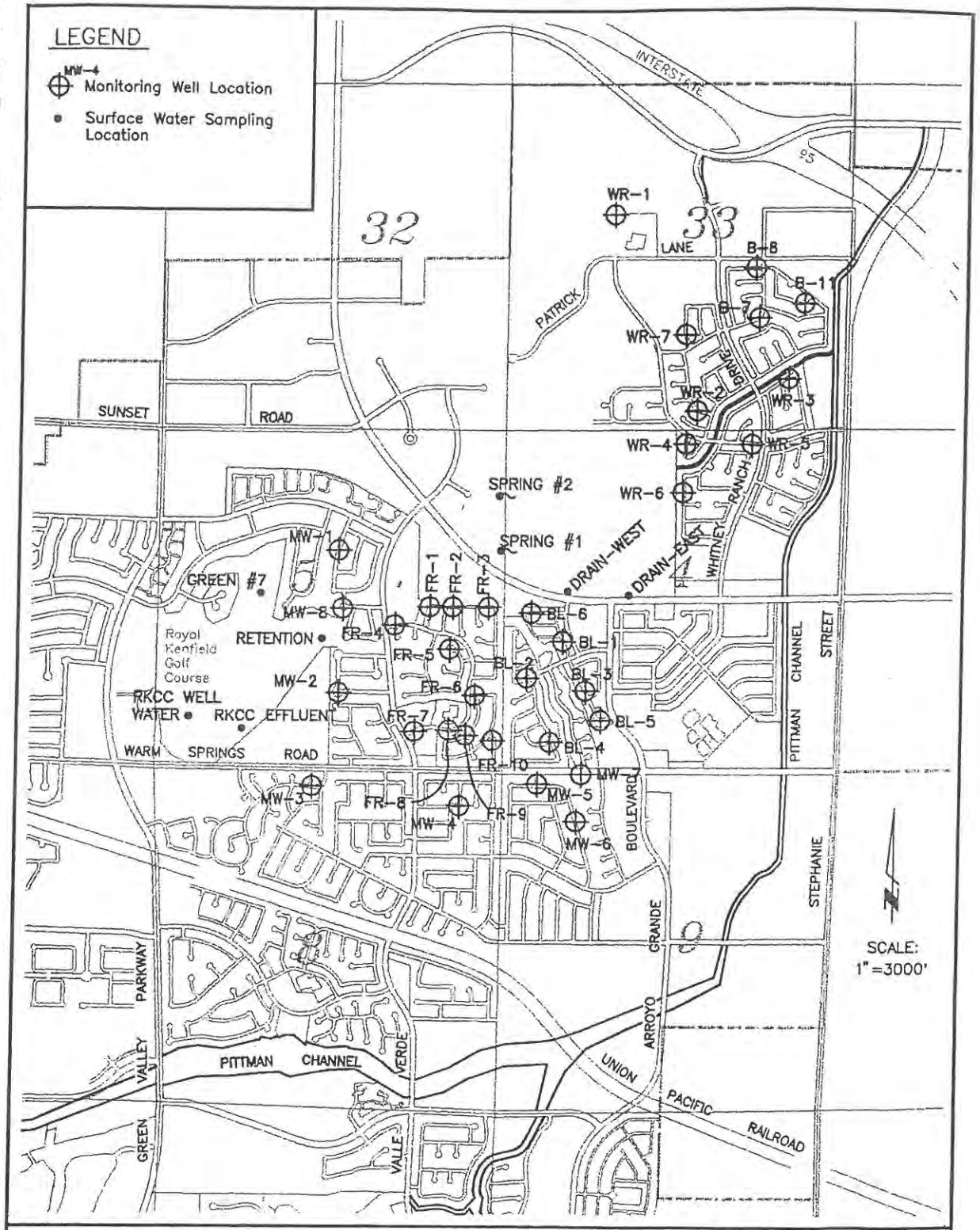
EXPLORATORY WELLS

DETAILS—PLANS—SCHEMATICS

DESIGNED R.L. Swinscoe — TECHNICAL APPROVAL
DRAWN — SUBMITTED
CHECKED — MAJOR APPROVAL

BOULDER CITY, NEVADA — JUNE 12, 1978 — 1297-300-123

Appendix C
COH Groundwater Sample Location Map
and Summary of Groundwater Quality



RENO/SPARKS, NEVADA
LAS VEGAS, NEVADA
PHOENIX, ARIZONA

City of Henderson

Water Sampling Locations

PROJECT NO. 2-337-07-3

FIGURE 6

Summary of Well Sampling

Well No.	Purged Volume (gal)	Well Production (gal/min)	pH	EC μ mhos/cm	Temp. (°F)	Date Sampled	Ions	^{18}O and ^{2}H	Tritium
WR-1	3	0.1	7.08	7,370	69.3	04-10-94	✓		
WR-2	28	1.0	6.90	15,750	71.4	04-08-94	✓		
WR-3	40	2+	7.24	5,540	67.1	04-08-94	✓		
WR-4	17	0.5	7.10	10,860	72.6	04-08-94	✓		
WR-5	1.5	minor	7.16	5,230	68.8	04-08-94	✓		
WR-6	2	very minor	7.10	6,630	59.1	04-09-94	✓		
WR-7	18	1.5	6.65	14,500	68.1	04-27-94	✓		
BL-1	5	0.3	7.18	5,110	71.2	04-09-94	✓		
BL-2	10	0.2	7.97	2,570	70.4	04-09-94	✓		
BL-3	2	0.1	7.00	7,670	65.1	04-09-94	✓		
BL-4s	3.5	0.1	7.30	5,940	64.6	04-09-94	✓	✓	
BL-4i	2	minor	7.47	4,890	69.3	04-09-94	✓		
BL-4d	3	very minor	7.72	2,030	71.1	04-09-94	✓	✓	
BL-5	11	0.3	6.73	5,510	67.3	04-09-94	✓		
BL-6	7	0.3	7.07	5,800	64.5	04-26-94	✓		
FR-1	16	1.0	7.23	6,060	68.1	04-27-94	✓		
FR-2s	20	2+	7.17	5,120	71.3	04-10-94	✓	✓	✓
FR-2d	3	minor	7.24	4,110	69.3	04-10-94	✓	✓	✓
FR-3	dry -	no sample				N/A			
FR-4	35	2+	7.06	5,360	65.5	04-10-94	✓		
FR-5	12	0.6	6.95	5,470	65.3	04-27-94	✓		
FR-6	4	0.1	7.00	5,510	67.6	04-27-94	✓		
FR-7	30	2+	7.17	4,710	66.3	04-09-94	✓		
FR-8s	3.5	minor	7.40	6,600	65.6	04-09-94	✓	✓	
FR-8i	2.5	minor	7.25	5,890	63.6	04-09-94	✓		
FR-8d	3	minor	7.26	3,170	64.9	04-09-94	✓	✓	
FR-9	16	0.7	7.26	5,720	61.2	04-09-94	✓		
FR-10	15	0.6	7.15	7,090	61.6	04-09-94	✓		
MW-1	18	1.5	7.20	5,600	71.8	04-26-94	✓		
MW-2	2	minor	7.40	4,460	71.6	04-10-94	✓		
MW-3	6	0.3	6.95	6,180	68.3	04-26-94	✓		
MW-4	dry -	no sample				N/A			
MW-5	2	0.1	7.02	6,520	62.0	04-26-94	✓		
MW-6	dry -	no sample				N/A			
MW-7s	5.5	0.4	7.08	2,760	66.6	04-26-94	✓		
MW-7i	4	minor	7.42	2,010	64.7	04-26-94	✓	✓	✓
MW-7d	4	minor	7.50	2,020	65.4	04-26-94	✓		
MW-8	6	0.2	7.11	5,520	65.2	04-26-94	✓	✓	✓
B-7	1.5	minor	7.01	9,250	65.0	04-27-94	✓		
B-8	1.5	minor	7.00	8,340	65.5	04-27-94	✓		
B-11	2.5	0.1	6.83	13,360	67.2	04-27-94	✓	✓	✓

Summary of Common Ion Analytical Results
(mg/l)

