COMPARATIVE ASSESSMENT OF HUMAN AND ECOLOGICAL IMPACTS FROM MUNICIPAL WASTEWATER DISPOSAL METHODS IN SOUTHEAST FLORIDA

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1. EXECUTIVE SUMMARY

Injection to deep wells is currently one alternative for disposing municipal wastewater effluent in Southeast Florida. In the past several years, elevated concentrations of ammonia and total Kjeldahl nitrogen, and depressed salinity, relative to native water in the Floridan Aquifer, have been reported in monitoring wells in zones overlying the injection zone in Miami-Dade County. This finding has raised concerns of the U.S. EPA and others regarding the extent of migration of injected water.

In this research, indicators of the human health and ecological risks of available alternatives for disposal of treated municipal wastewater effluent in Southeast Florida were evaluated on a relative basis. Prior to the study, little was known regarding the relative risks of such alternatives. Municipal wastewater effluent disposal alternatives in Southeast Florida and considered in this proposal include (a) injection wells, (b) ocean outfalls and (c) surficial aquifer recharge via canal discharge. Assessment of risks of reuse of treated effluent for irrigation of golf courses, residential lawns, and parks was outside of the scope of this study. Because of the seasonal rainfall and shallow water tables in South Florida, irrigation reuse is frequently impossible during the rainy season (June through November), and therefore a backup disposal system of similar capacity is required. That is, wastewater utilities utilizing reclaimed water for irrigation still require one of the effluent disposal alternatives listed above, for use during wet periods. Surficial aquifer recharge via shallow wells would require full treatment (typically reverse osmosis) under current regulations, a higher level of treatment than was assumed by the study Team for aquifer recharge. Therefore, surficial aquifer recharge by shallow well injection was also not considered.

Objectives of the research were to:

1. Compile and summarize water quality data on treated wastewater effluents and ground waters, related to or in proximity with large deep well injection systems and other disposal systems in Southeast Florida,
2. Develop a conceptual model of the operating environment for each disposal option, including regulatory constraints, hydrogeological and hydrological considerations, and potential pathways of health and ecological exposure,
3. Develop a probabilistic assessment of risks of injection well disposal, based on (a) published literature, (b) available data, and (c) expert opinion, relative to those of ocean outfall and surficial aquifer recharge methods of treated-effluent disposal,
4. Prepare a report addressing the relative risks of the three wastewater treatment disposal alternatives, and
5. Recommend additional data and research needs, if appropriate, to refine conclusions reached in the project report.

Because of the complexity of potential exposure paths, time scales, and population characteristics, and the need to avoid site-specificity in the assessment, a predictive Bayesian assessment of relative risks of the various alternatives was undertaken. Bayesian methods allow the explicit and rigorous integration of expert opinion and numeric data, in contrast with resampling methods (which have no subjective capability), and fuzzy logic methods (having limited numeric data capability). The generalized quantitative assessment presented was made possible through the use of a further extension of the approach termed predictive Bayesian methods, involving the use of unconditional, believed probability distributions for potential human health and ecological losses. Such distributions represent both uncertainty (due to information limitations) and variability (due to natural random variation). Resulting unconditional distributions become broader with decreasing levels of available information, giving estimates of risk directly, and avoiding the arbitrary assumption of confidence limits. Because the distributions are broader in general, their means are typically larger than the corresponding mean frequencies of occurrence. Therefore, these probabilities are termed *believed probabilities*, and are not interpreted as frequencies.

The project comprised two phases, data collection and relative risk assessment. First, data on the quality of wastewater effluents from different levels of treatment, and the quality of ground water at depths to approximately 3000 feet, were collected from participating utilities and regulatory agencies, summarized, and analyzed. In addition, local and regional geologic data were collected. Data for effluents and ground waters were compared to primary and secondary drinking water standards. Second, an assessment of risks of disposing of treated municipal effluent by injection to deep wells, relative to those of disposal by ocean outfall and to those of aquifer recharge by canal, was conducted.

Three meetings of the Research Team were convened over the course of the project. At the first meeting, a conceptual model of the technological and environmental setting for wastewater disposal in Southeast Florida was constructed, including available wastewater treatment technologies, water quality regulations, hydrologic characteristics, and conventional and emerging wastewater constituents of concern. At the second meeting, the analysis of collected water quality data was presented, along with tree diagrams describing potential exposure pathways, and the conceptual model for the risk analysis was developed. Risk was defined for the assessment as the probability of violating a water quality standard. A modified Delphi elicitation of expert judgment concerning risks associated with the three disposal alternatives was then conducted electronically, based on data collected for the region, applicable published literature information, and the experience of the Research Team. Experience of the Research Team encompassed probabilistic risk analysis, wastewater process engineering, microbiological and chemical transport and modeling in groundwater, surface water, and marine waters, Floridan and Biscayne aquifer geology and hydrogeology, wastewater management and disposal, ocean outfall disposal, aquifer recharge disposal, injection well disposal, and utility permitting and management. A predictive Bayesian model was then constructed based on the conceptual model developed previously, to probabilistically compute total relative risk for the three alternatives. Information from the Delphi survey was used as input to the computer model. Initial results were presented at the third team meeting. The model and input were refined, based on a final iteration of the modified Delphi survey and review of results by the Team, to develop final relative risk estimates. Risks were then characterized, in a discussion of the tradeoffs involved.

Output of the probabilistic analysis included the believed number of days during which one or more violations of existing or assumed water quality standards for arsenic, microbes, n-nitrosodimethylamine (NDMA), and total Kjeldahl nitrogen (TKN) would occur, for comparative purposes. Arsenic, microbes (*Cryptosporidium parvum* for surface water, rotavirus for ground water), and NDMA were used as indicators of human health risks, and TKN was used as an ecological risk indicator. The compound NDMA was selected to represent nitrosamines, an emerging class of toxins that has been found in wastewater effluent. NDMA is considered carcinogenic at extremely low doses. Believed violation days are shown in Table 1 (a) and 1 (b). These numbers were larger than the expected number of days on which violations would be expected to occur, because they reflected uncertainty in addition to inherent variability. In addition, they were based upon multiple assumptions, as detailed in Section 5. In particular, the following assumptions were considered important to the results obtained:

1. Rapid vertical migration to the Upper Floridan Aquifer from deep injection wells in the Lower Floridan Aquifer was assumed, although evidence of effluent in the Upper Floridan near injection wells in Miami-Dade County could have been related to construction problems. This assumption is equivalent to assuming that the Floridan Aquifer will be "impacted" with water of generally much lower dissolved solids and inorganics, yet higher organics and nutrients, than native water of the aquifer. Constituents found in higher concentrations in effluent included cyanide, nitrogen, phosphorous, color, odor, foaming agents, total trihalomethanes (THMs), biochemical oxygen demand (BOD), and total coliform count. In addition, treated effluents were somewhat higher in temperature and lower in pH, on average. Of note and based on wastewater effluent analyses obtained, on average, treated effluents met both primary and secondary standards for drinking water, with the exceptions of primary standards for antimony and total coliform, and secondary standards for color, odor, TDS, and foaming agents. The assumption of rapid vertical migration to the upper Floridan was equivalent to assuming a violation of the USDW with 100% probability;

2. Aquifer storage and recovery (ASR) wells were assumed located one mile from effluent injection wells. It was further assumed that, as water is withdrawn from potable and non-potable ASR wells, salinity would be monitored, and withdrawals would stop if elevated levels were detected. However, the Team assessed the risks associated with the discharge of non-potable ASR water (to canals without treatment) to be higher than those associated with discharge of water from potable ASR wells (to distribution systems following chlorination and blending). Assumptions of Team members regarding the future levels of operational control and treatment to be required before and after ASR withdrawals undoubtedly affected these judgments, and are considered to affect the risks associated with contamination of ASR wells from injection wells. In addition, actual risks will be related to the distance between injection and ASR wells;

3. Because marine raw water for drinking was assumed to receive RO treatment, human consumption risks were driven by accidental ocean water ingestion by bathers at the beach, as indicated by the probability of violating marine surface water standards at the beach. In general, surface water standards are comparable to drinking water standards, though consumption of surface water in South Florida is probably three orders of magnitude less than consumption of drinking water. Because specific surface water standards do not exist in Florida for NDMA and *Cryptosporidium parvum*, standards were assumed based on California action levels (NDMA) and published dose-response data (*Cryptosporidium parvum*). Assumed standards were adjusted by a factor of 1000, to account for the fact that ocean water is ingested only accidentally in small quantities, relative to drinking water. Because a specific surface water standard does exist for arsenic in Florida, this standard was not adjusted (in keeping with the definition of risk assumed for the project). Therefore, results for arsenic may be less indicative of actual human health risks, and

4. Levels of treatment assumed to be received by discharged effluent and treated drinking water varied according to regulatory requirements; only effluent released to surficial aquifers was assumed to receive AWT. Surficial aquifer recharge by canal was assessed at lower risk than ocean outfalls for *Cryptosporidium parvum*, because (a) the filtration step included in AWT treatment preceding canal discharge provides efficient removal of *cryptosporidium parvum*, and (b) persistent onshore winds could result in inadequate dilution of ocean outfall plumes at the shore. Risks of surficial aquifer recharge by shallow well injection would have been much lower, assuming reverse osmosis treatment of discharged water. Thus, these assessed risks, and others evaluated in the study, depended upon the level of treatment assumed. Consideration of cost, including those of treatment, was outside the scope of this study.

Under assumption (1), and the definition of risk adopted by the Team, the injection well alternative would entail 10^4 violation-days because effluent would be present above the USDW every day over the 30 year planning period. Not considering violations of the USDW, the relative risks listed in Table 1 were assessed. In light of the assumptions used, generalized scenarios represented, and uncertainties reflected, risk assessment results shown in Tables 1 (a) and (b) can be evaluated only on a relative basis. Relative, or comparative, risks were defined as the ratio of believed violation days (that is, the mean of the believed probability distribution for violation days) for injection well disposal to those for each of the alternatives, and are shown in Table 1. Results are considered significant in terms of orders of magnitude only. In addition, results should not be compared among constituents. For example, arsenic risks are expected to be lower than other risks, because average arsenic concentrations in the effluent samples analyzed were lower than either existing or proposed surface and drinking water standards, in contrast with other constituents selected for assessment. While the results of Tables 1 (a) and (b) do not reflect the lower arsenic risk, the relative risks of arsenic are shown to be comparable among discharge alternatives in Table 1 (c), as expected.In general, injection wells were assessed to represent lower health risks, assuming potential changes in Floridan Aquifer water quality in the vicinity of injection wells. Further, while there are no zero-risk options, all discharge alternatives evaluated are permitted under current regulations (though revised rules have been proposed for injection well disposal). Ecological risks within the three urban counties studied were also lower. However, impacts to the Everglades system associated with urban water use/reuse were not evaluated as part of this study. Assessed risks were low because of the geologic isolation and lack of ecological features within the aquifer, and because it was assumed that any contamination of ASR wells would be detected during operational withdrawals and that withdrawals would then stop.

It was not possible to conduct a quantitative assessment of risks associated with pharmaceutically active substances (PASs), because such compounds are still being identified chemically, concentrations in treated and natural waters are largely unknown, and environmental fates are uncertain. Currently these substances are not monitored. However, such chemicals are being found in concentrations not recognized previously. Because of the widespread use of birth control and other hormonally active drugs, and the lack of removal of PASs in conventional wastewater treatment, the potential risks associated with these compounds require significant further study. Most direct evidence of toxicity is in the form of animal data; evidence in humans is limited at the present time. Additional data regarding effects of exposure in animals and humans are needed. Statistical pilot monitoring programs should be implemented on a broad scale as a basis for future policy development. Further questions include treatment technologies for removal, and the effects of natural processes including microbial degradation, adsorption, dilution, and photochemical reactivity on the fate of PASs in the surface and subsurface environment. Estrogens may be useful as an indicator in future risk assessments, because the compounds and their health effects are measurable.

In addition to PASs, the Team felt that potential risks of blue-green algae and their toxins related to the discharge of treated wastewater effluent, also outside the scope of the current project, also deserve further study. Information on blue-green algae toxicity in Florida is limited at present. However, several species of freshwater or freshwater-estuarine cyanobacteria, or blue-green algae, that produce cyanotoxins occur in Florida waters. Of samples collected in recent monitoring studies of recreational and surface drinking water supplies in Florida with algal blooms, approximately half showed significant levels of blue green algae, all of which were positively identified to contain blue green algal toxins found lethal in mice. Because such algae are nitrogen-fixing, growth rate is independent of TKN levels. However, growth is enhanced with phosphorus concentration. Even following AWT treatment, concentrations of phosphorus in wastewater effluent are two orders of magnitude greater than in natural South Florida surface waters. Further, cyanotoxins are not well removed in conventional flocculation and filtration. Therefore, blue-green algae may be a factor to consider in evaluating and determining the level of treatment associated with surface discharge alternatives.

Benefits and costs were not considered as part of this study. In particular, benefits and costs of wastewater reuse were not considered. Wastewater flows disposed in Miami-Dade, Broward and Palm Beach Counties are on the order of 0.5 billion gallons per day (bgd), and are significant when compared with the 1.6 bgd to be recovered for Everglades restoration through use of ASR technology. Reuse of portions of these flows for surficial aquifer recharge would reduce water withdrawals from the Everglades system during dry periods. Such reuse would entail additional costs for treatment and distribution. It is also conceivable that in Southeast Florida, where outfalls lie within the influence of the Gulfstream, ocean outfall disposal contributes positively to the marine environment through the return of nutrients and organic matter. For example, it can be noted that no evidence of benthic accumulation of secondary effluent particles has been detected in the vicinity of the Southeast Florida outfalls. The effects of wastewater management strategies on the cycling of water, nutrients, and other constituents in Southeast Florida should be considered in further studies.

There are important limitations to the results presented in this report. Some of these are related to the broad scope and generalized nature of the assessment, the currently limited implementation and regulation of ASR technology, uncertainties associated with emerging wastewater constituents of concern such as NDMA and PASs, and associated assumptions for the assessment. The definition of risk as the probability of violation of a standard allowed a broad assessment based on limited available information. However, the definition limits the interpretation of results. In particular, numbers of exposed individuals were not explicitly compared. Further, the assessment was based on professional judgment, using current data for the region, applicable published literature information, and the experience of the Team. The results reported represent the first quantitative assessment of wastewater discharge risks of such scope, and are therefore considered a starting point rather than an end. Nevertheless, the results are considered important for water management planning and as a basis for further studies. Cooperation with Investigators in a similar and imminent study, supported by the U.S. EPA, is planned, and the approach taken may represent an example for future assessments. It is recommended that in future studies, the number of individual risk events which expert teams are asked to assess be reduced through preliminary screening, to more narrowly focus attention on significant risk events.