SAMPLE	Na	K	Ca	Mg	Cl	HCO_3	SO_4	NO_3	SiO_2	TDS
Whitney Mesa										
SPRING #1	797	87	585	280	1040	262	2630	11	28	5740
SPRING#2	267	45	442	243	380	169	1910	18	37	1910
DRAINWEST	669	74	488	253	810	245	2270	6.4	-	5080
DRAINEAST	522	56	418	227	690	275	1810	2.4	47	4220
Royal Kenfield Country Club										
EFFLUENT	186	19	137	52	250	82	570	1.4	18	1320
RETENTION	1290	161	561	435	1570	373	3340	29	70	8200
WELL	122	16	128	65	210	142	400	2	33	1140
GREEN#7	768	71	511	288	1110	210	2530	7.1	55	5720
Whitney Ranch										
WR-1	1230	193	501	278	780	74	3850	10	33	7240
WR-2	2704	277	663	810	4660	272	3830	14	68	11400
WR-3	769	90	482	278	930	220	2570	7.2	67	5340
WR-4	1660	163	558	596	1900	301	4280	6.7	48	10300
WR-5	741	120	554	316	830	190	3030	6.6	-	6080
WR-6	893	118	534	357	960	208	3180	2.4	-	6500
WR-7	1900	230	699	714	3180	135	4220	12	-	12200
B-7	1320	189	488	476	930	192	4650	4.7	-	8600
B-8	1170	137	515	398	1040	92	3980	5.4	32	7580
B-11	2230	226	486	594	1600	164	6220	7.8	33	12400
The Bluffs										
BL-1	618	64	433	212	370	212	2560	1.8	34	4540
BL-2	212	32	223	127	490	155	650	2.3	34	2170
BL-3	865	76	645	434	1530	367	2940	0	46	7260
BL-4s	383	31	445	174	570	204	1520	3	43	3680
BL-4i	797	24	244	108	520	190	1700	6.8	30	3740
BL-4d	180	21	150	71	220	188	540	0	32	1380
BL-5	500	53	496	253	830	267	1700	1.5	43	4320
BL-6	533	62	531	296	531	339	1980	5.4	47	5160

SAMPLE	Na	K	Ca	Mg	Cl	HCO_3	SO_4	NO_3	SiO_2	TDS
Fox Ridge										
FR-1	727	132	445	210	680	258	2510	4.2	-	4880
FR-2s	659	52	419	224	690	244	2140	4.1	47	4640
FR-2d	411	48	482	214	440	177	2140	1.8	39	4180
FR-3	-	-	-	-	-	-	-	-	-	-
FR-4	783	144	467	249	750	240	2560	6.4	-	5400
FR-5	554	84	442	249	820	231	1930	6.4	72	4540
FR-6	516	54	472	257	1000	176	1680	5.6	-	4640
FR-7	473	53	419	204	790	198	1480	3.5	-	4020
FR-8s	755	35	541	268	1390	210	1780	6.4	36	5420
FR-8i	1065	23	302	152	1090	208	1720	7.8	34	4700
FR-8d	306	23	282	141	600	191	830	2.8	33	2700
FR-9	659	48	592	251	1040	241	2020	5.1	36	5240
FR-10	769	52	722	365	1260	278	2830	8.4	442	7020
Western and Southern Sites										
MW-1	650	70	509	245	760	180	2220	7.7	53	4740
MW-2	554	48	438	212	660	260	1790	3.2	46	4240
MW-3	529	47	667	306	1790	132	1290	6.8	38	6060
MW-4	-	-	-	-	-	-	-	-	-	-
MW-5	682	44	569	280	1110	227	2050	3.7	49	5500
MW-6	-	-	-	-	-	-	-	-	-	-
MW-7s	293	21	279	131	580	177	780	2.6	44	2450
MW-7i	132	16	151	73	299	175	375	1	42	1330
MW-7d	124	17	154	73	280	176	380	1.1	31	1340
MW-8	816	99	525	273	850	384	2550	18	68	5620
CITY	101.2	5.15	81.8	30.2	90	129	296	0.47		694

Summary of Stable Isotope Results

Sample Label	VSMOW $\delta^{18}O$	VSMOW $\delta^{2}H$
FR-2s	-11.7	-94
FR-2d	-12.5	-93
FR-8s	-11.8	-95
FR-8d	-12.5	-95
BL-4s	-11.6	-92
BL-4d	-12.5	-95
MW-7i	-12.6	-94
MW-8	-10.5	-86
B-11	-10.2	-88
SPRING#2	-11.5	-91

Summary of Tritium Results

Sample	Tritium	
	(pCi/l)	(TU)
MW-8	35	10.8
MW-7i	<10	<3.1
B-11	29	8.9
FR-2s	42	12.9
FR-2d	<10	<3.1

Appendix D

Nevada Division of Environmental Protection Authorization to Discharge (Permit No. NEV80003) issued to City of Henderson

STATE OF NEVADA
Department of Conservation & Natural Resources
DIVISION OF ENVIRONMENTAL PROTECTION
NEVADA DIVISION OF ENVIRONMENTAL PROTECTION
protecting the future for generations
Brian Sandoval, Governor
Leo M. Drozdoff, P.E., Director
Colleen Cripps, Ph.D., Administrator

September 12, 2011

Mr. Adrian Edwards
City of Henderson
P.O. Box 95050
Henderson, NV 89009-5050

Re: **Renewal of Groundwater Discharge Permit NEV80003, Kurt R. Segler WRF and Southwest WRF reuse in Henderson, Clark County, Nevada**

Dear Mr. Edwards:

In accordance with provisions of the Nevada Water Pollution Control Law Chapter 445A, of the Nevada Revised Statutes, the Department of Conservation and Natural Resources, Division of Environmental Protection has reviewed the following application for a groundwater discharge permit:

Discharger	**Permit Number**
City of Henderson –Kurt R. Segler Water Reclamation Facility and -Southwest Water Reclamation Facility	**NEV80003**

Copies of the draft permit conditions, fact sheet, and public notice were sent to your office. The public notice was also published in the **Las Vegas Review Journal**, and sent to interested persons and governmental agencies on our electronic notification e-mail list. During the 30-day public comment period, no comments were received for this public notice, which closed on **September 6, 2011** at **5:00 P.M.**

Therefore, the Division of Environmental Protection is renewing the enclosed discharge permit for a period of five (5) years. This permit action does not constitute a significant change from the tentative determinations set forth in the public notice.

The new permit will expire at midnight on **September 12, 2016**, providing all permit conditions are followed, and annual fees paid accordingly. In accordance with the permit conditions, an annual review and services fee to maintain the discharge permit is due on **July 1, 2012**, and every year thereafter until the permit is terminated. The first Discharge Monitoring Report (DMR) under the new permit is due on **October 28, 2011**.

If you have any questions regarding the permit action, please contact me at (775) 687-9423, or by email at jgardner@ndep.nv.gov.

Sincerely,

Jeryl R. Gardner, P.E.

Jeryl R. Gardner, P.E.
Bureau of Water Pollution Control

Attachments: Permit NEV80003
Fact Sheet NEV80003
Discharge Monitoring Report (DMR) Form

cc: Compliance Coordinator, BWPC (hand-delivered)
Mason Luedtke, Parks Coordinator, City of Henderson, 240 Water Street, Henderson, NV 89015 (w/permit)
Troy Flanagan, Anthem Country Club, 1 Grosse Pointe Place, Henderson, NV 89052 (w/permit)
Frank Espino, Black Mountain Golf Course, 500 Greenway Road, Henderson, NV 89015 (w/permit)
Al Kueker, Desert Willow Golf Course, 2020 W. Horizon Ridge Pkwy., Henderson, NV 89012 (w/permit)
Greg Wilson, Dragon Ridge Golf Course, 1700 W. Horizon Ridge Pkwy., Henderson, NV 89012 (w/permit)
Bob Laas, Legacy Golf Course, 130 Par Excellence Drive, Henderson, NV 89014 (w/permit)
David Presley, Revere Golf Club, 2600 Hampton Road, Henderson, NV 89052 (w/permit)
Jared Bumpus, Rio Secco Golf Course, 2851 Grand Hills Drive, Henderson, NV 89052 (w/permit)
Tom Giuliano, Palm Mortuary, 800 South Boulder Highway, Henderson, NV 89015 (w/permit)
Brad Vowles, Tuscany Golf Club, 901 Olivia Parkway, Henderson, NV 89015 (w/permit)
Scott Sutton, Wildhorse Golf Club, 2100 Warm Springs Road, Henderson, NV 89014 (w/permit)
Susan Brager, CCBC Chair, 500 Grand Central Pkwy. 6th Floor, Las Vegas, NV 89155 (w/permit)

NEVADA DIVISION OF ENVIRONMENTAL PROTECTION

AUTHORIZATION TO DISCHARGE

In compliance with the provisions of Chapter 445A of the Nevada Revised Statutes

City of Henderson
240 Water Street
Henderson, NV 89015

is authorized to discharge treated wastewater from two water reclamation facilities located in Henderson, Clark County, Nevada at:

Kurt R. Segler Water Reclamation Facility
450 E. Galleria Drive
Section 36, T21S R62E MDB&M
Latitude: 36° 5' 14" N Longitude: 114° 59' 13" W

and

Southwest Water Reclamation Facility
2610 St. Rose Parkway
Section 24, T22S R61E MDB&M
Latitude: 36° 01' 32" N Longitude: 115° 06' 10" W

to receiving waters named groundwaters of the state, via five outfalls for distribution to Henderson-area irrigation systems:

Outfall 001: City of Henderson Bird Viewing Preserve wetlands
Outfall 002: Green Valley Reclaimed Water Distribution System (RWDS) for reuse
Outfall 003: Black Mountain RWDS for reuse
Outfall 004: North East RWDS for reuse
Outfall 005: Southwest Water Reclamation Facility on-site irrigation

in accordance with the effluent limitations, monitoring requirements, and other conditions set forth in Parts I, II, and III hereof.