In the past, wastewater treatment plant design has been governed by the removal of conventional constituents, particularly biochemical oxygen demand. As knowledge regarding emerging wastewater constituents and effects of wastewater discharges increases, design will be driven by these new concerns. As wastewater quality increases in response to these concerns, and population pressures increase, reuse will become an increasingly important part of an integrated wastewater management strategy. Therefore it is imperative that monitoring, literature search, and toxicity testing be actively undertaken to ensure the long-term viability of reuse and dispersal/disposal options. Ultimately, human and ecological benefits and risks will be governed in large part by the treatment processes employed and, consequently, cost, neither of which was considered in this study. Therefore, the present study should be considered a first step in evaluating the sustainability of alternatives for municipal wastewater effluent disposal in Southeast Florida.

Table 1 (a). Comparison of Human Health Risk Indicators for Three Discharge Alternatives Not Considering Violation of the USDW.

Alternative Disposal Methods	**Mean Believed Violation Days In 30 Years[1]**		
	Arsenic	**Microbial[2]**	**NDMA**
Deep Well Injection	1	0.1	0.5
Ocean Outfall	10	50	30
Canal Aquifer Recharge	0.3	5	40

[1]*Results reflect input developed on a relative basis, and should not be evaluated individually.*
[2]*rotavirus for ground water nodes; Cryptosporidium parvum for surface water nodes*

Table 1 (b). Comparison of an Ecological Risk Indicator for three Discharge Alternatives Not Considering Violation of the USDW

Alternative Disposal Methods	**Mean Believed Violation Days In 30 Years[1]**
	TKN
Deep Well Injection	10
Ocean Outfall	40
Canal Aquifer Recharge	100

[1]*Results reflect input developed on a relative basis, and should not be evaluated individually.*

Table 1 (c). Relative Risk Indicators for Three Disposal Alternatives Not Considering Violation of the USDW

Alternative Disposal Methods	**Relative Mean Believed Violation Days In 30 Years[1] (days/days)**			
	Arsenic	**Microbial (rotavirus or *Cryptosporidium parvum***	**NDMA**	**TKN**
Injection Well/Ocean Outfall	10^{-1}	10^{-3}	10^{-2}	10^{-1}
Injection Well/Canal Aquifer Recharge	10^{0}	10^{-2}	10^{-2}	10^{-1}

[1]*Higher values represent higher potential frequency of, and/or higher uncertainty in the probability of, violating surface and drinking water standards given current treatment requirements, for a generalized scenario in Southeast Florida. Values less than one indicate a lower believed risk of violating standards for injection well disposal relative to the alternative.*

2. INTRODUCTION

In this research, indicators of the human health and ecological risks of available alternatives for disposal of treated municipal wastewater effluent in Southeast Florida were evaluated on a relative basis. Injection to deep wells is currently one alternative for disposing municipal wastewater effluent in Southeast Florida. However, elevated concentrations of ammonia and total Kjeldahl nitrogen, and depressed salinity, relative to native water in the Floridan Aquifer, have been reported in monitoring wells in zones overlying the injection zone in Miami-Dade County. This finding has raised concerns of the U.S. EPA and others regarding the extent of migration of injected water. At the time of study, little was known regarding the relative risks of such alternatives. Municipal wastewater effluent disposal alternatives in Southeast Florida and considered in this proposal include (a) injection wells, (b) ocean outfalls, and (c) surficial aquifer recharge via canals and shallow wells. Reuse of treated effluent for irrigation of golf courses, residential lawns, and parks was outside of the scope of this study. Because of the seasonal nature of rainfall and shallow water tables in South Florida, such reuse is not always possible during the rainy season (June through November), and therefore a backup disposal systems of similar capacity is required. That is, wastewater utilities utilizing reclaimed water for irrigation still require one of the effluent disposal alternatives listed above, for use during wet periods. The Research Team assumed advanced wastewater treatment to be required prior to surficial aquifer recharge, and aquifer recharge by shallow well injection would require full treatment (typically reverse osmosis). Therefore, surficial aquifer recharge by shallow well injection was also outside the scope of study.

Objectives of the research were to:

1. Compile and summarize water quality data on treated wastewaster effluents and ground waters, related to or in proximity with large deep well injection systems and other disposal systems in Southeast Florida,
2. Develop a conceptual model of the operating environment for each disposal option, including regulatory constraints, hydrogeological and hydrological considerations, and potential pathways of health and ecological exposure,
3. Develop a probabilistic assessment of risks of injection well disposal, based on (a) published literature, (b) available data, and (c) expert opinion, relative to those of ocean outfall and surficial aquifer recharge methods of treated-effluent disposal,
4. Develop a report addressing the relative risks of the three wastewater treatment disposal alternatives, and
5. Recommend additional data and research needs, if appropriate, to refine conclusions reached in the project report.

2.1. Project Approach

The project comprised two phases, data collection and relative risk assessment. First, data on the quality of wastewater effluents from different levels of treatment, and the quality of ground water at depths to approximately 3000 feet, were collected from participating utilities and regulatory agencies, summarized, and analyzed. In addition, local and regional geologic data were collected. Data for effluents and ground waters were compared to primary and secondary drinking water standards. Second, an assessment of risks of disposing of treated municipal effluent by injection to deep wells, relative to those of disposal by ocean outfall and to those of surficial aquifer recharge, was performed. Three meetings of the Research Team were convened over the course of the project. At the first meeting, a conceptual model of the technological and environmental setting for wastewater disposal in Southeast Florida was constructed, including available wastewater treatment technologies, water quality regulations, hydrologic characteristics, and conventional and emerging wastewater constituents of concern. At the second meeting, the analysis of collected water quality data was presented, along with tree diagrams describing potential exposure pathways, and the conceptual model for the risk analysis was developed. A modified Delphi elicitation of expert judgment concerning risks associated with the three disposal alternatives was conducted electronically, based on data collected for the region, applicable published literature information, and the experience of the Research Team. Experience of the Research Team encompassed probabilistic risk analysis, wastewater process engineering, microbiological and chemical transport and modeling in groundwater, surface water, and marine waters, Floridan and Biscayne aquifer geology and hydrogeology, wastewater management and disposal, ocean outfall disposal, aquifer recharge disposal, injection well disposal, and utility permitting and management. A predictive Bayesian model was then constructed based on the conceptual model developed previously, to probabilistically compute total relative risk for the three alternatives. Information from the Delphi survey was used as input to the computer model. Initial results were presented at the third team meeting. The model and input were refined, based on a final iteration of the modified Delphi survey and review of results by the Team, to develop final relative risk estimates. Risks were then characterized in a discussion of the tradeoffs involved.

3. COLLECTED EFFLUENT AND WATER QUALITY DATA AND ANALYSIS

A summary of data on water quality, relative to disposal of wastewater treatment plant effluent by deep well injection in Southeast Florida, is presented in this section. Water quality data for the Biscayne aquifer, upper and lower Floridan aquifer, secondary effluent, advanced wastewater treatment (AWT) effluent, and reclaimed water were collected and analyzed. Data were obtained from utilities, hydrogeologists, consulting engineers and the files of the Florida Department of Environmental Protection in West Palm Beach. Based on these data, initial comparisons and conclusions regarding potential health concerns associated with disposal of treated wastewater effluent to injection wells were drawn.

3.1. Data Collection and Analysis Methods

Data were collected from utilities, hydrogeologists, consulting engineers, and the files of the Florida Department of Environmental Protection in West Palm Beach for wastewater treatment plant effluent, water quality for the Biscayne, Upper and Lower Floridan aquifer formations, and advanced treated wastewater. The utilities from which one or more of these analyses were derived included:

- City of Hollywood
- City of Boca Raton
- City of Fort Lauderdale
- City of Sunrise
- City of Plantation
- City of Boynton Beach
- City of West Palm Beach
- Palm Beach County
- Broward County, North Regional Wastewater Treatment Plant
- Miami-Dade County, North and South District Wastewater Treatment Plants
- Seacoast Utilities
- South Central Regional Wastewater Plant
- Collier County Water-Sewer District
- Florida Governmental Utility Authority (FGUA), Sarasota plant
- FGUA, Golden Gate plant

The last three utilities are located in southwest Florida, and were included to supplement information not completely available for Southeast Florida. Much of the data for injection wells was taken from injection well completion reports sent to FDEP. These reports include the initial water quality for the Upper and Lower Floridan Aquifer (the injection zone) system, and Biscayne aquifer wells, along with representative water quality for the secondary wastewater and data collected during facility operation. All samples were grab samples except for samples of wastewater effluent, which are generally composites. Water sample sources, sampling methods, and dates are listed in detail in Appendix F.

3.2. Data Description

Water quality data were collected for three types of treated wastewater effluent, four monitoring zones in the Floridan aquifer, and from the Biscayne aquifer, as described in the following sections. Data shown in Table 2 and Appendices A through F include only data collected prior to effluent injection, and therefore represent native water. Data for the post-injection period was used to develop Figures 1 through 8, for the five largest injection well systems in Southeast Florida.

Secondary Effluent

All treated effluent currently disposed by deep well injection and ocean outfalls in Southeast Florida is secondary effluent. Secondary effluent data were obtained from FGUA-Golden Gate plant, Seacoast, City of Hollywood, City of Fort Lauderdale, Broward County North Regional Wastewater Treatment Plant, South Central Regional Wastewater Treatment Plant, City of Sunrise, and the Miami-Dade Water and Sewer Department South and North District Plants.

Reclaimed Water

Data for reclaimed water were collected from the City of Boca Raton and the City of Hollywood, for comparative analysis. Several semi-annual results were obtained from each utility. Reclaimed water samples are grab or composite samples, as detailed in Appendix F.

AWT

To receive regulatory approval to discharge treated effluent to surficial aquifers, wastewater treatment facilities would be required to upgrade the currently employed secondary treatment facilities to “advanced wastewater treatment” (AWT). Here AWT refers to standard treatment with the addition of tertiary treatment for nutrient removal, and filtration. Currently, all wastewater treatment plants in the tri-county area employ secondary, or advanced secondary (reuse), treatment only. Therefore, AWT water quality analyses were obtained from two FGUA-Sarasota AWT plants. AWT water samples were 24-hour composites, with the exception that certain parameters including pH, TRC, and coliforms, can be measured only in grab samples.

Effluent Injection Zone

During injection well construction, all injection zones were sampled for native water quality. One water quality report each was obtained from City of Boynton Beach, Seacoast Utilities, the City of West Palm Beach, Broward County North Regional Wastewater Treatment Plant, and the City of Ft. Lauderdale, and 20 reports were obtained from Miami-Dade South and North District Plants. In general, the water analyses appeared to reflect native water quality. However, the reports from West Palm Beach and Ft. Lauderdale, and four from Miami-Dade County, showed TDS values of 10,000 mg/L or less, and the Broward County sample showed an ammonia concentration of 15.4 mg/L. These values are reflected in the averages shown in Table 1, and may indicate contamination of these six water samples taken during well construction. Because the samples were taken during well construction, the potential existed for introduction of foreign water to the wells during the construction process.

Lower Monitoring Zone

Each effluent injection well system in Southeast Florida has two associated monitoring wells at different depths in the Floridan Aquifer. The depths of these aquifers vary spatially, with variations in the geology at a specific site. Water quality data for the upper and lower monitoring zone of the Floridan aquifer at each of the five largest injection well systems were collected. Data were obtained from Miami-Dade North and South District plants, Miami-Dade West Wellfield, City of West Palm Beach, Broward County North Regional Wastewater Treatment plant, and Boynton Beach. Post-injection data are presented in Figures 1 through 8.

Upper Monitoring Zone

Data on water quality in the Upper Monitoring Zone prior to effluent injection into the Boulder Zone of the Floridan Aquifer were collected from Miami-Dade Water and Sewer Department South District Plant, Miami-Dade Water and Sewer Department North District Plant, Miami-Dade Water and Sewer Department West Wellfield, City of West Palm Beach, and City of Boynton Beach. These are presented in Table 2 and Appendices A through F. Post-injection data from the five largest injection programs, Miami-Dade North and South Districts, Fort Lauderdale, Broward County, and West Palm Beach, were then collected and graphed as presented in Figures 1 through 8.

ASR Injection Zone

An aquifer storage and recovery (ASR) well system is an injection well in the upper Floridan aquifer that serves to accept fresh water during periods of excess, and deliver fresh water in periods of deficit. Mixing of the fresh water with native saline water in the Floridan Aquifer is expected to be inhibited by the density gradient between the two waters. There is one operating aquifer storage and recover (ASR) well system in Southeast Florida, located in Boynton Beach. In addition, ASR wells are under construction at the Miami-Dade County West Wellfield, and Fort Lauderdale, at the Five Ash Water Treatment Plant. Data on native water quality in the ASR injection zone prior to well operation were obtained for all three locations. In addition, data on ASR injection zone quality subsequent to ASR operation were obtained for the operating system in Boynton Beach.

Biscayne Monitoring Zone

Biscayne aquifer monitoring zone water quality data were collected from the City of Fort Lauderdale, the City of Hollywood, Miami-Dade Water and Sewer Department South

District Plant, and City of West Palm Beach (technically, not the Biscayne Aquifer in the West Palm Beach area). These water samples represent Biscayne Aquifer groundwater, the main source of water supply in the tri-county area. A distinction has been drawn between this water and surface water of the canals of the area. While interconnections between Biscayne aquifer water and canal water exist, the two water sources are covered under different regulations.

3.3. Results of Data Analysis

A summary of data averages for treated secondary effluent, reclaimed water, ambient waters from the effluent injection zone, Floridan Aquifer lower and upper monitoring zones, the Biscayne Aquifer monitoring zone, aquifer storage and recovery (ASR) injection zone (Upper Floridan), and AWT effluent, is shown in Table 2. Data are from locations in Southeast Florida, except that AWT samples were obtained from Southwest Florida, because no AWT facilities exist in the project area. All data shown in Table 2 represent measurements taken prior to the injection of treated wastewater effluent. Therefore, the aquifer and injection zone data presented should represent native waters. Averages of all available data are shown. The data were not weighted according to time or wastewater utility. Concentrations shown in Table 2 for the effluent injection zone appear to reflect the influence of non-native water. In particular, six of the 25 reports obtained indicated TDS values of 10,000 mg/L or less, and one reported an ammonia concentration of 15.4 mg/L. These samples are reflected in the averages shown, and may indicate contamination of these six water samples during well construction. More detailed data summaries appear in Appendices A through C. Data and analysis of volatile organic compounds (VOCs) and synthetic organic compounds (SOCs) are shown in Appendix D. Plots of the data are presented in Appendix E. Because detection limits for VOCs and SOCs varied widely among laboratories, concentrations were assumed equal to one half of the detection limit. Sources, sampling methods, and dates of all water samples are listed in Appendix F.

Table 2. Averages of Data Collected for Treated Wastewaters and Ground Waters

Parameter Name	Drinking Water MCL	AWT	Reclaimed Water Analysis	Secondary Effluent	Effluent Injection Zone	Lower Monitoring Zone	Upper Monitoring Zone	ASR Injection Zone	Biscayne Monitoring Zone
Inorganic Analysis									
Arsenic (mg/L)	0.050	0.001	0.003	0.003	0.010	0.007	0.005	0.002	0.015
Barium (mg/L)	2.000		0.094	0.023	0.184	0.363	0.089	0.404	0.244
Cadmium (mg/L)	0.005	0.000	0.001	0.001	0.004	0.012	0.065	0.003	0.001
Chromium (mg/L)	0.100	0.001	0.003	0.005	0.014	0.023	0.006	0.010	0.004
Cyanide (mg/L)	0.200		0.002	0.015	0.006	0.009	0.004	0.002	0.004
Fluoride (mg/L)	4.000	0.940	0.420	0.790	0.700	0.860	1.470	1.580	0.190
Lead (mg/L)	0.015	0.000	0.001	0.004	0.069	0.108	0.022	0.002	0.009
Mercury (mg/L)	0.002	0.000	0.000	0.000	0.000	0.001	0.001	0.000	0.000
Nickel (mg/L)	0.100	0.002	0.005	0.011	0.023	0.036	0.025	0.004	0.003
Nitrate (mg/L)	10.00		3.690	3.820	0.420	0.070	0.040	0.030	0.190
Nitrite (mg/L)	1.000		0.013	0.575	0.009	0.025	0.012	0.006	0.005
Selenium (mg/L)	0.050	0.001	0.004	0.004	0.637	0.007	0.004	0.005	0.001
Sodium (mg/L)	160.0	64.00	75.00	114.0	8062	5514	1357	1215	80.0
Antimony (mg/L)	0.006		0.142	0.013	0.003	0.019	0.010	0.004	0.001
Beryllium (mg/L)	0.004		0.004	0.001	0.008	0.010	0.005	0.001	0.000
Thallium (mg/L)	0.002		0.001	0.002	0.305	0.013	0.007	0.001	0.001
Secondary Analysis									
Aluminum (mg/L)	0.200		0.050	0.074	0.20	0.917	0.744	0.163	0.823
Chloride (mg/L)	250.0	82.20	116.9	151.85	15302.5	9897.0	2203.3	2448.4	176.2
Copper (mg/L)	1.000	0.003	0.021	0.004	0.21	0.032	0.132	0.010	0.005
Iron (mg/L)	0.300	0.000	0.177	0.183	3.151	4.450	19.294	1.079	0.420
Manganese (mg/L)	0.050		0.024	0.018	0.038	0.046	0.027	0.043	0.013
Silver (mg/L)	0.100		0.001	0.002	0.037	0.008	0.005	0.004	0.003
Sulfate (mg/L)	250.0	179.5	76.20	56.623	2379.2	1117.9	401.0	521.8	38.80
Zinc (mg/L)	5.000	0.000	0.023	0.014	0.008	0.015	0.059	0.082	0.025
Color (PtCo units)	15.00		33.00	43.91	7.400	6.300	12.60	12.00	21.90
Odor (TON)	3.000		2.500	10.95	1.200	3.300	2.100	13.50	0.700
pH	6.5-8.5		7.000	6.863	7.700	7.900	7.700	7.500	8.100
TDS (mg/L)	500.0		528.0	550.71	28682	18328	4128	5240	533.0
Foaming Agents (mg/L)	1.500		0.143	2.518	0.080	0.253	0.118	0.074	0.193
Trihalomethane Analysis									
Total THMs (ug/L)	80.00		26.850	61.584	0.167	0.650	0.500	2.607	0.026
Radiological Analysis									
Gross Alpha (pCi/L)	15		3.167	0.400	9.675	7.300	4.100	24.660	5.550
Miscellaneous Analysis									
Ammonia-N (mg/L)	-			8.753	3.766	0.561	0.644	0.575	
Nitrogen, total (mg/L)	-		13.30	17.000	9.350	0.881	1.330		
Nitrogen, organic (mg/L)	-			1.584	0.998	0.374	0.432	0.307	
Nitrogen, total Kjeldahl (mg/L)	-		4.075	9.783	5.528	0.474	0.678	0.830	
Ortho-phosphate (mg/L)	-			1.431	0.234	0.045	0.023	0.133	
Phosphorus, total (mg/L)	-		1.375	1.327	0.271	0.261	0.129	0.255	
BOD (mg/L)	-			8.300	4.300	5.400	7.000	1.400	
Total Coliform (col/100ml)	-			394.071	33.50	7.000	0.500	6.000	
Water Temperature (°C)	-			25.333	22.80	23.50	24.30		24.40
Numbers are the average of the means of the measurements calculated with non-detects as zero and non-detects at their detection limit values									

Available data indicate that treated effluents disposed by injection well in Southeast Florida are, on average, lower in dissolved minerals and higher in organic material than the water into which they are introduced. In particular, averages calculated for total dissolved solids (TDS), sodium, chloride, sulfate, and gross alpha count were well below ambient values, and metals were generally lower. Constituents found in higher concentrations in the treated effluents included cyanide, nitrogen and phosphorous compounds, color, odor, foaming agents, total trihalomethanes (THMs), biochemical oxygen demand (BOD), and total coliform count. In addition, treated effluents were higher in temperature and lower in pH, on the average, than ambient groundwaters. All averages calculated for the treated effluents met both primary and secondary standards for drinking water, with the exceptions of primary standards for antimony and total coliform, and secondary standards for color, odor, TDS, and foaming agents. All data averages for VOCs and SOCs, assuming undetected values equal to one half of the detection limit, were less than associated MCL drinking water standards.

In general, the collected data did not indicate significant health concerns associated with the injection of treated effluent. Of the measured constituents with specific toxicity or infectivity, only antimony and total coliforms were higher in the effluent with respect to both ambient water and regulatory drinking water standards. Coliforms occur particularly in injected effluent that is not chlorinated.

Based on experience in California, several emerging constituents that are not currently tested for in Southeast Florida effluents, such as pharmaceutically-active substances (PASs) and nitrosamines, may be present in treated wastewater effluent. In the environment, PASs such as endocrine disruptors could pose human and ecological risks (in particular, to males), and nitrosamines could pose carcinogenic human health risks, if present and if exposure pathways exist. The potential for the existence of such constituents and health concerns in Southeast Florida will be evaluated in subsequent tasks.

Health concerns, if any, would be expected to be associated with migration of effluent out of the injection zone. Releases upward into the Floridan aquifer in Miami-Dade County are clearly indicated by the data, although the cause is not known. Figures 1 through 8 show concentrations of ammonia and TDS at different levels in the aquifer surrounding the five largest injection well systems in Southeast Florida. The figures indicate approximately 20% effluent at approximately 1500 feet of depth in the Floridan aquifer near injection wells at the Miami-Dade County North and South District plants. In subsequent tasks, relative risks of injection well, ocean outfall, and surficial aquifer recharge alternatives for treated wastewater effluent disposal in Southeast Florida will be assessed.

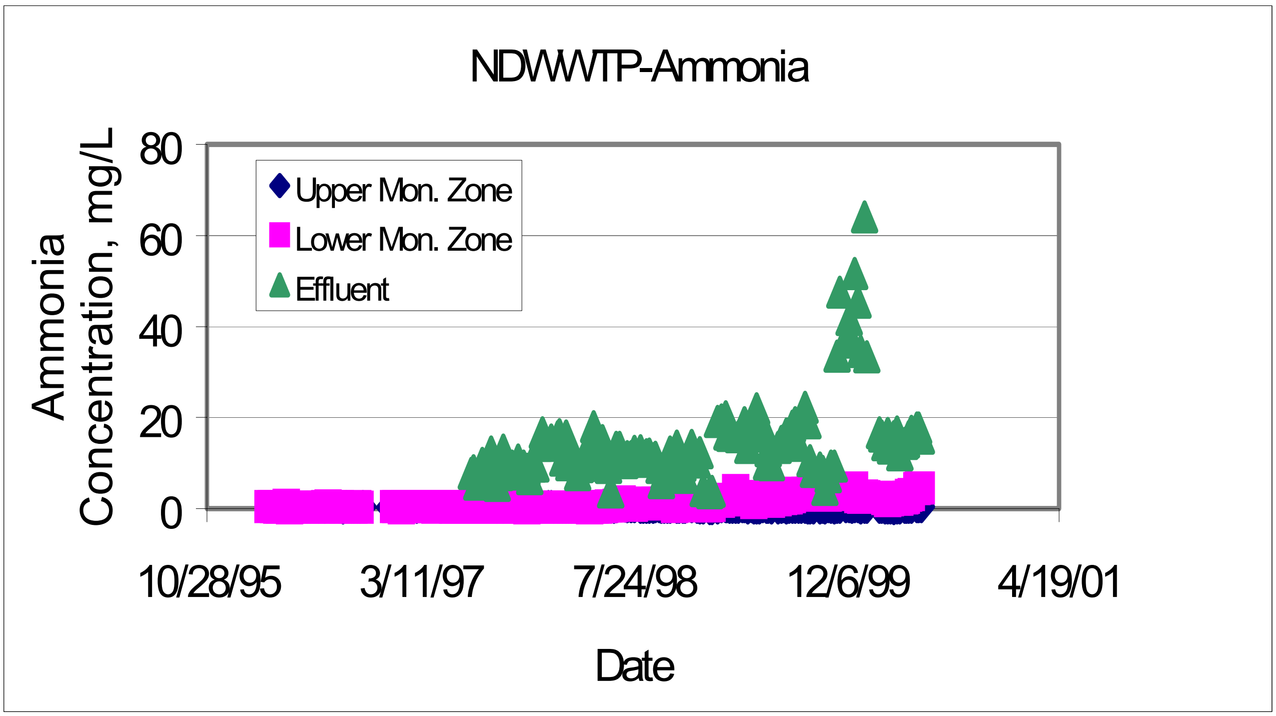


Figure 1. Ammonia concentration versus time at the Miami-Dade Water and Sewer Department North District wastewater treatment plant.

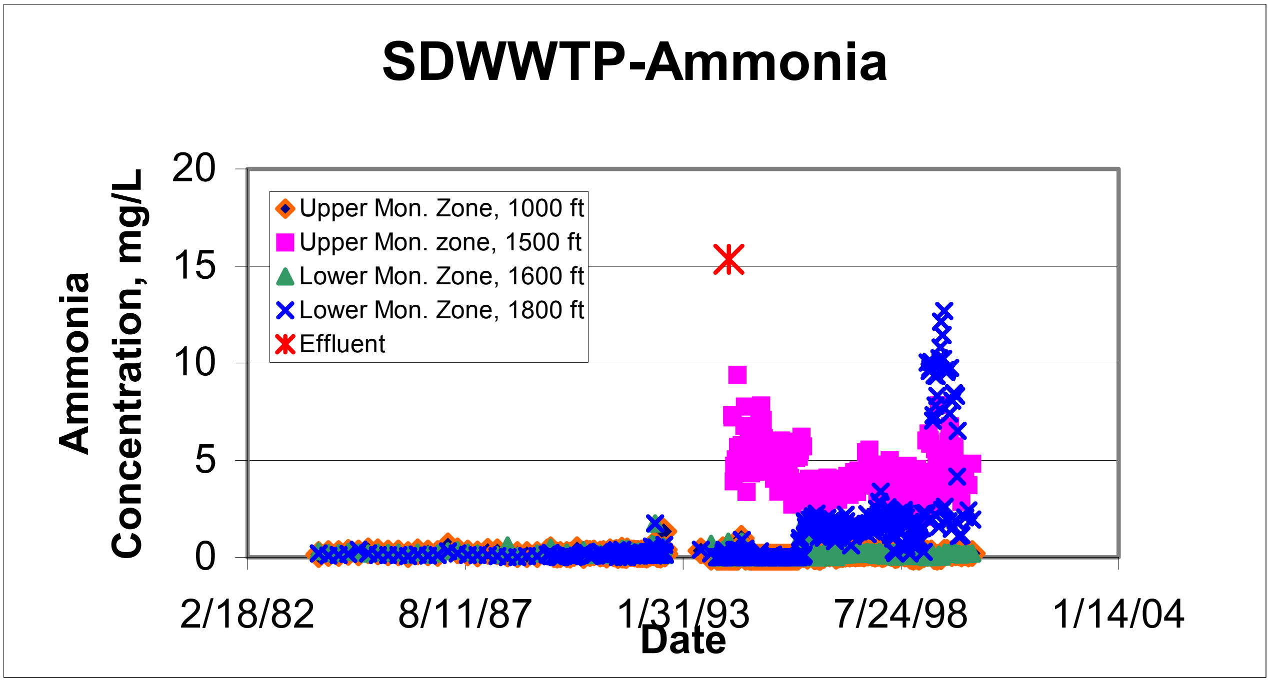


Figure 2. Ammonia concentration versus time at the Miami-Dade Water and Sewer Department South District wastewater treatment plant.

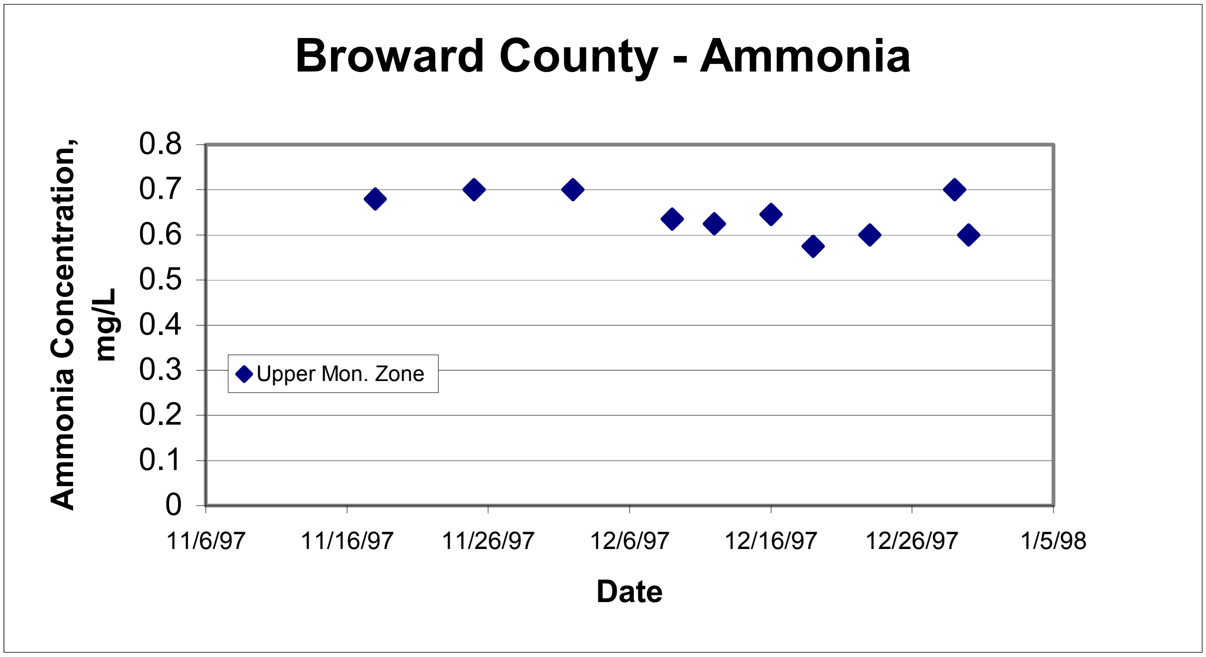


Figure 3. Ammonia concentration versus time at the Broward County wastewater treatment plant.