This permit shall become effective on **September 13, 2011**.

This permit shall expire at midnight **September 12, 2016.**

Signed this 12th day of September, 2011.

Jeryl R. Gardner, P.E.
Bureau of Water Pollution Control

PART I

I.A. EFFLUENT LIMITS, SAMPLING REQUIREMENTS AND CONDITIONS

Introduction: The Permittee, City of Henderson (COH), owns and operates two water reclamation facilities which treat wastewater to Category B specifications. The **Kurt R. Segler Water Reclamation Facility (KRSWRF)** discharges to four outfalls: **Outfall 001 –Bird Viewing Preserve (BVP)** wetlands ponds, **Outfall 002 – Green Valley Reclaimed Water Distribution System (GVRWDS), Outfall 003 – Black Mountain RWDS, Outfall 004 –North East RWDS**, and the **Southwest Water Reclamation Facility (SWRF)** discharges to one outfall: **Outfall 005 – SWRF**, for on-site drip irrigation. The SWRF effluent is also used to supply reuse water for irrigation at the approved effluent reuse sites listed below, via the three RWDS. The KRSWRF and SWRF also discharge a portion of their flow to the Las Vegas Wash under the terms and conditions of NPDES permit, NV0022098.

I.A.1. During the period beginning on the effective date of this permit and lasting until the permit expires, the Permittee is authorized to discharge tertiary treated, denitrified wastewater from the wastewater treatment and water reclamation facilities to:

a. groundwaters of the State from the **KRSWRF** via wetlands ponds at the **Bird Viewing Preserve (Outfall 001).**

b. groundwaters of the State via the **Green Valley RWDS (Outfall 002)**, the **Black Mountain RWDS (Outfall 003)**, the **North East RWDS (Outfall 004)**, or the **SWRF (Outfall 005)** for irrigation at the reuse sites in the greater Henderson area listed in Table I.A.2, including the on-site irrigation uses at KRSWRF and SWRF.

A system of groundwater monitoring wells provides additional groundwater quality information. In addition to the influent and effluent sampling and monitoring requirements detailed in Table I.A.1., groundwater sampling and monitoring is also required in Table I.A.3. below.

Effluent samples are designated as EFF. Effluent samples intended for reuse shall be taken downstream of the disinfection facilities, prior to export for reuse. Influent samples shall be taken at the headworks and are to be designated as INF. Samples taken in compliance with the monitoring requirements specified below shall be taken at the following location(s) prior to discharge at Outfalls 001, 002, 003, 004 and 005, or others. The discharge shall be limited and monitored as specified in Table I.A.1.

TABLE I.A.1. EFFLUENT LIMITS, SAMPLING AND MONITORING REQUIREMENTS

Parameters	Units	Effluent Limitations		Monitoring Requirements		
		30-Day Avg	Daily Max	Sampling Locations	Monitoring Frequency	Monitoring Type
KRS Influent Flow Rate [1]	MGD	40.0	---	INF–KRS	Continuous	Meter
SWRF Influent	MGD	8.0	---	INF–	Continuous	Meter

Flow Rate [1]				SWRF		
KRS Effluent Flow Rate [2]	MGD	M&R	---	001	Continuous	Meter
KRS Effluent Flow Rate [2]	MGD	M&R	---	002, 003, 004	Continuous	Meter
SWRF Effluent Flow Rate [2]	MGD	M&R	---	005	Continuous	Meter
Volume supplied to Reuse Sites [3]	MG	M&R	---	Each reuse site	Continuous	Meter, estimate
BOD_5	mg/l	M&R	M&R	INF–KRS, INF–SWRF	Weekly	Composite
BOD_5 –Reuse	mg/l	30	45	001, 002, 003, 004, 005	Weekly	Composite
TSS	mg/l	M&R	M&R	INF–KRS, INF–SWRF	Weekly	Composite
TSS –Reuse	mg/l	30	45	001, 002, 003, 004, 005	Weekly	Composite
pH	S.U.	---	≥ 6.0 and ≤ 9.0	EFF –KRS, EFF –SW	Weekly	Discrete
Fecal coliform [4]	MPN/ 100 ml	2.2	23	002, 003, 004, 005	Weekly	Discrete
TN	mg/l	M&R	M&R	001, 002, 003, 004, 005	Weekly	Composite

NOTES: INF –KRS = Influent to Kurt R. Segler WRF; INF –SWRF = Influent to Southwest WRF; 001 = Effluent to Bird Viewing Preserve; 002 = Effluent to Green Valley RWDS; 003 = Effluent to Black Mountain RWDS; 004 = Effluent to North East RWDS; 005 = Effluent to SWRF on site irrigation; EFF –KRS = Effluent from Kurt R. Segler WRF; EFF –SW = Effluent from Southwest WRF.

MGD: million gallons per day
mg/l: milligrams per liter
TSS: Total Suspended Solids
MPN: Most Probable Number
M&R: Monitor & Report
BOD_5 = 5-day Biological Oxygen Demand
S.U. = Standard pH units
TN = Total Nitrogen as N

1. Monitor influent flow continuously for each WRF. Report quarterly, the 30-day average influent rates for each WRF individually.
2. Monitor effluent discharge rates continuously for each outfall, and report quarterly, the 30-day average discharge rates for each outfall individually on DMR forms.
3. Monitor continuously and report quarterly, the volume of effluent discharged to each of the reuse sites individually.
4. The 30-day average for fecal coliform = geometric mean of all measurements made during a month.

Table I.A.2 contains the list of current reuse sites. Reuse sites may be added to or deleted from the permit by amending the Effluent Management Plan (EMP). Each of the off-site reuse sites listed in Table I.A.2 is permitted under an individual reuse permit. Changes to the List of Off-Site Reuse Sites shall also be submitted to the Division as an update to current Division records. All reuse sites not directly owned and managed by the KRSWRF or SWRF shall obtain their own reuse permit from the Division and have a Division-approved EMP in place prior to the discharge of reclaimed effluent.

Until acceptance by a permitted reuse site of reclaimed water supplied by the KRSWRF

or SWRF, to be used at an end use site, the limits and conditions of this permit are the responsibility of the Permittee.

TABLE I.A.2. LIST OF OFF-SITE REUSE SITES

Reuse Site	Address	Permit Number (NEV...)	Source	Reuse (ac-ft/year)
Anthem Country Club Golf Course	1 Grosse Pointe Place	98023	GVRWDS, SWRF	1,027
Black Mountain Golf Course	500 Greenway Road	96017	BMRWDS	1,510
Desert Willow Golf Course	2020 W. Horizon Ridge Pkwy.	95038	GVRWDS, SWRF	700
Dragon Ridge Golf Course	1700 W. Horizon Ridge Pkwy.	97007	GVRWDS, SWRF	1,078
Legacy Golf Course	100 Par Excellence Drive	92024	GVRWDS, SWRF	940
Revere Golf Club - Lexington	2600 Hampton Road	98019	GVRWDS, SWRF	1,086
Revere Golf Club - Concorde	2600 Hampton Road	2001511	GVRWDS, SWRF	942
Rio Secco Golf Course	2851 Grand Hills Drive	96010	GVRWDS, SWRF	1,437
Palm Mortuary	800 South Boulder Highway	2000505	BMRWDS	182
Boulder Highway Landscaping Irrigation	240 Water Street	2000513	BMRWDS	645
Tuscany Golf Club	901 Olivia Parkway	2001503	NERWDS	1,064
Wildhorse Golf Club	2100 Warm Springs Road	2002518	GVRWDS, SWRF	660

GVRWDS = Green Valley Reclaimed Water Distribution System; SWRF = Southwest Water Reclamation Facility; BMRWDS = Black Mountain Reclaimed Water Distribution System; KRS = Kurt R. Segler Water Reclamation Facility; NERWDS = North East Reclaimed Water Distribution System.

In addition to influent and effluent sampling, groundwater is required to be monitored and sampled per the permit requirements stipulated in Table I.A.3.

All monitoring wells shall be labeled, locked and capped to prevent tampering.