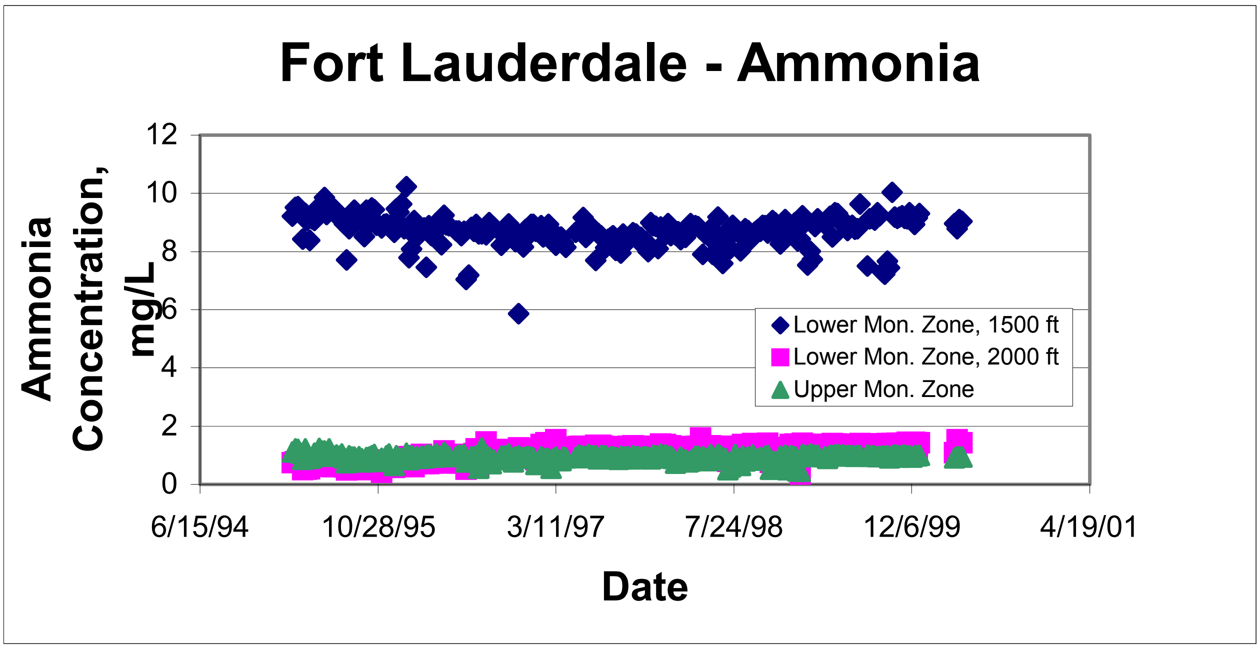


Figure 4. Ammonia concentration versus time at the Fort Lauderdale wastewater treatment plant.

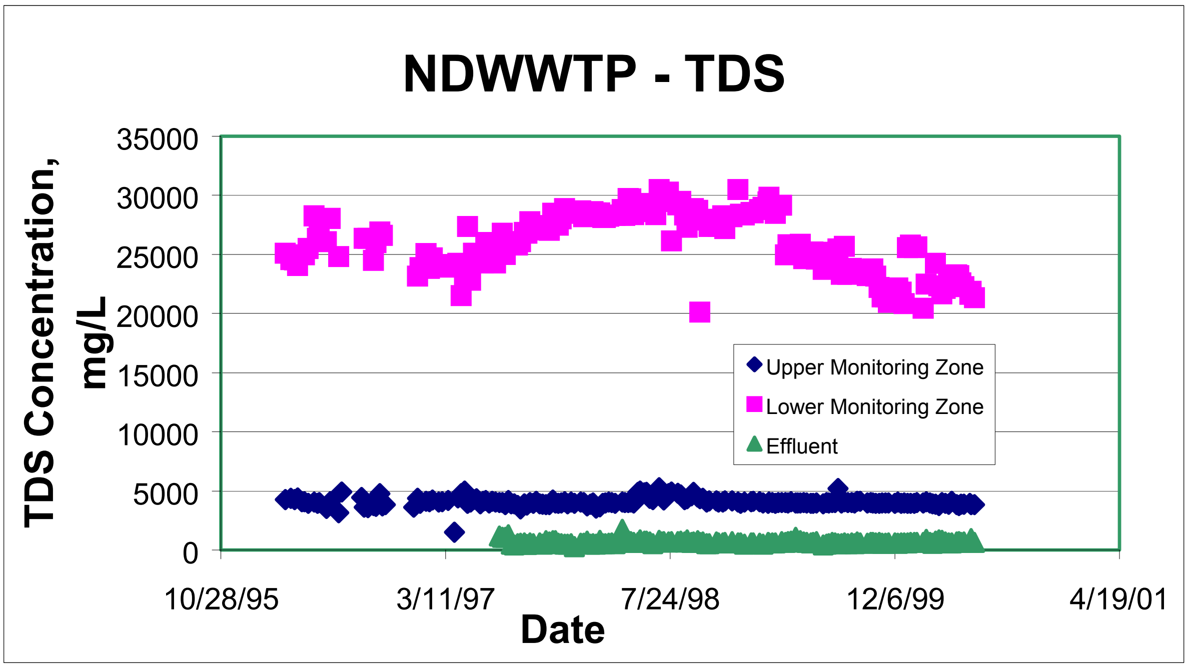


Figure 5. TDS concentration versus time at Miami-Dade Water and Sewer Department North District wastewater treatment plant.

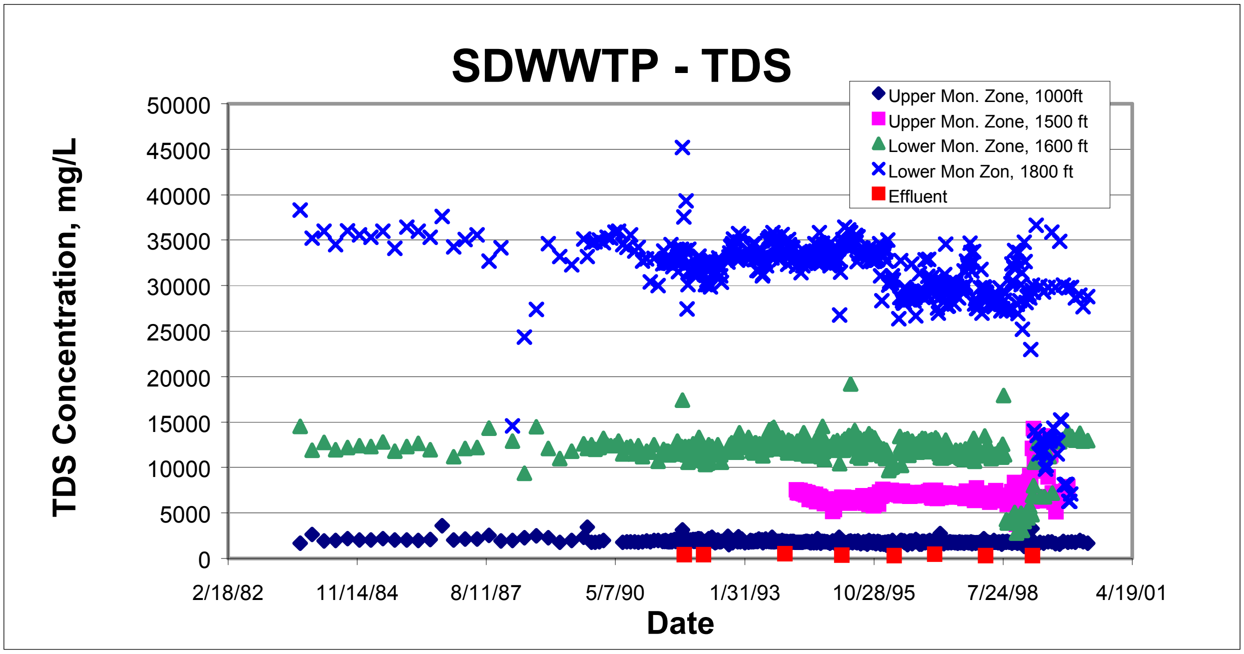


Figure 6. TDS concentration versus time at Miami-Dade Water and Sewer Department South District wastewater treatment plant.

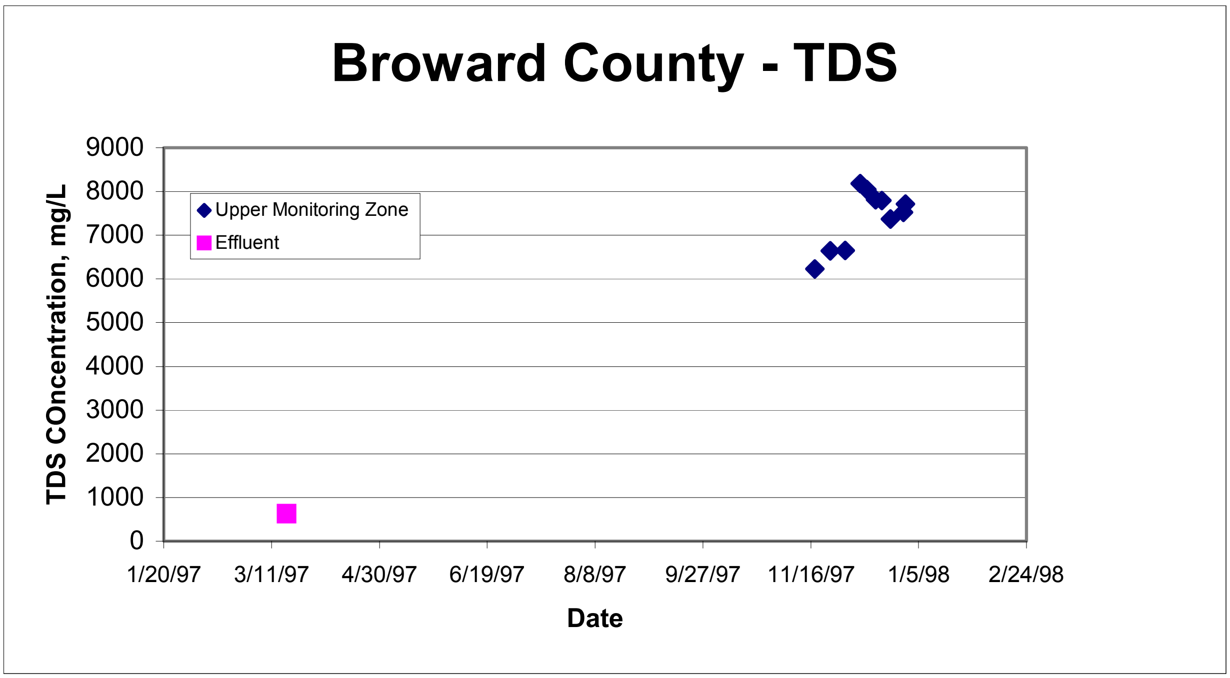


Figure 7. TDS concentration versus time at the Broward County wastewater treatment plant.

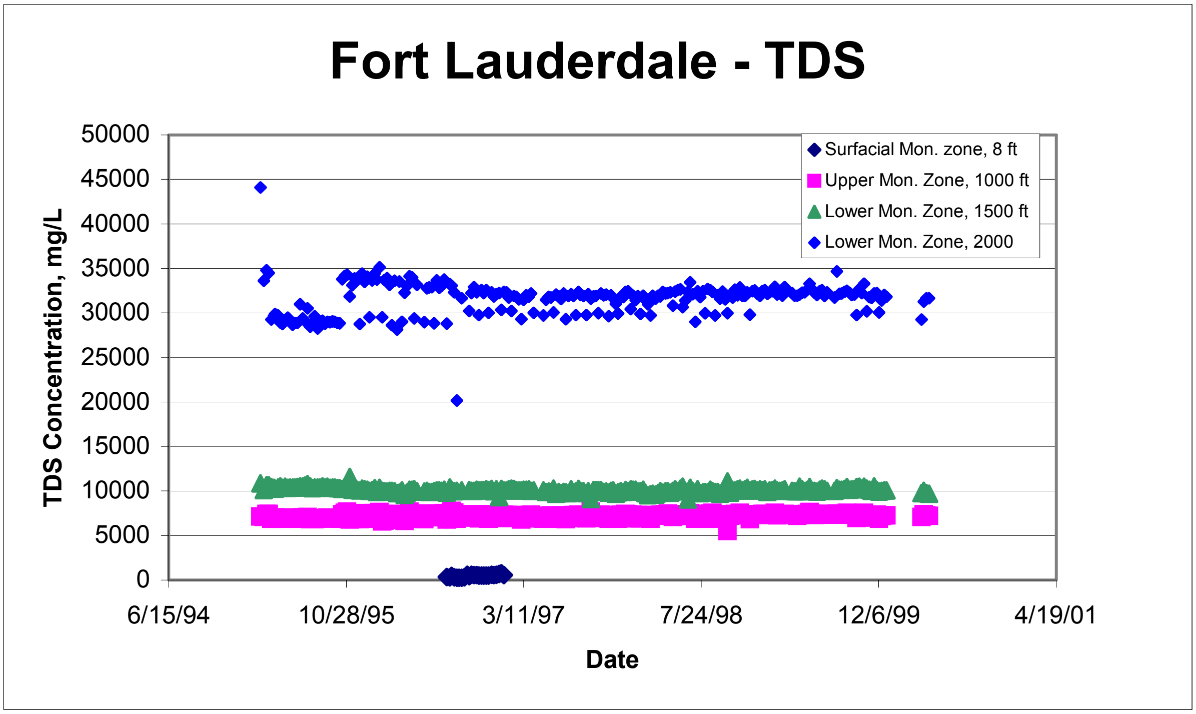


Figure 8. TDS concentration versus time at the Fort Lauderdale wastewater treatment plant.