TABLE I.A.3. GROUNDWATER SAMPLING AND REPORTING REQUIREMENTS

Parameters	Units	Effluent Limitations		Monitoring Requirements		
				Sampling Locations	Monitoring Frequency	Monitoring Type
Depth to Water [1]	ft	---	M&R	All	Annually	Meter
Static water elevation [1]	ft amsl	---	M&R	All	Annually	Meter
Chlorides [2]	mg/l	---	M&R	All	Annually	Discrete
TDS [2]	mg/l	---	M&R	All	Annually	Discrete
Nitrate as N [2]	mg/l	---	M&R	All	Annually	Discrete

Total Nitrogen [2]	mg/l	---	M&R	All	Annually	Discrete
Ammonia as N [2]	mg/l	---	M&R	All	Annually	Discrete

NOTES: All = Monitoring Wells: 13, 14, 16, and others that may be added.
amsl: above mean sea level
mg/l: milligrams per liter
M&R: Monitor & Report
TDS: Total Dissolved Solids

1. Measure annually, the depth to groundwater, and static water elevation, for each well, at the time of sampling, and report for each calendar year 4th quarter on January DMR Forms.
2. Sample and analyze annually and report for each of the parameters. Report annually in January for each calendar year 4th quarter.

I.A.2. **Discharge Limitations Applicability:** The discharge limitations of Table I.A.1 apply only to the flows that discharge to groundwater or effluent reuse. The discharge limitations for the Las Vegas Wash are established in NPDES permit # NV0022098. Any flow to the Las Vegas Wash shall be reported and monitored per requirements in NV0022098.

I.A.3. **Schedule of Compliance:** The Permittee shall implement and comply with the provisions of the schedule of compliance after approval by the Administrator, including in said implementation and compliance, any additions or modifications which the Administrator may make in approving the schedule of compliance.

a. The Permittee shall achieve compliance with the effluent limitations upon issuance of the permit.

b. **By December 12, 2011,** the Permittee shall submit for review and approval an updated Effluent Management Plan (EMP), prepared in accordance with the Division's WTS-1A guidance: *General Criteria for Preparing an Effluent Management Plan.*

All schedule of compliance submittals and evidence of compliance documents shall be submitted to the Division at the address listed below:

Division of Environmental Protection
Bureau of Water Pollution Control
ATTN: Compliance Coordinator
901 S. Stewart Street, Suite 4001
Carson City, Nevada 89701

Before implementing changes to an approved EMP or O&M Manual, the Permittee shall submit proposed changes to the Division for review and approval.

I.A.4. **Annual Fee:** The Permittee shall remit an annual review and services fee in accordance with NAC 445A.232 starting **July 1, 2012**, and every year thereafter until the permit is terminated.

I.A.5. **Biosolids:** All solid waste screening and sewage sludge shall be disposed of in a manner approved by the Division and the County. Facilities that generate and dispose of sewage sludge shall monitor the concentrations of arsenic, cadmium, chromium, copper, lead, mercury, molybdenum, nickel, selenium and zinc and report in mg/dry Kg of sludge as outlined below.

Dry Sludge Disposal rate in tons/yr.	Frequency
>0 - <320	Once per year
≥320 - <1654	Once per quarter
≥1654 - <16538	Once every 2 months
≥16538	Once per month

A monitoring report which includes the analytical data, volume disposed, facility name, address, phone number and contact person where sludge was disposed or reused shall be submitted with the Quarterly Discharge Monitoring Report (DMR).

a. The Permittee shall ensure that all biosolids generated at the facility including, solid waste screening and sewage sludge, shall be used or disposed of in compliance with the applicable sections of the following regulations whether the Permittee uses or disposes of the biosolids itself or transfers them to another party for further treatment, use or disposal:

1. 40 Code of Federal Regulations 503: for non-hazardous biosolids that are land applied, placed in surface disposal sites (dedicated land disposal sites or monofills), or incinerated;

2. 40 CFR 258: for biosolids disposed in municipal solid waste landfills as approved by the Administrator and the County;

3. 40 CFR 257: for all biosolids use and disposal practices not covered under 40 CFR 258 or 503;

4. 40 CFR 261 for hazardous biosolids or 40 CFR 761 for biosolids with a PCB concentration greater than 50 mg/kg;

b. The Permittee is responsible for informing any biosolid preparer, applier, or disposer of the requirements that they must comply with and the applicable regulations listed above.

c. If biosolids are stored at any facility owned or operated by the Permittee for over two years from the time they are generated, the Permittee shall notify the Division within 30 days and shall ensure compliance with all the requirements of surface disposal 40 CFR 503 C, or must submit a written notification to the Division and U.S. Environmental Protection Agency (EPA) with the information listed at 40 CFR 503.20 (b), demonstrating the need for longer temporary storage.

d. Biosolids treatment, storage or disposal facilities shall be designed to divert stormwater run-on for the 100-year storm event, and be designed to prevent erosion which could cause biosolids to run-off.

e. The Permittee shall ensure that biosolids haulers take all necessary measures to contain the biosolids. The beneficial use of biosolids is not authorized by this permit.

I.A.6. **Odors:** There shall be no objectionable odors from the collection systems, treatment facilities, or the reuse areas.

I.A.7. **Authorized Discharge:** There shall be no discharge from the collection systems, treatment facilities, or the reuse areas, except as authorized by this permit. There shall be no discharge of substances from the facility that would cause a violation of the water quality standards of the State of Nevada.

I.A.8. **Visibility Parameters:** There shall be no discharge of floating solids or visible foam in other than trace amounts.

I.A.9. **Operations and Maintenance (O&M) Manual.** The facility shall be operated in accordance with an (O&M) Manual approved by the Division. The O & M shall contain an Effluent Management Plan for any onsite effluent reuse irrigation and, or for truck fill facilities that may be constructed. Plans for these facilities shall be approved by NDEP prior to use. The manual shall be updated whenever there is a change in the treatment process or operation of the facility, or a change in staff.

I.A.10. **Operator Certification:** The treatment facility shall be operated by a Nevada Certified Class IV (or higher) Operator. The DMRs must be signed by the facility's highest ranking certified operator. The first DMR submitted under this permit must include the written designation of certified operator (required by Part III A.2) as the authorized representative to sign the DMRs. If the certified operator in responsible charge changes, a new designation letter must be submitted.

I.A.11. **Additional Analyses:** Any additional analyses conducted by the City of Henderson shall be reported in accordance with Part I.B.1.

I.A.12. **Pre-Treatment Program:** The Permittee shall continue to implement the pretreatment program which was delegated to them by the U.S.E.P.A. and NDEP to prohibit the discharge of any toxic substance into the treatment plant which would result in violation of Federal or State laws and regulations. This information is handled under permit, NV0022098.

I.A.13. **Health and Safety Plan:** The Permittee shall provide a copy of a brief, but complete and understandable, document describing the potential health hazards and proper hygiene of working around treated wastewater to all personnel working in the facility area; a copy shall be included in the Operations and Maintenance Manual (O & M). A copy of this document shall be provided to every potential effluent user for construction water or dust control.

I.A.14. **Effluent Reuse Permits:** Prior to supplying any effluent to new effluent reuse sites, the Permittee shall ensure that the user has applied for and received an effluent reuse discharge permit. Addition of any effluent reuse outfalls to this permit will be considered a minor modification.

I.A.15. **Facility Maintenance:** The facilities shall be maintained in conformance with the plans approved by the Division, Bureau of Water Pollution Control. The Division

must authorize all changes to the approved plans prior to implementation.

I.A.16. **Security:** The collection, treatment, storage, pump stations, and disposal areas shall be fenced and posted, with conspicuous warning signs that clearly identify the storage of treated wastewater, as needed.

I.A.17. **Best Management Practices:** The Permittee shall implement Best Management Practices (BMPs) at the facility in any and all forms prudent or necessary to protect groundwaters of the State.

I.A.18. **Presumption of Possession and Compliance:** Copies of this permit, any subsequent modifications, and the approved O&M Manual shall be maintained at the permitted facility at all times.

I.A.19. **Stormwater Management Plan:** All *Stormwater Discharges Associated with Industrial Activity*, as defined in Code of Federal Regulations (CFR) 122.26 (b)(14), that are not otherwise controlled under this permit shall be covered by a separate stormwater permit for those discharges. Stormwater permit coverage must be obtained prior to the occurrence of a stormwater discharge associated with industrial activity.

I.A.20. **Solid Waste Management:** All solid, toxic, or hazardous waste shall be properly handled and disposed of pursuant to applicable laws and regulations. Any sludge generated during this operation shall be characterized and disposed of in accordance with local, State, and Federal regulations.

I.A.21. **Prerogative to Reopen:** This permit may be re-opened, re-evaluated, and modified by the permitting authority to include effluent limits, additional testing, and/or other appropriate actions in response to demonstrated effluent toxicity or conditions confirmed by subsequent monitoring data. This permit may also be re-evaluated and modified by the permitting authority to incorporate alternative permit conditions determined to be appropriate based on subsequent monitoring data and/or effluent toxicity information.