4. SYSTEM DESCRIPTION

This section summarizes the treatment and disposal alternatives, and applicable regulatory standards, in Southeast Florida. As part of the description of injection well disposal systems, the geological setting of the region as it pertains to injection well effluent disposal is summarized.

4.1. Wastewater Treatment Unit Processes and Regulations in Southeast Florida

The findings, intent and anti-degradation policy for surface water quality are found in Chapter 62-302.300 Florida Administrative Code (F.A.C.), and are in conformance with Article II, Section 7 of the Florida Constitution which requires abatement of water pollution, and conservation and protection of the natural resources and scenic beauty of Florida. In addition, Section 101(a)(2) of the Federal Water Pollution Control Act, as amended, declares the intention to achieve water quality sufficient for the protection and propagation of fish, shellfish, and wildlife, as well as for recreation in and on the water by July 1, 1983. Congress further stated in Section 101(a)(3), that it is the national policy that the discharge of pollutants in toxic amounts be prohibited.

In Florida, all domestic wastewater treatment plants must be operated and maintained in accordance with the applicable provisions of 62-600.410 Florida Administrative Code (F.A.C.) so as to attain, at a minimum, the effluent quality required by the applicable discharge option. The following effluent requirements apply:

- All reuse and land application systems must be operated and maintained in accordance with the applicable provisions of Chapter 62-610, F.A.C.

- All underground injection effluent disposal systems must be operated and maintained in accordance with the applicable provisions of Chapter 62-528, F.A.C.

- All surface water discharge systems must be operated and maintained in accordance with the applicable provisions of Chapter 62-4, F.A.C.

To achieve the statutory provisions for wastewater quality, different degrees of treatment are required. The following paragraphs outline the treatment required to meet the effluent quality requirements of the State. Process schematics are shown in Appendix G.

Primary Treatment

Primary treatment is defined as the use of treatment trains to accomplish the removal of a portion of the suspended solids and organic matter prior to discharge into the receiving water (Figure G-1). Typically the treatment consists of settling basins (or primary clarifiers) and macro-scale screening (i.e., bar racks or screens). These processes remove only the largest constituents (and those most likely to clog pumps and pipes). Thus the effluent will have a high concentration of biological oxygen demand (BOD) and organics (typically over 40 percent of the incoming amount). Primary clarifiers are designed to remove 50 to 70 percent of the suspended solids and 25-40 percent of the BOD. They typically precede biological processes and can be used for flow equalization in secondary treatment facilities. These clarifiers have a detention time from 10 to 30 minutes, hence the low removal rates compared to secondary treatment. No biological processes are used. Most primary facilities are being phased out and replaced with secondary systems nation-wide. Boston has one of the largest primary systems and the expenses being incurred there to improve effluent quality. In Florida, there are no current, large primary facilities.

Secondary Treatment

Secondary treatment is directed principally toward the removal of biodegradable organics and suspended solids. Biological processes are activated sludge, fixed film reactors, extended aeration systems, or lagoons, and employ secondary clarifiers after the biological process. During the biological process, air is introduced into the wastewater in order to increase the food:air ratio to a point where the optimum number of bacteria will consume the incoming organics and use up the air. As the organisms pass the optimum lifetime, they die. During the secondary clarification process, the dead/dying bacteria, along with non-consumed organics and metals, will settle to the bottom. They are removed as sludge and disposed of via the sludge rules. Disinfection via chlorination or ultra-violet is preferred.

Typically a secondary treatment facility will have a bar screen, and may have a primary clarifiers ahead of the biological treatment process (Figure G-2). Secondary plants are designed to achieve an effluent prior to discharge containing not more than 30 mg/L $CBOD_5$ and 30 mg/L TSS, or 85% removal of these pollutants from the wastewater influent, whichever is more stringent. The requirement is 20 mg/L $CBOD_5$ for injection wells. Appropriate disinfection and pH control of the effluents is normally required. Coastal waters have more stringent effluent limits.

Reclaimed Water (Advanced Secondary)

Advanced secondary treatment in Florida is also termed reuse quality water (Figure G-3). It requires the employment of all secondary processes, plus filtration and high level disinfection, (residual over 1.0 after a given period of time). Typically the filtration step uses gravity sand/anthracite filters. Land application or ground water discharge systems (excluding underground injection) are designed to achieve an effluent quality (after disinfection) containing not more than 5 mg/L total suspended solids (TSS). Advanced secondary treatment is often confused with tertiary treatment. However, the latter assumes nutrient removal, which does not occur with filtration. The nutrients are generally preferred by the reuse recipient.

Principal Treatment (More Advanced Secondary)

Principal treatment is a term in Florida Rule 62-610 F.A.C. For reclaimed water projects to be applied to ground water recharge and indirect potable reuse projects, primary treatment standards have been developed in Florida, to include:

- Water quality that meets secondary treatment quality with high-level disinfection. The reclaimed water cannot contain more than 5.0 mg/L of total suspended solids before application of the disinfectant;
- Filtration for total suspended solids control. By removing TSS before disinfection, filtration serves to increase the ability of the disinfection process to inactivate virus and other pathogens. Filtration also serves as the primary barrier for removal of protozoan pathogens (*Cryptosporidium*, *Giardia*, and others). Addition of chemical coagulants generally increases the effectiveness of pathogen removal. Chemical feed facilities include coagulants, coagulant aids, or poly-electrolytes. Chemical feed facilities may be idle (on stand-by) if the water quality limitations are being achieved without chemical addition; and
- Total nitrogen is limited to 10 mg/L of nitrogen as a maximum annual average limitation. Monthly average and single sample permit limitations are established using the multipliers in Rule 62-600.740 (1) (b) 2, F.A.C. For surface water discharges, Water Quality Based Effluent Limits (WQBELs) established under Chapter 62-650, F.A.C., may place additional limitations on nitrogen or other parameters.

The principal treatment requirement applies where nitrogen is thought to be a problem. If nitrogen creates a discharge problem, chemical processes such as those described under advanced wastewater treatment are employed.

Advanced Wastewater Treatment (AWT)

The term advanced wastewater treatment (AWT) is generally used in Southeast Florida to include treatment necessary to raise wastewater quality beyond that produced by secondary treatment, including reduction of nutrients, toxicity, suspended solids, and organics. Typically, AWT includes secondary treatment, plus nutrient removal (nitrification, de-nitrification and phosphorous removal) and may not contain more, on an annual average basis, than the following concentrations (see Figure G-5):

- Carbonaceous Biochemical Oxygen Demand $CBOD_5$ 5 mg/l
- Total Suspended Solids 5 mg/l
- Total Nitrogen (as N) 3 mg/l
- Total Phosphorus (as P) 1 mg/l
- Reclaimed water discharged to a treatment or a receiving wetland may not exceed 2.0 milligrams per liter total ammonia (as N) as a monthly average.

TSS removal can be accomplished via the filtration step in advanced secondary treatment. Thus every process included in advanced secondary treatment is included in AWT. In addition, nitrification/denitrification is commonly accomplished in Florida with methanol and bio-reactors or rotating biological disks. Phosphorus is commonly removed by the addition of alum coagulants (which increases sludge volume significantly). This level of treatment and disinfection, or specific components of these levels of treatment and disinfection, shall be applied to ground water recharge and indirect potable reuse projects.

Full Treatment And Disinfection Requirements

Florida Rule 62-610.563, F.A.C., defines "full treatment and disinfection." This concept is employed in groundwater recharge programs in California. Full treatment systems include all the treatment steps contemplated under AWT, plus reverse osmosis and/or activated carbon for removal of the remaining organics to reduce TOC and TOX, and some pathogen removal (see Figure G-6). Dechlorination is often required. The requirements in Florida are as follows:

- The parameters listed as primary drinking water standards are applied as maximum single sample permit limits, except for asbestos. The primary drinking water standards for bacteriological parameters are applied via the disinfection standard. The primary drinking water standard for sodium is applied as a maximum annual average permit limitation. Multipliers are established in Rule 62-600.740(1)(b) 2, F.A.C. as maximum monthly and single sample maximum permit limits for sodium.
- Except for pH, the parameters listed as secondary drinking water standards shall be applied as maximum annual average permit limits, with the multipliers
- All pH observations must fall within the pH range established in the secondary drinking water standards.
- Additional reductions are required of pollutants which otherwise would be discharged in quantities which would reasonably be anticipated to pose risk to public health because of acute or chronic toxicity.
- Total organic carbon (TOC) cannot exceed 3.0 mg/L as the monthly average limitation; no single sample shall exceed 5.0 mg/L.
- Total organic halogen (TOX) cannot exceed 0.2 mg/L as the monthly average limitation; no single sample can exceed 0.3 mg/L.
- The treatment processes must include processes that serve as multiple barriers for control of organic compounds and pathogens.
- Treatment and disinfection requirements are additive to other effluent or reclaimed water limitations imposed by other rules (such as WQBEL limits designed to protect surface water quality, which are imposed by Chapter 62-650, F.A.C.).

Membrane Treatment Options And Resulting Concentrate

Membrane treatment is a viable technology for salinity reduction and desalination in regions with significant amounts of saltwater and variable amounts of freshwater, water supplies of critical environmental concern, and drought-prone areas with saltwater sources. Membranes may be required for full treatment of wastewater. In practice, the disposal of concentrate is an issue. Figure G-7 shows a typical process flow diagram for membrane processes. These processes include pretreatment, membrane treatment and post-treatment. The process recovery rate for reverse osmosis systems is estimated to produce a 60 to 90 percent recovery, depending on the quality of the feedwater.

Pretreatment to precede membrane treatment includes both physical and chemical processes. A scale inhibitor and sulfuric acid are injected into the water to stabilize the water before it flows into the cartridge filters. The design pH for a reverse osmosis system is between 5.5 and 6.5. Cartridge filtration is essential for removal of suspended particulates larger than five microns from the raw water.

Once the feedwater is chemically conditioned and suspended solids are removed, it is delivered to the feed pumps. Typically a dedicated feed pump supplying each skid increases the feedwater pressure prior to applying the feedwater to the membrane process. The configuration of the membrane skids generally accommodates two stages of reverse osmosis membranes with pressures between 100 and 400 psi depending on water quality. A membrane system shut-down flush is required every time a membrane skid is taken out of operation. The raw water in the membrane elements is replaced with permeate water from the permeate flushing tank. The permeate is pumped through the membrane elements using the feed pump at low pressure.

After passage through the membrane skids, the residual pressure allows the water to move to the post-treatment processes, which may include degasification and chemical addition. These are required for stabilization of the water to reduce corrosivity. Post-treatment chemicals typically are sodium hydroxide, zinc orthophosphate, sodium silicofluoride, ammonia, and chlorine.

The membrane cleaning/flushing system consists of cleaning and flushing solution tanks, 5-micron cartridge filters, and cleaning pumps. The cleaning pumps are constructed to handle high and low pH cleaning chemicals.

Most facilities include a central supervised computer system that allows operations staff to operate and monitor the membrane treatment process from one location. The computer system will also allow the operators to monitor the entire water distribution system, including the wellfields and tanks, and to monitor the wastewater system during storm events.

Membrane treatment facilities produce a waste stream commonly referred to as “reject water” or “concentrate.” The United States Environmental Protection Agency (USEPA) has classified this waste stream as an industrial waste, thereby requiring an industrial wastewater discharge permit from the Florida Department of Environmental Protection (FDEP). To permit this discharge, the utility must conduct a series of tests to demonstrate that the concentrate is not toxic to the receiving environment. Ion imbalances are typically a surface water discharge problem.

4.2. Wastewater Disposal Alternatives and Regulations in Southeast Florida

The three principal alternatives for disposing of treated wastewater effluent in Southeast Florida are described in this section.

Surface Water and Surficial Discharges

Surface water discharge is one of the oldest methods of wastewater disposal. Mechanisms of public health protection include dilution and natural degradation processes, given sufficient treatment prior to discharge. In the U.S., the discharge point is usually a pipe on the side of the stream (for small systems) or a pipe into the bottom of the water body with one or more holes (or diffusers). Each diffuser in the pipe has a percentage of the total flow going through it. The pipe is generally comes from the effluent wet well or chlorination chamber to the discharge point. Dechlorination (if required) is often performed in the pipe. Smaller systems often use gravity flow, while larger system have larger pipes and generally require pumping from a wet well to get peak flows out of the plant. Figure G-8 shows the typical layout for a surface discharge (excluding ocean outfalls).

The most important potential environmental impact of discharge of wastewater effluent to a surface water body is a decrease in dissolved oxygen levels in the surface water downstream of the discharge, due to consumption of oxygen in the oxidation of organics in the wastewater. For this reason, secondary treatment is generally required in the U.S. prior to discharge of wastewater effluent to surface water. Secondary treatment is designed to remove oxygen demand, such that oxygen levels return to levels necessary to support life through turbulence, wind, rain, and photosynthetic activity. In smaller or more sensitive water bodies, advanced (AWT) treatment is often required. This is especially true in South Florida where the delineation between the surficial groundwater system and the canal system is less clear. Other potential environmental impacts of surface discharge arise from the precipitation of metals and other heavy compounds on the bottom of the receiving water body, downstream of discharge. Heavy metal accumulation among benthic populations, and the recycling of these metals through the food chain, is a subject of current research. Currently, mercury is the metal receiving the most scrutiny in South Florida.

Natural drainage in Southeast Florida is by “sheetflow,” or shallow surface flooding during the wet season with gradual movement either through the Everglades towards the Gulf of Mexico and Florida Bay, or across the coastal ridge into Biscayne Bay. Surface water drainage in Southeast Florida is currently controlled by a series of canals. Because canals represent the only significant surface flows outside of the Everglades, discharges of wastewater effluent would be via the canal system. However, due to the flat topography and long periods with minimal rainfall, DO levels typically decrease in canals during the spring. In some areas where organic loading is high, canal water can turn septic. Ecological concerns spawned a move in the 1960's and 1970's away from surface discharges in South Florida, though they are still used in North Florida. A few west coast surface discharges, where no other discharge option was available, have been converted to AWT.

Canal discharge of wastewater in Southeast Florida could also affect groundwater levels and quality. The Biscayne Aquifer is exposed to the surface with little in the way of horizontal geological confinement, and water levels fluctuate in response to rainfall, drainage and withdrawal for irrigation and potable use. The principal source of recharge is rainfall, occurring mainly between June and October. During winter months, water level continues to decline in the aquifer without some form of supplemental recharge. The canal system operated by the South Florida Water Management District provides drainage,as well as recharge (e.g., in the vicinity of wellfields) from water stored in Lake Okeechobee.

The Biscayne Aquifer System is wedge-shaped, and approximately 10 feet thick at the western boundaries of the urban area. The aquifer dips eastward to its thickest section, approximately 250 to 300 feet thick, at the coast. The increased thickness and generally higher transmissivity to the east account for the greater productivity of wells drilled in this section of the aquifer. Regional trends of the Biscayne Aquifer System show that both water quality and groundwater productivity (the transmissivity of the aquifer system) improve in eastward and southward directions. Transmissivity in the City of Hollywood area is approximately 300,000 square feet per day. Storage coefficients are reported to be 1×10^{-3} to 1×10^{-4}, and specific yields, 0.20 to 0.30, with a vertical to horizontal ratio of 1 to 100. The natural groundwater flow direction in the Biscayne Aquifer System is to the east/southeast.

Groundwater quality in the Biscayne aquifer typically decreases with aquifer depth. In some areas the water is high in hardness, iron, and TDS concentrations. Water in certain areas may also be high in concentrations of chlorides, hydrogen sulfide, and/or may have poor color quality. High chlorides and sulfates are typically attributed to connate (ancient sea) water that exists in isolated areas within the aquifer. High color originates from tannins and other compounds dissolving in the water from decomposing vegetation and organic matter (e.g., in the eastern Everglades). The water is also correspondingly high in other organic matter, which can react with chlorine to form trihalomethanes in treated drinking water.

Potential Pathways of Human Exposure to Wastewater Constituents due to Surface Discharge

Discharge of municipal wastewater effluent to canals in South Florida could be assumed to fill canals, particularly during the winter dry season when canals are stagnant. Therefore, it can be assumed that AWT would be required to reduce nutrient loading. Exposure of humans to wastewater constituents could occur via the canal, or via shallow wells in the Biscayne aquifer. Swimmers, fish consumers, benthic and water column species, consumers of water from wells and canals, and those exposed to irrigation water aerosol drift could be exposed.

Regulatory Environment for Surface Water Discharge

In keeping with the anti-degradation policy of the State of Florida, the most beneficial present and future uses of all waters of the State have been classified as follows:

- Class I — Potable Water Supplies
- Class II — Shellfish Propagation or Harvesting
- Class III — Recreation, Propagation and Maintenance of a Healthy, Well-Balanced Population of Fish and Wildlife
- Class IV — Agricultural Water Supplies
- Class V — Navigation, Utility and Industrial Use

Water quality standards are established by FDEP to protect these designated uses. Classification of a water body according to a particular designated use or uses does not preclude use of the water for other purposes.

US EPA has delegated the surface water program FDEP. The rules state that outfalls for all facilities must not discharge effluent which does not meet the applicable secondary treatment, basic disinfection, and pH levels, prior to discharge to receiving surface waters. New facilities and modifications of existing facilities must be designed to achieve an effluent after disinfection containing not more than 20 mg/L CBOD5 and 20 mg/L TSS, or 90% removal of each of these pollutants from the wastewater influent, whichever is more stringent. No discharge of reclaimed waters or effluents to Class I waters can be made unless the reclaimed water or effluent meets the appropriate additional treatment standards (beyond secondary) and high-level disinfection criteria, to give reasonable assurance of providing equivalent protection from pathogens.

Florida rule 62-302.500 F.A.C. details the surface water discharge Minimum and General Criteria. For the Minimum Criteria, all surface waters of the State must at all places and at all times be free from:

- Domestic, industrial, agricultural, or other man-induced non-thermal components of discharges which, alone or in combination with other substances or in combination with other components of discharges (whether thermal or non-thermal);
- Putrescent deposits or other nuisances;
- Floating debris, scum, oil, or other matter in such amounts as to form nuisances;
- Color, odor, taste, turbidity, or other conditions in such degree as to create a nuisance;
- Acute toxins;
- Concentrations which are carcinogenic, mutagenic, or teratogenic to human beings or to significant, locally occurring, wildlife or aquatic species;
- Dangers to the public health, safety, or welfare;
- Thermal components of discharges which, alone, or in combination with other discharges or components of discharges (whether thermal or non-thermal); and
- Silver in concentrations above 2.3 micrograms/liter in predominately marine waters.

The surface water quality criteria apply to all surface waters outside of zones of mixing, except where inconsistent with the limitations of Section 403.061(7) F.S.

An evaluation of the impact of a proposed or continued discharge on the water quality of the receiving water body must be conducted by FDEP for all proposed surface water discharges. The appropriate district office determines whether technology based effluent limits (TBELs) are adequate to maintain water quality standards in the receiving water body. If TBELs are not sufficient, or if additional information or analysis is determined to be necessary to ensure that the effluent will not violate water quality standards in the receiving water body, a water quality based effluent limit (WQBEL) must be determined.

If FDEP finds that a proposed new discharge or expansion of an existing discharge will not reduce the quality of the receiving waters below the classification established for them, it may permit the discharge. In addition, FDEP cannot issue a discharge permit unless FDEP has established an effluent limit for those pollutants in the discharge that are present in quantities or concentrations which can reasonably be expected to cause or contribute, directly or indirectly, to a violation of any water quality standard established in Rule 62-302, F.A.C.

For outfalls potentially discharging to waters contiguous to Class I waters, the necessity for treatment, in addition to that required, must be dependent upon the extent of travel time between the point of discharge and the effluent arrival at the boundary of Class I waters, or at the 500 foot no discharge zone surrounding potable water intakes (if any). Travel time determinations must be based upon the expected flow of the receiving water during the typically wettest month of the year.

<u>Ocean Outfall Disposal</u>

Ocean outfall discharge of wastewater effluent also has a long history throughout the world. Mechanisms of public health protection include dilution, advection away from shore, and natural environmental degradation processes. Secondary treatment is required prior to discharge in South Florida. Ocean discharge has two primary differences from other surface water discharge, those relating to the higher density (due principally to salinity) and much greater volume of receiving waters. Hence, the dilution is immediate and considerable, and effluent plumes rise.

The buoyancy of the plume, and marine currents and turbulence, result in three distinct phases of dilution:

- Initial plume dilution takes place from the time the effluent leaves the outfall until it reaches the surface of the ocean. The initial dilution phase is a rapid process, taking less than two minutes. The freshwater effluent creates a turbulent, rising plume with buoyant forces exceeding the horizontal velocity forces. The result creates excellent mixing. The mixing is further improved by the horizontal movement of the Florida Current. The plume rises to the surface downstream of the outlet, by at least 10 meters. The initial dilution can be defined as a ratio of the constituent in the effluent and the maximum concentration at the boil;

- Near-field dilution occurs when the effluent reaches the surface. At this point, the vertical momentum of the plume is translated to horizontal momentum, and the plume is radially dispersed the plume within 3 meters of the surface. The interaction of the rising plume and the vertical movement creates the characteristic "boil." Near-field dilution takes place within the water column, the boil and areas adjacent to the boil; and
- Far-field dilution results from the interaction of the mixing plume and surface convective processes. For highly diluted plumes, after the initial mixing processes, the subsequent dilution will be dominated by oceanic turbulence. The effects of buoyant spreading are negligible in the farfield.

There are six open ocean outfalls in Southeast Florida. All are owned by public agencies. Field investigations revealed that surfacing plumes were present at all outfalls throughout a year, even in summer months when the water column density stratification was present. This was because the density stratifications were weak enough to allow the surfacing of plumes. However, some trapping of portions of rising plumes was detected by the acoustic system during a few strong stratification conditions.

Table 3 outlines the characteristics for each of the outfalls. Two of the outfalls, Miami-Central and Miami-North outfalls, have multi-port diffusers. All are in at least 28 meters of water, and 2 miles offshore. As a result, all the outfall sites are located in the westerly boundary of the Florida Current, a tributary of the Gulf Stream. The Florida Current is strong. Maximum current speeds often occur in the Florida Strait between Southeast Florida and the Bahamas, in the vicinity of Southeast Florida outfalls, advecting and dispersing outfall plumes rapidly.

<u>Ocean Outfall Monitoring Projects</u>

Previous efforts to characterize impacts of ocean outfall disposal of treated wastewater effluent in Southeast Florida include the Southeast Florida Ocean Outfall Experiments, initiated by Broward County, Miami-Dade County, and the City of Hollywood, Florida. In the first phase (SEFLOE I), field dye and salinity data were processed to obtain initial dilutions and subsequent dilutions. Initial dilution data together with current meter data and effluent discharge data were analyzed using dimensional analysis and regression to establish semi-empirical relations. Total physical dilutions, as a function of distance from the surface boil, were generated from dye concentration data and from salinity data. It was found that within the 100-meter range, the Broward and Hollywood outfall plumes undergo an enhanced dilution. This rapid dilution may be attributed to an internal hydraulic jump. Subsequent mixing of plumes may be dominated by buoyant spreading for several hundred meters from the boil, because the positive buoyancy of effluent plumes has not been dissipated even after the internal hydraulic jump. For the Miami-North and Miami-Central outfalls, effluent was initially distributed over a wide area because of multi-port diffuser discharges. However, the dilutions of these outfall plumes did not increase as rapidly as did

Hollywood and Broward outfall plumes. Both buoyant spreading and oceanic turbulence were expected to be dominant mixing mechanisms for subsequent mixing of these plumes.

The Southeast Florida Ocean Outfall Experiment II (SEFLOE II, 1991-1994) project was a cooperative effort of state, federal and local government agencies, and Hazen and Sawyer, P.C. The project was designed to satisfy bio-monitoring concerns and provide site specific information to allow the USEPA Regional Administrator to evaluate the southern-most four open ocean outfalls. During the field studies of the project, significant efforts were made to collect physical, chemical, and biological data. These data were analyzed to characterize outfall plumes and associated environmental conditions.

The objectives of the SEFLOE II project were as follows:

- Scientifically characterize the physical oceanographic conditions associated with each of the four open ocean outfalls on a year-around basis in order to identify critical oceanographic conditions;
- Characterize and define the area of rapid dilution and the mixing zones;
- Determine the characteristics of the receiving water/effluent mixture both with and without chlorination using bioassay techniques;
- Examine the dilution properties and natural disinfection capability of the open ocean upon secondary effluents dispersed through open ocean outfalls;
- Determine the nutrient concentrations in the discharged effluent, background and outfall plumes; and
- Collect samples to analyze for priority pollutant and oil and grease concentrations.

To achieve the project objectives, field investigations were designed to include three components:

1. Current Monitoring was accomplished using current meter mooring systems, each of which contained two Aanderaa RCM-4 or RCM-5 current meters. Systems were deployed near each outfall discharge site during several periods within a one year span (from August 1991 to October 1992). These measurements provided long-term records of current speeds and directions. dIn addition to the mooring systems, an Acoustic Doppler Current Profiler (ADCP) was deployed near the Miami-Central outfall diffuser from July 10 to August 15, 1992. The ADCP data indicated that three current regimes are found present at the outfall sites:

    - Northerly-directed flows that are thought to be associated with western meanders of the Florida Current,
    - Southerly flows that are expected parts of an extensive eddy current, and
    - Rotary-like flow that consists of groups of rotations interspersed between northerly and southerly flows. The rotations are irregular with periods of rotation as short as three hours.

    Although the three current regimes are present, the entire regional currents continue to be from the south to the North. Easterly and westerly currents are infrequent and of short duration. Therefore, the potential for the highly diluted effluent plumes reaching the shore is extremely remote. The continued northerly flow greatly reduces the superposition effect often encountered in tidal rivers where effluent concentrations are additive over time.

The ADCP data revealed non-linear profiles of current speeds through the water column. In general, the current magnitude is greater near the water surface (where the plume goes) than near the bottom. Although current speed measured at a curtain depth could be zero, the vertically averaged current speed was not zero any time during the measurement period.

2. Intensive cruises by NOAA research vessels to each outfall during extreme oceanographic conditions (one winter and one summer cruise), included:

    a. Acoustic measurements during the SEFLOE II field investigations, using a high-frequency back scattering acoustic system, 200 kHz Raytheon Model DE719B Echosounder, to aid in initial plume detection, to guide plume sampling, and to provide two-dimensional acoustic images of outfall plumes; and
    b. Salinity measurements made in semi-monthly small boat operations at each outfall from July 1991 to October 1992 (except the months when intensive cruises were underway). During each operation, a boat towed a CDT at 1 m or less beneath the water surface through surface plumes. The CDT data were later processed to obtain salinity distributions in surface plumes, and therefore characterizations of the plumes. Both initial dilution and subsequent dilution of plumes were estimated using salinity deficit as a tracer.

3. Water quality sampling included:

    a. Bacteriological measurements, including tests for total coliforms, fecal coliforms, and enterococcus bacteria;
    b. Nutrient measurements, including tests for ammonia, TKN, total phosphorous, and nitrates;
    c. Measurements for oil and grease, priority pollutants (such as silver, zinc, and phenols), and total suspended solids (TSS); and
    d. Analysis of effluent samples collected in treatment plants, for salinity, bacteria, nutrients, priority pollutants, oil and grease, BOD5, and TSS.

Table 3. Summary of Measurements Made in the SEFLOE II Project

Parameter	Methods and Instruments	Data Density or Operations
Currents at two depths	Mooring systems	2182 meter-days
Water column current profiles	ADCP	One month
Water column temperature, Salinity, and density	CTD cast	Semi-monthly small boat operations
Dye concentrations in plumes	Rhodamine-WT injection, fluorometers	Two intensive cruises
Salinity in plumes	Towed CDT	Semi-monthly small boat operations
Acoustic scattering strength	High-frequency back scattering acoustic system	Two intensive cruises, semi-monthly small boat operations
Bacteria	Water samples and laboratory tests	
Nutrient	Water samples and laboratory tests	
Oil and grease, TSS, etc.	Water samples and laboratory tests	
Bioassay	Water samples and laboratory test	1836 tests

SEFLOE Water Quality Testing Results

The following outline the results of the water quality investigations.

Bacteria

Currently, fecal coliforms are used as an indicator organism to detect the potential of human contamination. Because coliforms are typically present in waters containing mammalian emissions at concentrations several orders of magnitude greater than other organisms, it is assumed that when the fecal coliforms are eliminated, others are eliminated as well. Therefore, enterococcus was used as the indicator in the SEFLOE II study. Concentration data were plotted as a function of distance from the outfall discharge point, indicating that no organisms could be detected more than 800 meters from the outfall.