I.B. MONITORING AND REPORTING

I.B.1. **Monitoring:**

a. Representative Samples: Samples and measurements taken as required herein shall be representative of the volume and nature of the monitored discharge.

b. Test Procedures: Analyses shall be conducted by a "certified laboratory" using an "approved method of testing", as defined by NAC 445A.0564 and NAC 445A.0562, respectively.

c. Recording the Results: For each measurement or sample taken pursuant to the requirements of this permit, the Permittee shall record the following information:

i. The exact place, date, and time of sampling;
ii. The dates the analyses were performed;
iii. The person(s) who performed the analyses;
iv. The analytical techniques or methods used; and
v. The results of all required analyses, including reporting limits.

d. Additional Monitoring by Permittee: If the Permittee monitors any pollutant at the location(s) designated herein more frequently than required by this permit, using approved analytical methods as specified above, the results of such monitoring shall be included in any calculation and/or reported value required in this permit. Such increased frequency shall also be indicated in required reports.

e. Records Retention: All records and information resulting from monitoring activities; the permit application; and reporting required by this permit, including all records of analyses performed, calibration and maintenance of instrumentation, and recordings from continuous monitoring instrumentation shall be retained for a minimum of five (5) years or longer if required by the Administrator.

f. Reporting Limits: Unless otherwise allowed by the Division, the approved method of testing selected for analyses shall have a reporting limit which is:

i. Half or less of the discharge limit; or, if there is not limit,
ii. Half or less of the applicable water quality criteria; or, if there is not a limit or criteria,
iii. The lowest reasonably obtainable reporting limit using an approved test method.

g. Modification of Monitoring Frequency and Sample Type: After considering monitoring data, stream flow, discharge flow, and receiving water conditions, the Administrator may, for just cause, modify the monitoring frequency and/or sample type by issuing an order to the Permittee.

h. Definitions:

i. Daily maximum: is the highest measurement made or obtained during the monitoring period.

ii. 30-day average discharge: means the total discharge during a month divided by the number of samples in the period that the facility was discharging. Where less than daily sampling is required by this permit, the 30-day average discharge shall be determined by the summation of all the measured discharges divided by the number of samples during the period when the measurements were made.

iii. 30-day average concentration: means the arithmetic mean of measurements made during a month other than for fecal bacteria. The "30-Day Average" for fecal coliform bacteria means the geometric

mean of measurements made during a month. The geometric mean is defined as the "n^{th}" root of the product of "n" numbers. Geometric mean calculations where there are non-detect results for fecal coliform shall use one half the detection limit as the value for the non-detect results.

iv. "Discrete" sample: means any individual sample collected in less than 15 minutes.

I.B.2. **Reporting:** Analytical data and monitoring results shall be summarized, tabulated, and/or graphically illustrated for presentation in standardized Discharge Monitoring Reports (DMRs). The Permittee is considered compliant if the reported results are less than established permit limits. If there is no discharge during a reporting period, report this condition as 'no discharge' on the DMR for that period. Laboratory reports for quantitative analyses conducted by State of Nevada certified laboratories must accompany all report submittals.

DMRs shall be received by the 28th day of the month following the third month of each quarter (reporting period). Quarterly and annual reporting periods are based on the standard annual cycle, January 1 through December 31. The first report is due by **October 28, 2011**.

Each report submittal (DMR) must be signed by the person directly responsible for operating the facility. The first report submitted under this permit must include the written designation of an eligible facility representative authorized to sign DMRs or other periodic report submittals. If the facility representative in responsible charge changes, a new designation letter must be submitted.

a. Quarterly Reports: Quarterly reports shall be submitted for the quarterly periods corresponding to: January 1 through March 31, April 1 through June 30, July 1 through September 30, and October 1 through December 31.

DMRs: Each DMR shall include monitoring results for effluent discharge parameters described pursuant to Part I.A. of the permit shall be summarized and tabulated for each three (3) month, quarterly period. Any data submitted that exceeds the limits of Part I.A.1 must be explained by a narrative; and

b. Annual Reports:

i. DMRs: The fourth quarter DMR report be prepared as an annual report and shall contain a plot of concentration (y-axis) versus date (x-axis) for each analyzed effluent discharge constituent defined or limited in Part I.A. The plot shall include data from the preceding five (5) years or from the effective date of the permit whichever is shorter. A narrative must explain any data point from the current year that exceeds the limits in Part I.A.1.

ii. Exemption: Graphing is not required for any constituent that has been below the detection limit for every analysis during the current year and

the previous four years or the monitoring period if not required by the previous permit. Graphing of less than three data points is not required. The Permittee must explain why the analyzed constituents have not been graphed in the DMR cover letter.

c. Compliance Reports: Reports of compliance or noncompliance with, or any progress reports on, interim and final requirements contained in any compliance schedule of this permit shall be submitted no later than 14 days following each scheduled date.

d. Other Information: Where the Permittee becomes aware of failure to submit any relevant facts in a permit application or the submittal of incorrect information in a permit application or in any report to the Administrator, the Permittee shall promptly submit such facts or information.

e. Planned Changes: The Permittee shall give notice to the Administrator as soon as possible of any planned alterations or additions to the permitted facility. Notice is required only when the alteration or addition to a permitted facility:

i. May meet one of the criteria for determining whether a facility is a new source (40 CFR 122.29(b)); or
ii. Could significantly change the nature or increase the quantity of pollutants discharged.

f. Anticipated Noncompliance: The Permittee shall give advance notice to the Administrator of any planned changes in the permitted facility or activity which may result in noncompliance with permit requirements.

An original, signed copy of these and all other reports required herein shall be submitted to the Division at the following address:

Division of Environmental Protection
Bureau of Water Pollution Control
ATTN: Compliance Coordinator
901 S. Stewart Street, Suite 4001
Carson City, Nevada 89701

I.B.3. **Signatory Certification Required on Application and Reporting Forms:**

a. All applications, reports, or information submitted to the Administrator shall be signed and certified by making the following certification.

"I certify, under penalty of law, that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering information, the information submitted is, to the best of my

knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

b. All applications, reports, or other information submitted to the Administrator shall be signed by one of the following:

i. A principal executive officer of the corporation (of at least the level of vice president) or his authorized representative who is responsible for the overall operation of the facility from which the discharge described in the application or reporting form originates;
ii. A general partner of the partnership;
iii. The proprietor of the sole proprietorship; or
iv. A principal executive officer, ranking elected official, or other authorized employee of the municipal, state, or other public facility.

c. If an authorization under Part I.B.3.b. is no longer accurate because a different individual or position has responsibility for the overall operation of the facility, a new authorization satisfying the requirements of Part I.B.3.b. must be submitted to the Administrator prior to or together with any reports, information, or applications to be signed by an authorized representative.

PART II

II.A. MANAGEMENT REQUIREMENTS

II.A.1. **Change in Discharge:** All discharges authorized herein shall be consistent with the terms and conditions of this permit. The discharge of any pollutant identified in this permit more frequently than, or at a level in excess of, that authorized shall constitute a violation of the permit.

Any anticipated facility expansions or treatment modifications which will result in new, different, or increased discharges of pollutants must be reported by submission of a new application or, if such changes will not violate the effluent limitations specified in this permit, by notice to the permit-issuing authority of such changes. Any changes to the permitted treatment facility must comply with NAC 445A.283 to 445A.285. Pursuant to NAC 445A.263, the permit may be modified to specify and limit any pollutants not previously limited.

II.A.2. **Facilities Operation-Proper Operation and Maintenance:** The Permittee shall, at all times, maintain in good working order and operate as efficiently as possible all treatment or control facilities, collection systems, or pump stations installed or used by the Permittee to achieve compliance with the terms and conditions of this permit. Proper operation and maintenance includes effective performance, adequate funding, adequate operator staffing and training, and adequate laboratory and process controls, including appropriate quality assurance/quality control procedures.

II.A.3. **Adverse Impact-Duty to Mitigate:** The Permittee shall take all reasonable steps to minimize releases to the environment resulting from noncompliance with any effluent

limitations specified in this permit, including such accelerated or additional monitoring as necessary to determine the nature and impact of the noncomplying discharge. The Permittee shall carry out such measures, as reasonable, to prevent significant adverse impacts on human health or the environment.