Nutrients

Concentrations of ammonia, TKN, total phosphorous, nitrate as a function of distance from the outfall discharge point were found to reach background levels within 400 meters from the discharge points. This finding suggested that the outfall nutrients were not involved with the presence of Codium algae outbreaks on the coral reefs, as indicated by a report by Brian LaPoint several years prior.

Oil and grease

In general, oil and grease data did not show a correlation with other measured parameters. The accuracy of this data was questioned, because during many of the sampling days the background concentration were higher than those measured within surface plumes. Visual field observations indicated no oil or grease sheens within plumes at the surface. It was concluded that neither oil nor grease discharges from ocean outfalls were of concern.

Priority pollutants

The wastewater plant effluents were analyzed for all 126 priority pollutants. None of these pollutants detected exceeded the acute toxicity criteria listed as State of Florida Maximum Allowable Effluent Levels. It was concluded that any chronic toxicity associated with the pollutants detected could be addressed through suitable dilution and mixing zones.

Bioassays

Bioassays were conducted to characterize the acute and chronic potential toxicity of the effluent/receiving water mixture in the zone of initial dilution and the mixing zones and to evaluate the exposure potential of the effluent to the indigenous ocean population. A total of 1727 acute static bioassay tests and 109 short-term chronic bioassay tests were performed. The bioassay test results indicated that the treated effluent was not toxic. It was believed that the bioassay test was conservative, because the receiving water criteria were based on a concentration one-half of the concentration causing observed response in the laboratory. In addition, the required test procedure assumed Eulerian exposure of the organisms, while outfall conditions exhibit only Lagrangian exposures.

Potential Pathways of Human Exposure to Wastewater Constituents due to Ocean Outfall Disposal

Figure G-11 depicts the basic ocean outfall discharge in South Florida. The effluent disposed experiences significant mixing in the intermediate vicinity of the outfall, and dilution with the ambient seawater (Chin, 2000). This dilution is related to depth and current speed in the vicinity of the effluent port. All are subject to the significant effects of the Gulfstream current, which moves northward. An advantage of ocean outfalls is that this current speed increases dilution speed, while moving the wastewater away from the outfall port. It should also be noted that the buoyancy of the plume causes it to rise immediately to the surface. The velocity and force of this movement are significant enough that marine organisms and humans cannot penetrate the plume. Therefore, impacts, if any, are expected to occur outside the plume. That is, impacts were considered to occur in the farfield region, where a minimum dilution of 20:1 is conservatively assumed to be achieved.

Potential pathways of human exposure include through the consumption of seafood, through ingestion and inhalation by swimmers and divers, and by consumption of seawater desalinated by reverse osmosis treatment (see Figure 12). Seafood consumption exposures are affected by such variables as bioconcentration in the food chain and cooking, and apply to principally to fish, shellfish, and invertebrates. Ecological impacts may be related to increases in levels of nutrients, metals, and hormone-disrupting agents in the farfield zone.

Regulatory Environment for Ocean Outfall Disposal

Waters within three miles of the coast are considered waters of the State of Florida. Therefore, the federal government has delegated responsibility for regulation of the open ocean outfall program to FDEP. Chapter 62-600.520 F.A.C. states that no permittee may discharge effluent to coastal or open ocean waters that does not meet applicable secondary treatment and pH criteria, as well as basic disinfection. All domestic wastewater treatment plants discharging to open ocean waters are required, at a minimum, to provide secondary treatment designed to achieve an effluent prior to discharge containing not more than 30 mg/L $CBOD_5$ and 30 mg/L TSS, or 85% removal of these pollutants from the wastewater influent, whichever is more stringent.

Outfalls must be designed to ensure structural integrity so as to minimize potential damage from natural occurrences (e.g., wave action) or human activities (e.g., anchorage). Ocean action during storms are the most significant potential impact to the integrity of the outfall. Outfalls must be designed, with respect to depth and location, so as to minimize adverse effects on public health and environmental quality. The SEFLOE study was designed to meet this goal, and gather scientific information relevant to the issue. The design must address the initial dilution, dispersion, and decay rates of the effluent wastes in surrounding waters in order to accomplish these objectives.

To receive an ocean outfall permit, the following must be demonstrated:

- That granting the permit is in the public interest; and
- That minimum treatment standards and requirements to insure adequate protection of public health and the marine environment are complied with; and
- That granting the of the permit will not interfere with existing uses or the designated uses of the receiving waters or contiguous waters, or otherwise impair the recreational use, bathing waters, or economic values associated with the area potentially affected by the discharge; and

- That there is no reasonable relationship between the economic, social, and environmental costs of compliance with the treatment requirements and the benefits associated therewith; and
- That oceanographic features influencing the effects of the proposed discharge support the proposed level of treatment and any proposed extent of the mixing zone; and
- That the facility will be constructed (where applicable) and operated so that there is no occurrence of inadequately treated wastewater reaching contiguous coastal waters; and
- That an acceptable monitoring program for the discharge has been proposed and would be implemented by the permittee.

Many of the surface water discharge rules apply to ocean outfalls, except where otherwise noted.

Injection Well Disposal

More than twenty years ago municipalities in South Florida began disposing of treated wastewater effluent by injection to deep wells. These wells penetrate geological formations that are highly transmissive, saline, and geologically isolated from surficial drinking water aquifers. Southeast Florida is underlain by a series of interspersed rock and clay formations with vastly varying permeability. The uppermost formation generally encountered along the southeast coast includes the Biscayne Aquifer. This surficial deposit occurs throughout most of South Florida and consists of a series of fossiliferous, sandy limestones. Thickness of the aquifer increases approaching the coast, where it can be as much as 300 feet deep. Underlying the Biscayne Aquifer is the Hawthorn formation, comprising approximately 500 feet of clay. The Floridan Aquifer occurs below that, and the injection horizon even further down. Thus, the injection zone into the Oldsmar formation (or Boulder zone) occurs below 2500, and usually 2900 feet below land surface. The exact location of the injection horizon is found when drilling an exploratory pilot hole.

Well construction is shown in Figure 13. Four casings are placed, in ever decreasing diameter, and increasing depth, to seal off upper rock formations. Each casing is grouted in place with cement, to minimize potential for casing leaks and resulting migration of injectate into an upper formation. Surface equipment for all injection well facilities includes manual backup capability for monitoring wellhead pressure. Flow is recorded in systems utilizing automatic and continuous recording equipment, allowing monitoring of the system to detect leakage should it occur. Mechanical integrity tests are conducted every five years, as well.

Secondary treatment is required in Florida prior to deep well injection, and injectate may be chlorinated as well. Without chlorination, there is the potential for enhanced microbial growth and fouling in the wells and surrounding formation, and resulting long term damage to well casings.

Regulatory Environment for Deep Well Injection

Underground injection programs are regulated under the Underground Injection Control (UIC) regulations (40 CFR 146) as Class I municipal wells. These regulations were established under the authority of Safe Drinking Water Act approved in 1974 and amended in 1986 and 1996, setting forth standards for underground injection control programs. Florida received national primary enforcement responsibility for the UIC program for Class I, III, IV and V wells on March 9, 1983. However, significant issues have required continued involvement of U.S. EPA into the underground injection program in Florida. Florida Chapter 62-528 F.A.C. governs underground injection. Florida regulations are similar to federal rules, with minor variances which are stricter than the federal criteria, as outlined in Appendix H. After groundwater monitoring revealed migration of injected or native formation fluids into underground sources of drinking water (USDW), violating current Federal UIC regulations, U.S. EPA proposed changes to federal rules. Proposed changes would "allow for continued injection by existing Class I municipal wells that have caused or may cause such fluid movement into USDWs in specific areas of Florida if certain requirements are met which provide adequate protection for underground sources of drinking water" (Federal Register, July 7, 2000, Vol. 65, No. 131, pp. 42233-42245).

Federal rules define five classes of injection wells in Sec. 144.6. Class I wells are defined as wells which inject fluids beneath the lowermost formation containing, within one quarter mile of the well bore, a USDW. Class I wells can be hazardous, industrial or municipal waste disposal wells. Thus, injection wells used for disposal of treated municipal wastewater are regulated as Class I wells. Class II wells are those used to inject fluids that are brought to the surface in connection with oil and natural gas production or the enhancement of recovery of oil and natural gas and the storage of hydrocarbons that are at liquid temperature. Class III wells are utilized for the extraction of the minerals. Class IV wells are used by generators of hazardous radioactive waste which inject water below the lower most drinking water zone. Class V wells are all wells that are not included in Class I, II, III or IV. Class V wells include air conditioning return wells, cooling water return wells, drainage wells, dry wells for injection of wastes, recharge wells for replenishing water wells, saltwater intrusion barrier wells, wells to inject water into fresh water aquifer wells, aquifer storage and recovery wells, sand backfill wells, and other wells to inject mixtures of water and sand, and septic system wells.

Federal regulations contain formulas and descriptions of test methods for determining well operations, corrective actions in cases of well failure, and requirements for mechanical integrity tests to ensure detection of leaks in the casing, tubing, or packer (when used), and ensure that is there is no significant fluid movement into an underground source of drinking water through vertical channels adjacent to the well. Subparts B, C, D and F set up construction requirements, operating, monitoring and reporting requirements, and information that is to be considered in permitting wells. This may include information on the proposed operation of the well (such as maximum daily rate of flow and volume of fluids to be injected in the average injection pressure), the source of the water, analysis of the characteristics of the injected fluids, appropriate geological data and the construction details of the well. The regulations require that an applicant include a certificate that the applicant has assured, through performance bond or other appropriate means, that the permittee has the resources necessary to close, plug and abandon the well as required by the federal regulations.

Geologic Setting for Injection Well Disposal in South Florida

The purpose of this section is to provide an overview and to acquaint the reader with the basic geologic setting of the area (and to describe those physical properties that influence the movement of fluids). A detailed description of the geology is beyond the scope of the project; a considerable body of material on the subject is available from the literature in the form of publications from various public agencies, the scientific literature and from consulting reports. A bibliography is provided at the end of this section.

Information contained in this section was derived from data and consultants' reports from the five largest disposal-well facilities in the area, Miami Dade (North and South Plants), North Broward Regional, Fort Lauderdale, and West Palm Beach Regional. Additional information was obtained from seven other facilities (disposal well or ASR sites located in the three counties). Data from core and pumping/injection tests, and geologic and geophysical logs were used to determine characteristics of the various components of the Floridan aquifer system. Additionally, information was derived from the published reports listed in the bibliography.

Floridan Aquifer System

Southeastern Florida is underlain by a thick sequence of carbonate rocks, limestone and dolomite, and lesser amounts of unconsolidated clastics consisting of sand silt and clay and minor amounts of evaporites (gypsum and anhydrite). By far the carbonate rocks are the principal rock types. Total thickness of the sequence is in excess of 5000 feet; the section in the depth interval between 200+/- and 3500+/- feet is the focus of this discussion. The evaporites are present in the lower (deeper) part and the clastics are present in the upper (shallow) part. The movement of ground water occurs principally through the carbonate rocks.

Ranging from the oldest to youngest in age the various geologic formations comprising the sequence are: Cedar Keys, Oldsmar and Avon Park Formations, the Ocala and Suwanee Limestones, the Tampa Limestone and the Hawthorn Formation (Group). These formations constitute the various elements of the so-called Floridan aquifer system. Evaporite deposits present in the Cedar Keys Formation constitute a lower confining unit marking the base of the active ground water flow system (Meyer, 1989). The Floridan aquifer is comprised of permeable limestones and dolomites of the various formations noted above; they are hydraulically interconnected. The degree of interconnection varies as does the permeability. In general, the rocks comprising the Floridan aquifer resemble a layer cake composed of numerous zones of alternating high and low permeability (Meyer 1989).

In southeastern coastal Florida, the base of the Floridan aquifer system occurs at an approximate depth of 3500 feet; its top is present at a depth of 900 feet +/-. The top occurs in the Suwanee Limestone. Clay, marl and claystone present in the Hawthorn Formation (Group) constitute the confining sequence for the Floridan aquifer system, which isolates the Floridan from the beds forming the Biscayne and shallow aquifers in Southeast Florida (Miller 1986).

These relationships are shown in the cross section given on on Figure 9, which has been reproduced from U.S. Geological Survey Professional Paper 1403-G (Meyer, 1989). The line of the cross section is east-west through the City of Fort Lauderdale.

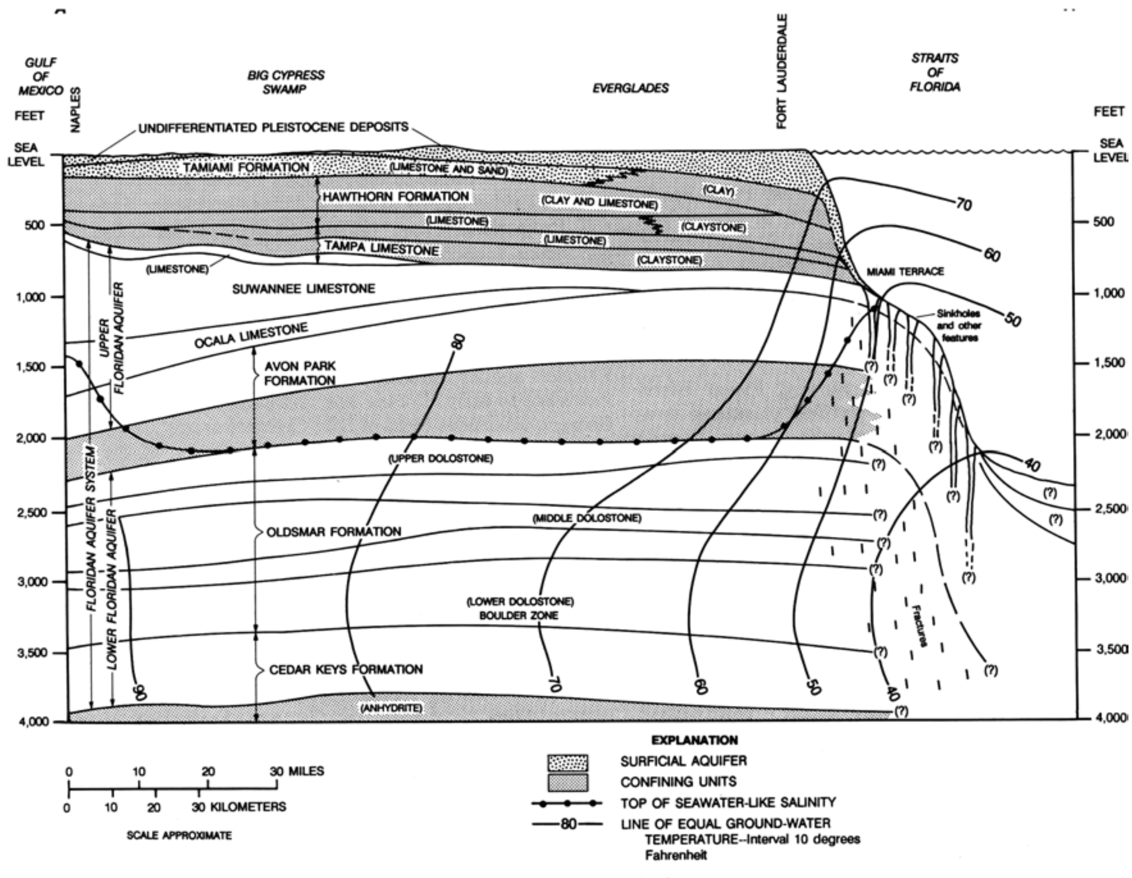


Figure 9. Hydrogeologic Cross Section through South Florida (Meyer, 1989)