II.A.4. **Noncompliance, Unauthorized Discharge, Bypass, and Upset:**

a. Any diversion, bypass, spill, overflow, or discharge of treated or untreated wastewater from wastewater treatment or conveyance facilities or process water from industrial or commercial operations under the control of the Permittee is prohibited except as authorized by this permit.

b. In the event the Permittee has knowledge that a diversion, bypass, spill, overflow, or discharge not authorized by this permit is probable, the Permittee shall notify the Administrator immediately at one of the following phone numbers: **775-687-9485 or 888-331-NDEP (331-6337).**

c. The Permittee shall notify the Administrator within twenty-four (24) hours of the occurrence of any diversion, bypass, spill, upset, overflow, or release of treated or untreated discharge, other than that which is authorized by this permit, resulting in:

i. Any unanticipated bypass which exceeds any effluent limitation in the permit;

ii. Any upset which exceeds any effluent limitation in the permit; and

iii. Any violation of a limitation for any toxic pollutant or any pollutant identified as the method to control a toxic pollutant.

The Permittee shall also notify all agencies, organizations, tribes, utilities, and/or local governments responsible for, having a legal interest in, or impacted by downstream water quality affecting public health and welfare, biological integrity, or designated uses within the State of Nevada, within twenty-four hours of the occurrence.

d. A written report shall be submitted to the Administrator within five (5) days of diversion, bypass, spill, overflow, upset, or discharge detailing the entire incident including:

i. Time and date of discharge;

ii. The type of discharge (e.g. bypass, upset, or violation);

iii. The effluent limitation, condition, or standard violated;

iv. Exact location and estimated amount of discharge;

v. Flow path and any bodies of water which the discharge contacts;

vi. The specific cause of the discharge;

vii. The preventive and/or corrective actions taken; and

viii. A comprehensive list of all agencies, organizations, tribes, utilities, and/or local governments notified and when notification was issued.

e. The Permittee shall report all instances of noncompliance not reported under Part II.A.4.c. at the time DMRs are submitted. The reports shall contain the information listed in Part II.A.4.d.

f. A "bypass" means the intentional diversion of waste streams from any portion of a treatment facility.

i. Bypass not exceeding limitations: The Permittee may allow any bypass to occur which does not cause effluent limitations to be exceeded if the bypass is needed to allow essential maintenance to assure efficient operation. These bypasses are not subject to the provisions of Parts II.A.4.a. and II.A.4.b.

ii. Anticipated bypass: If the Permittee knows in advance of the need for a bypass, it shall submit prior notice, if possible, at least ten (10) days before the date of bypass.

g. Bypass is prohibited, and the Administrator may take enforcement action against a Permittee for bypass, unless:

i. The bypass was unavoidable to prevent loss of life, personal injury, or severe property damage; and

ii. There were no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment down time. This condition is not satisfied if adequate back-up equipment should have been installed in the exercise of reasonable engineering judgment to prevent a bypass which occurred during normal periods of equipment downtime or preventative maintenance.

h. The Administrator may approve an anticipated bypass, after considering its adverse effects, if the Administrator determines that it will meet the conditions listed in Part II.A.4.g.

i. An "upset" means an exceptional incident in which there is unintentional and temporary noncompliance with technology based permit effluent limitations because of factors beyond the reasonable control of the Permittee. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventive maintenance, or careless or improper operation.

j. A Permittee who wishes to establish the affirmative defense of upset shall

demonstrate, through properly signed, contemporaneous operating logs or other relevant evidence that:

i. An upset occurred and that the Permittee can identify the cause(s) of the upset;

ii. The permitted facility was at the time being properly operated;

iii. The Permittee submitted notice of the upset as required under Part II.A.4.d.; and

iv. The Permittee complied with any remedial measures required under Part II.A.3.

k. An upset constitutes an affirmative defense to an action brought for noncompliance with such technology-based permit effluent limitations if the requirements of Part II.A.4.i. are met.

l. In selecting the appropriate enforcement option, the Administrator shall consider whether or not the noncompliance was the result of an upset. The burden of proof is on the Permittee to establish that an upset occurred.

II.A.5. **Removed Substances:** Solids, sludges, filter backwash, or other pollutants removed in the course of treatment or control of wastewaters shall be disposed of in a manner such as to prevent any pollution from such materials from entering any navigable waters.

II.A.6. **Safeguards to Electric Power Failure:** In order to maintain compliance with the effluent limitations and prohibitions of this permit the Permittee shall either:

a. Provide, at the time of discharge, an alternative power source sufficient to operate wastewater control facilities; or

b. Halt or reduce all discharges upon the reduction, loss, or failure of the primary source of power to wastewater control facilities.

II.B. RESPONSIBILITIES

II.B.1. **Right of Entry and Inspection:** The Permittee shall allow the Administrator and/or his authorized representatives, upon the presentation of credentials, to:

a. Enter at reasonable times upon the Permittee's premises where an effluent source is located or in which any records are required to be kept under the terms and conditions of this permit;

b. Have access to and copy any records required to be kept under the terms and conditions of this permit;

c. Inspect, at reasonable times, any facilities, equipment (including monitoring and control equipment), practices, or operations required in this permit; and

d. Perform any necessary sampling or monitoring to determine compliance with this permit at any location for any parameter.

II.B.2. **Transfer of Ownership or Control:** In the event of any change in control or ownership of facilities from which the authorized discharge emanates, the Permittee shall notify the succeeding owner or controller of the existence of this permit, by letter, a copy of which shall be forwarded to the Administrator. The Administrator may require modification or revocation and re-issuance of the permit to change the name of the Permittee and incorporate such other requirements as may be necessary. The Administrator shall approve all transfer of permits.

II.B.3. **Availability of Reports:** Except for data determined to be confidential under NRS 445A.665, all reports prepared in accordance with the terms of this permit shall be available for public inspection at the office of the Administrator. As required by the Act, effluent data shall not be considered confidential. Knowingly making any false statement on any such report may result in the imposition of criminal penalties as provided for in NRS 445A.710.

II.B.4. **Furnishing False Information and Tampering with Monitoring Devices:** Any person who knowingly makes any false statement, representation, or certification in any application, record, report, plan, or other document filed or required to be maintained by the provisions of NRS 445A.300 to 445A.730, inclusive, or by any permit, rule, regulation, or order issued pursuant thereto, or who falsifies, tampers with, or knowingly renders inaccurate any monitoring device or method required to be maintained under the provisions of NRS 445A.300 to 445A.730, inclusive, or by any permit, rule, regulation, or order issued pursuant thereto is guilty of a gross misdemeanor and shall be punished by a fine of not more than $10,000 or by imprisonment. This penalty is in addition to any other penalties, civil or criminal, provided pursuant to NRS 445A.300 to 445A.730, inclusive.

II.B.5. **Penalty for Violation of Permit Conditions:** NRS 445A.675 provides that any person who violates a permit condition is subject to administrative and judicial sanctions as outlined in NRS 445A.690 through 445A.705.

II.B.6. **Permit Modification, Suspension, or Revocation:**

a. After notice and opportunity for a hearing, this permit may be modified, suspended, or revoked in whole or in part during its term for cause including, but not limited to, the following:

i. Violation of any terms or conditions of this permit;
ii. Obtaining this permit by misrepresentation or failure to disclose fully all relevant facts;
iii. A change in any condition that requires either a temporary or permanent reduction or elimination of the authorized discharge;
iv. A determination that the permitted activity endangers human health or the environment and can only be regulated to acceptable levels by permit modification or termination;
v. There are material and substantial alterations or additions to the

permitted facility or activity;

vi. The Administrator has received new information;

vii. The standards or regulations have changed; or

viii. The Administrator has received notification that the permit will be transferred.

b. With the consent of the Permittee and without public notice, the Administrator may make minor modifications in a permit to:

i. Correct typographical errors;

ii. Clarify permit language;

iii. Require more frequent monitoring or reporting;

iv. Change an interim compliance date in a schedule of compliance, provided the new date is not more than 120 days after the date specified in the permit and does not interfere with attainment of the final compliance date;

v. Allow for change in ownership;

vi. Change the construction schedule for a new discharger provided that all equipment is installed and operational prior to discharge; and

vii. Delete an outfall when the discharge from that outfall is terminated and does not result in discharge of pollutants from other outfalls except in accordance with permit limits.

II.B.7. **Toxic Pollutants:** Notwithstanding Part II.B.6., if a toxic effluent standard or prohibition (including any schedule of compliance specified in such effluent standard or prohibition) is established under Section 307(a) of the Act for a toxic pollutant which is present in the discharge and such standard or prohibition is more stringent than any limitation for such pollutant in this permit, this permit shall be revised or modified in accordance with the toxic effluent standard or prohibition and the Permittee so notified.

II.B.8. **Liability:** Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the Permittee from any responsibilities, liabilities, or penalties established pursuant to any applicable Federal, State, or local laws, regulations, or ordinances.

II.B.9. **Property Rights:** The issuance of this permit does not convey any property rights, in either real or personal property, or any exclusive privileges, nor does it authorize any injury to private property, any invasion of personal rights, or any infringement of Federal, State, or local laws or regulations.

II.B.10. **Severability:** The provisions of this permit are severable and if any provision of this permit or the application of any provisions of this permit to any circumstance is held invalid, the application of such provision to other circumstances and the remainder of this permit shall not be affected thereby.

II.B.11. **Duty to Comply:** The Permittee shall comply with all conditions of this permit. Any permit noncompliance constitutes a violation of the Act and is grounds for: enforcement action, permit termination, revocation and re-issuance, modification, or

denial of a permit renewal application.

II.B.12. **Need to Halt or Reduce Activity Not a Defense:** In an enforcement action, the need to halt or reduce permitted activities in order to maintain compliance with the conditions of this permit shall not be a defense for a Permittee.

II.B.13. **Duty to Provide Information:** The Permittee shall furnish to the Administrator, within a reasonable time, any relevant information which the Administrator may request to determine whether cause exists for modifying, revoking and re-issuing, or terminating this permit, or to determine compliance with this permit. The Permittee shall also furnish to the Administrator, upon request, copies of records required to be kept by this permit.

PART III

III.A. OTHER REQUIREMENTS

III.A.1. **Reapplication:** If the Permittee desires to continue to discharge, he shall reapply not later than 180 days before this permit expires on the application forms then in use. The Permittee shall submit the reapplication fee required by NAC 445A.232 with the application.

III.A.2. **Signatures, Certification Required on Application and Reporting Forms:**

a. All applications, reports, or information submitted to the Administrator shall be signed and certified by making the following certification:

"I certify under penalty of law, that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

b. All applications, reports or other information submitted to the Administrator shall be signed by one of the following:

i. A principal executive officer of the corporation (of at least the level of vice president) or his authorized representative who is responsible for the overall operation of the facility from which the discharge described in the application or reporting form originates; or
ii. A general partner of the partnership; or
iii. The proprietor of the sole proprietorship; or
iv. A principal executive officer, ranking elected official or other authorized employee of the municipal, state or other public facility.

c. **Duly Authorized Representative:** All Discharge Monitoring Reports and any other information required by this permit or requested by the

Administrator shall be signed by a person described in paragraph (b) of this section, or by a duly authorized representative of that person. A person is a duly authorized representative only if:

i. The authorization is made in writing by a person described in paragraph (b) of this section

ii The authorization specifies either an individual or a position having responsibility for environmental matters for the company, and

iii. The authorization is submitted to the Division.

d. **Changes to Authorization:** If an authorization under paragraph c. of this section is no longer accurate because a different individual or position has responsibility for the overall operation of the facility, a new authorization satisfying the requirements of paragraph b. of this section must be submitted to the Administrator prior to or together with any reports, information, or applications to be signed by an authorized representative.

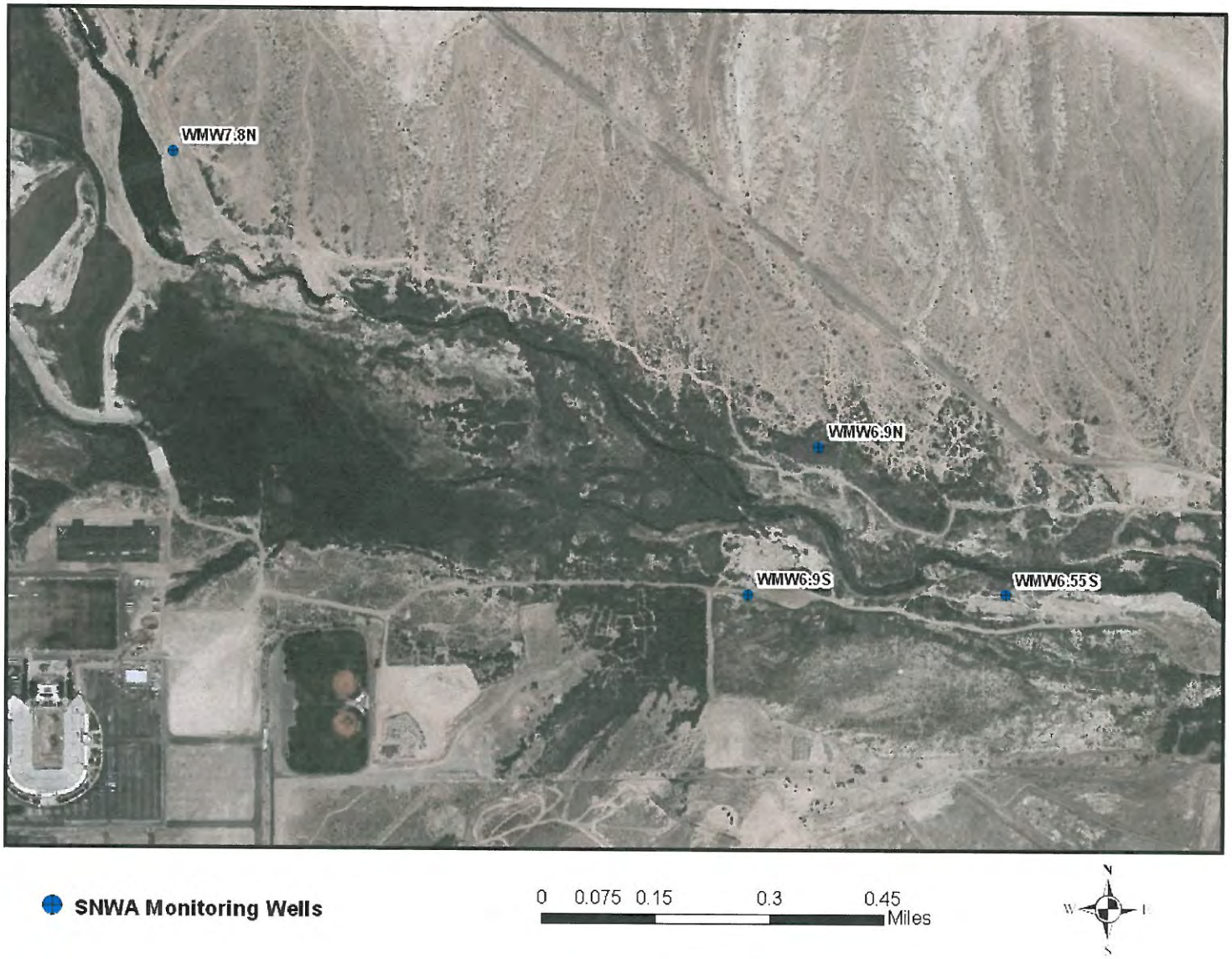
III.A.3. **Holding Pond Conditions:** If any treated effluent from the Permittee's facility is placed in transfer and storage ponds, such ponds shall be located and constructed so as to:

a. contain with no discharge the 25-year 24-hour storm at said location;

b. withstand with no discharge the 100-year flood of said location; and,

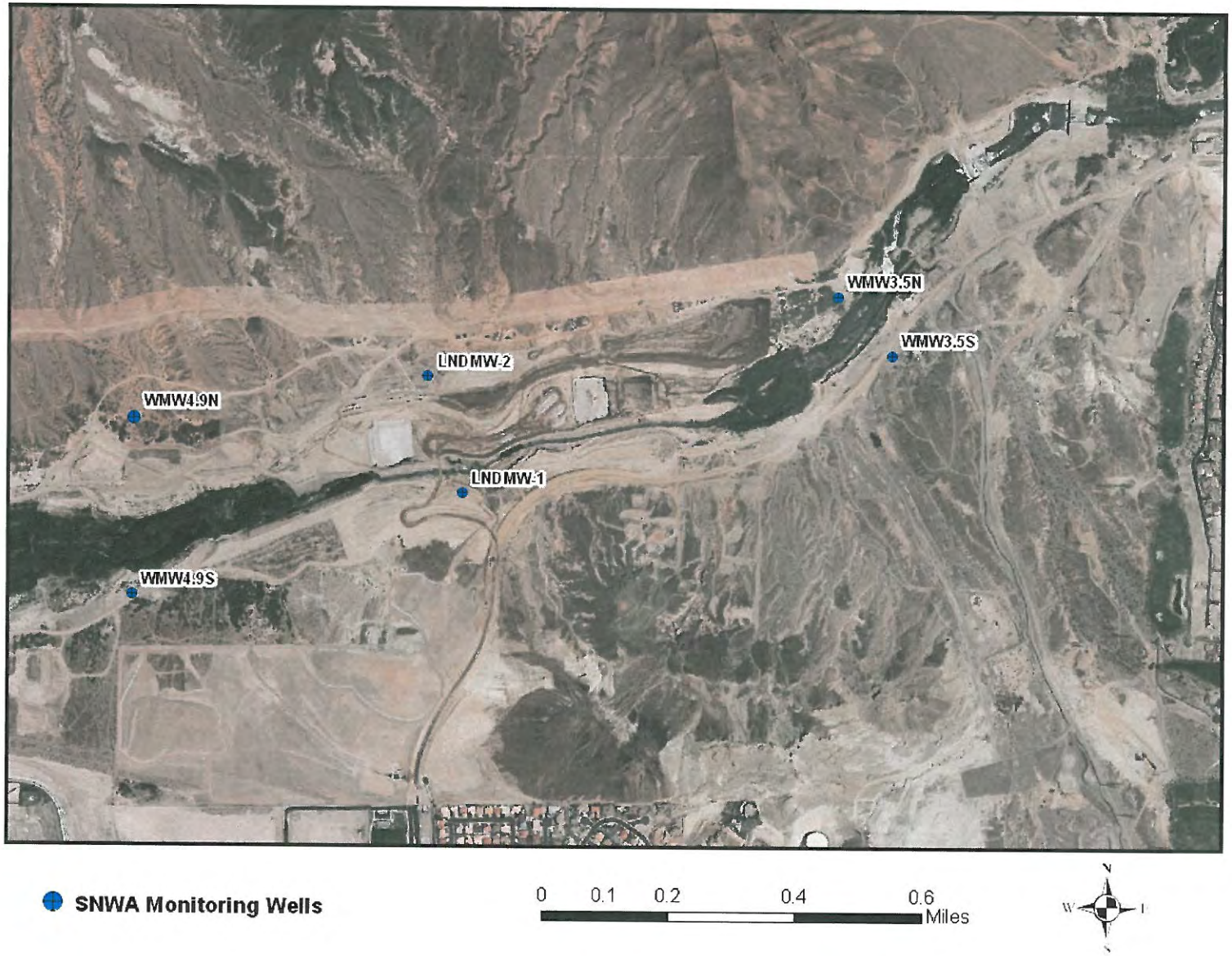
c. prevent escape of wastewater by leakage other than as authorized by this permit.

Appendix E
Maps showing the proposed monitoring well locations
along the Las Vegas Wash



Monitoring wells located at the upper portion of the Wash

Monitoring wells located at the middle portion of the Wash



Monitoring wells located at the lower portion of the Wash

Appendix F

List of Water Quality Parameters for the Shallow Groundwater Monitoring Program Along the Las Vegas Wash

Parameter or Parameter Group	Parameter
Alkalinity	Total alkalinity (carbonate, bicarbonate, hydroxide)
Bacteria	E. coli
	Fecal coliform
	Total coliform
Bacteria+	Enterococci
	Fecal streptococcus
Field Measurements	DO
	EC
	ph
	Temp
Flow	Flow
Ions	Chloride
	Flouride
	Sulfate
Ions+	Bromide (SNWA only)
	Chlorate (SNWA only)
	Sulfide
Metals (dissolved)	Aluminum
	Antimony
	Arsenic
	Barium
	Beryllium
	Boron (SNWA only)
	Cadmium
	Chromium
	Copper
	Iron (SNWA only)
	Lead
	Manganese
	Mercury (SNWA only)
	Molybdenum
	Nickel
	Silver
	Thalliium (SNWA only)
	Vanadium
	Zinc
Metals (total)	Aluminum
	Antimony
	Arsenic
	Arsenic III (COH only)
	Barium
	Beryllium
	Boron
	Cadmium
	Chromium
	Chromium III

Metals (total)	Chromium VI
	Copper
	Iron
	Lead
	Manganese
	Mercury
	Molybdenum
	Nickel
	Silver
	Thalliium
	Vanadium (SNWA only)
	Zinc
Minerals (dissolved)	Calcium
	Magnesium
	Potassium
	Sodium
Minerals (total)	Same as "Minerals (dissolved)" group
Nutrients	Amonia-N (except SNWS)
	Dissolved Orthophosphorus-Phosphorus
	Nitrate+Nitrate
	Nitrate-Nitrogen
	Nitrite-Nitrogen
	Total Phosphorus
Nutrients+	Total Kjeldahl Nitrogen
	Total Organic Nitrogen (SNWA only)
Perchlorate	Perchlorate
PPCP/Steroids	Atenolol
	Atorvastatin
	Atrazine
	Benzophenone
	BHA
	Bisphenol A
	Caffeine
	Carbamazepine
	DEET
	Diazepam
	Diclofenac
	Dilantin
	Estradiol
	Estrone
	Ethynylestradiol
	Fluoxetine
	Gemfibrozil
	Ibuprofen
	Iopromide
	Meprobamate
	Musk Ketone

PPCP/Steroids	Naproxen
	Octylphenol
	Primidone
	Progesterone
	Sulfamethoxazole
	TCEP
	TCPP
	Testosterone
	Triclosan
	Trimethoprim
PPL	1,1,1-trichloreothane
	1,1,2,2-tetrachloroethane
	1,1,2-trichloroethane
	1,1-dichloroethane
	1,1-dichloroethylene
	1,2,4-trichlorobenzene
	1,2-dichlorobenzene
	1,2-dichloroethane
	1,2-dichloropropane
	1,2-dichloropropylene
	1,2-diphenylhydrazine
	1,2-trans-dichloroethylene
	1,3-dichlorobenzene
	1,4-dichlorobenzene
	2,3,7,8-TCDD (COH only)
	2,4,6-trichlorophenol
	2,4-dichlorophenol
	2,4-dimethylphenol
	2,4-dinitrophenol
	2,4-dinitrotoluene
	2,6-dinitrotoluene
	2-chloroethyl vinyl ethers
	2-chloronaphthalene
	2-chlorophenol
	2-nitrophenol
	3,3-dichlorobenzidine
	4,4-DDD
	4,4-DDE
	4,4-DDT
	4,6-dinitro-o-cresol
	4-bromophenyl phenyl ether
	4-chlorophenyl phenyl ether
	4-nitrophenol
	Acenaphthene
	Acenaphthylene
	Acrolein
	Acrylonitrile

PPL	Aldrin
	Alpha-BHC
	Alpha-endosulfan
	Anthracene
	Asbestos (COH only)
	Benzene
	Benzidine
	benzo(a) anthracene
	Benzo(a)pyrene
	Benzo(b) fluoranthene
	Benzo(ghi) perylene
	Beta-BHC
	Beta-endosulfan
	Bis(2-chloroethoxy) methane
	Bis(2-chloroethyl) ether
	Bis(2-chloroisopropyl) ether
	Bis(2-ethylhexyl) phthalate
	Bromoform
	Butyl benzyl phthalate
	Carbon tetrachloride
	Chlordane
	Chlorobenzene
	Chlorodibromomethane
	Chloroethane
	Chloroform
	Chrysene
	Cyanide, Total (COH only)
	Delta-BHC
	Demeton
	Dibenzo(,h) anthracene
	Dichlorobromomethane
	Dichloropropenes
	Dieldrin
	Diethyl Phthalate
	Dimethyl phthalate
	Di-N-Butyl Phthalate
	Di-n-octyl phthalate
	Endosulfan sulfate
	Endrin
	Endrin aldehyde
	Ethylbenzene
	Fluoranthene
	Fluorene
	Gamma-BHC
	Guthion
	Heptachlor
	Heptachlor epoxide

PPL	Hexachlorobenzene
	Hexachlorobutadiene
	Hexachlorocyclopentadiene
	Hexachloroethane
	Indeno (1,2,3-cd) pyrene
	Isophorone
	Malathion
	Methoxychlor
	Methyl bromide
	Methyl chloride
	Methylene chloride
	Mirex
	Monochlorobenzene
	Naphthalene
	Nitrobenzene
	N-nitrosodimethylamine
	N-nitrosodi-n-propylamine
	N-nitrosodiphenylamine
	Parachlorometa cresol
	Parathion
	PCB–1016 (Arochlor 1016)
	PCB–1221 (Arochlor 1221)
	PCB–1232 (Arochlor 1232)
	PCB–1242 (Arochlor 1242)
	PCB–1248 (Arochlor 1248)
	PCB–1254 (Arochlor 1254)
	PCB–1260 (Arochlor 1260)
	Pentachlorophenol
	Phenanthrene
	Phenol
	Pyrene
	Silvex (2,4,5-TP)
	Tetrachloroethylene
	Toluene
	Toxaphene
	Trihalomethanes
	Vinyl chloride
PPL+	Acetaldehyde
	Dalapon
	DCPA
	Dichloroacetonitrile
	Formaldehyde
	Glyoxal
	Methyl glyoxal
	M-Glyoxal (Pyruvic Aldehyde)
	Propachlor
Selenium (dissolved)	Dissolved Selenium

Selenium (total)	Total Selenium
Selenate/Selenite	Selenate
	Selenite
Silica	Total Silica
TDS	Total Dissolved Solids
TSS	Total Suspended Solids
Turbidity	Turbidity
Giardia/Cryptosporidium	Giardia/Cryptosporidium
Viruses	Virus PCR
Legionella/Clostridium	Legionella/Clostridium