Hydraulic Properties of the Floridan Aquifer System, from samples at depths of 1360 to 2993 feet (Appendix I), can be summarized as follows:

1. Upper Floridan Aquifer:

    a. Transmissivity: 10,000 to 60,000 feet squared per day (Meyer1989)

2. Middle Confining Unit (from Consultants' reports listed at the end of this section):

    a. Vertical Hydraulic Conductivity (cm/sec)
        - Mean: 2.83E-4
        - Maximum: 5E-3
        - Minimum: 9.6E-10
        - Standard Deviation: 7.15E-4
        - Median: 4.6E-5
        - Number of Samples: 131

    b. Horizontal Hydraulic Conductivity (cm/sec)
        - Mean: 2.56E-4
        - Maximum: 4E-3
        - Minimum: 2.5E-9
        - Standard Deviation: 5.82E-4
        - Median: 7.4E-5
        - Number of Samples: 83

    c. Porosity (fraction)
        - Mean: 0.317
        - Maximum: 0.45
        - Minimum: 0.034
        - Standard Deviation: 0.091
        - Median: 0.33
        - Number of Samples: 127

3. Lower Floridan Aquifer (Boulder Zone)

    a. Transmissivity (feet squared per day)
        - 3.2E6 to 24.6E6 (Meyer 1989)
        - 13E6 (Geraghty & Miller, Inc 1984)

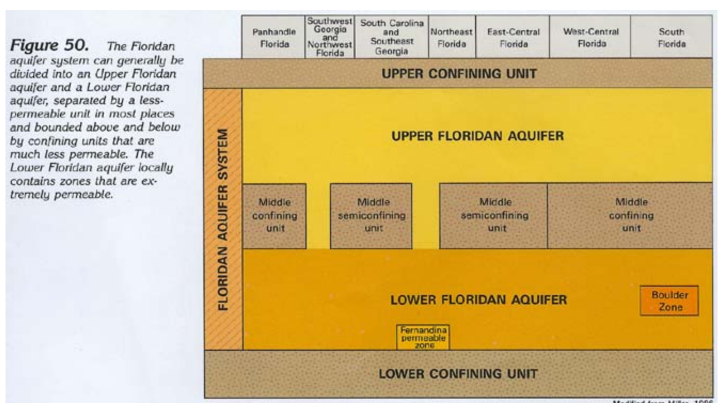
At one time, the Floridan aquifer was defined as being formed by some of the formations noted above, (Parker, 1955); it was later referred to as the Tertiary limestone aquifer system; and more recently has been designated as the Floridan Aquifer system. As knowledge of the geology of the area improved, it became apparent that the various formations underlying the area formed a single system, and that the designation "aquifer system" was appropriate.

In South Florida, the Floridan aquifer system is divided into three distinct hydrogeologic units, based on water quality (salinity), and hydraulics (Miller 1990). These units are:

- The Upper Floridan Aquifer,
- The middle confining unit, and
- The Lower Floridan Aquifer.

The three-fold subdivision is shown on Figure 10. The figure is based on Figure 50 of Hydrologic Atlas HA 730-G published by the U.S. Geological Survey (Miller 1990). The figure shows the three components of the system and their regional relationship; Figure 1 gives a more detailed description of the project area. The various formations forming the system in South Florida are regionally extensive. Each component of the system is present throughout the study area; the depth intervals of the occurrence of each are similar. Additional information on the aquifer system is shown on the conceptual cross section in Appendix I.

FLORIDAN AQUIFER COMPONENTS



Source: USGS Hydrologic Atlas HA730G

Figure 10. Components of the Floridan Aquifer System

Upper Floridan Aquifer

Permeable zones present in the Tampa, Suwanee and Ocala Limestones and in the upper part of the Avon Park Formation form the upper Floridan aquifer. The limestone has been affected by dissolution, enhancing its permeability. The transmissivity of the Upper

Floridan aquifer ranges from 10,000 to 60,000 feet squared per day or 74,800 to 448,000 gallons per day per foot (Meyer, 1989).In general the Upper Floridan occurs in the depth interval between approximately 900 feet+/-(the top) and 1500 feet +/-.
Water in the Upper Floridan is under pressure; that is to say a well tapping the aquifer will flow at land surface; heads or water level elevations in the Upper Floridan are well above sea level throughout the area. Some idea of the distribution of water levels is seen on Figure 11, which is derived from U.S. Geological Survey Professional Paper 1403-G (Meyer 1989). The data on which Figure 11 is based are from the year 1980 and depict regional relations. Little development of the aquifer (in South Florida) has occurred since then and it is reasonable to state that Figure 11 presents a reasonably accurate description of regional water-level relations. Examination of Figure 11 shows that water-level elevations along the coast are 40 feet or greater (relative to sea level) from West Palm Beach to south of Miami. Elevations increase in a westerly direction away from the coast; consequently the movement of ground water in the Upper Floridan in southeast Florida is roughly to the east or towards the coast. Ground water is moving from west to east and is discharging into the Atlantic Ocean offshore in those area where the rocks forming the Upper Floridan crop out (are exposed) at depths on the order of 1000 feet or so (Figure 9). The hydraulic gradient is about 0.5 feet per mile.

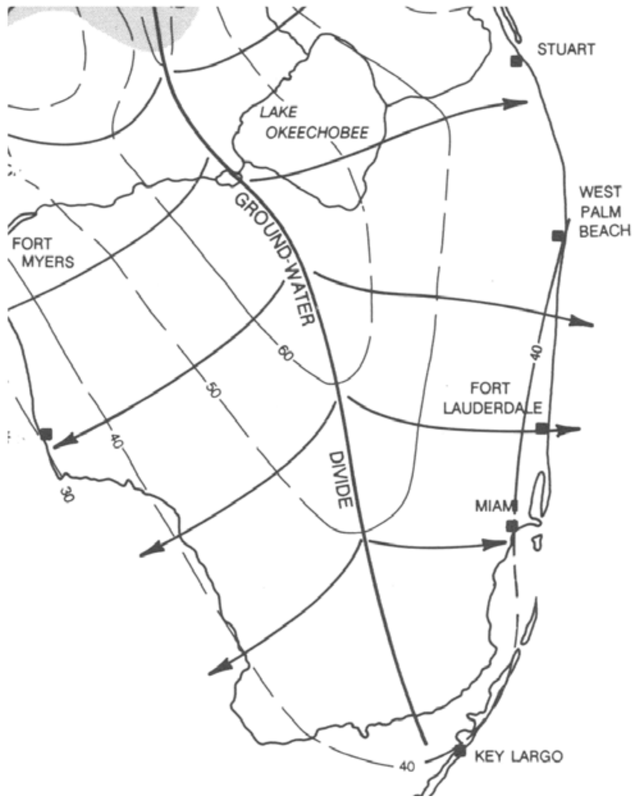


Figure 11. Water-Level Elevations in the Floridan Aquifer (Meyer, 1989)

Water in the Upper Floridan aquifer is brackish; total dissolved solids concentration generally is less than 10,000 mgl (milligrams per liter). The salinity increases with depth and eventually is equal to that of sea water (35,000mgl TDS). In southeastern coastal Florida the depth where salinity equals that of sea water (Figure 1) is 2000 feet +/-. Below this depth the salinity is constant and equal to that of sea water.

The Upper Floridan aquifer is underutilized, and it represents a potential source for the future. Currently, the aquifer is being developed for water supply; brackish water is being extracted and treated by reverse osmosis for public supply. Also, the aquifer is being used as the “storage zone” for a number of ASR (Aquifer Storage and Retrieval) systems throughout the area. As the demand for water grows in the future, the level of development of the Upper Floridan will grow.

Middle Confining Unit

The Middle Confining Unit of the Floridan aquifer system is formed by the lower portion of the Avon Park Formation and portions of the upper Oldsmar Formation. It is present in the project area in the approximate depth interval between 1500 and 3000 feet below land surface (Miller 1990). The unit is formed of limestone and dolomite, with the latter being a secondary feature created by the alteration of the original limestone. The term “confining unit” is a misnomer. In general it has an overall lower permeability than the overlying Upper Floridan aquifer and the underlying Lower Floridan aquifer and serves to confine fluids present in the Lower Floridan aquifer, but it does contain beds having high and low permeabilities. Higher permeability beds present in the Middle Confining Unit serve as locations for monitoring wells associated with injection well facilities tapping the Lower Floridan aquifer. For the most part, the salinity of water present in this section is equal to that of seawater, except perhaps in those portions of the unit above approximately 2000 feet.

Properties of the Middle Confining Unit in the project area are the best known of the three subdivisions of the Floridan aquifer system in the project area. Because it serves as the confining unit for the underlying Lower Floridan Aquifer, the zone of wastewater effluent injection, its properties (horizontal and vertical permeability, porosity and composition) are the best known of the three units comprising the Floridan aquifer system. Permits for the construction, testing and operation of disposal wells include specific requirements for identifying the nature of the confining sequence and collecting information on the nature of these beds.

Information on the vertical and horizontal permeability of cores taken from the Middle Confining unit was collected and evaluated to determine variations in the permeability of the unit. Information was collected from facilities ranging from West Palm Beach in the northern part of the project area to the Miami-Dade South Wastewater Treatment plant located south of the city of Miami. Data from 131 cores were examined. The depth interval between 1360 and 2993 feet was covered. The mean value for vertical permeability is 2.83E-4 cm/sec; the median is 4.60E-5 cm/sec; and a standard deviation of 7.146E-4 cm/sec. A minimum value of 9.66E-10 cm/sec and a maximum of 5.00E-3 cm/sec were found.. Horizontal permeability for 83 cores was found to be a mean of 2.56E-4 cm/sec; the median is 7.40E-5 cm/sec; with a standard deviation of 5.82E-4 cm/sec. The maximum value is 4.00E-3 cm/sec and the minimum is 2.5E-9 cm/sec. Porosity ranges from a minimum of 0.034 to a maximum of 0.45 (expressed as a fraction of 1). The mean porosity is 0.317 and a standard deviation of 0.091.

Lower Floridan Aquifer

The Lower Floridan aquifer is formed by the Oldsmar Formation. In the project area, the Oldsmar is predominantly composed of dense dolomite that ranges in nature from massive to cavernous. It was given the name “Boulder Zone” by oil-well drillers in the southwest part of the state, who found that it tended to collapse when penetrated by the drill bit, acting as if it were composed of boulders. It is present throughout the southern part of the State as shown on Figure 12.

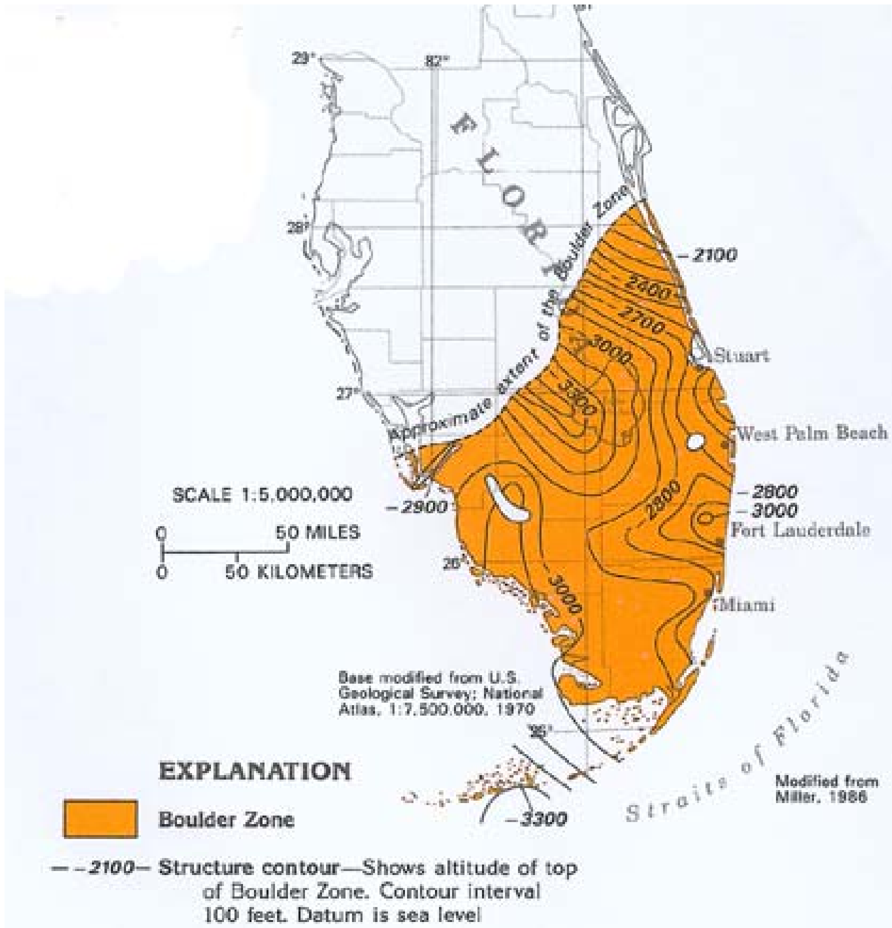


Figure 12. Structure Contours on top of the Boulder Zone. Source: U.S. Geological Survey Hydrologic Atlas HA730G

In general the Lower Floridan Aquifer occurs at an approximate depth of 3000+/- feet. Its top is generally taken to be the first occurrence of dense, microcrystalline dolomite; and it usually tends to collapse when first penetrated by the drill bit, causing drilling problems such as lost circulation and loss of cutting returns. Knowledge of potential problems and the use of specialized drilling techniques minimize drilling problems. The base of the zone occurs at a depth of approximately 3500 feet, marking the base of the Floridan Aquifer System.

The Boulder Zone consists of a vast system of interconnected cavities and fractures, giving rise to its exceptionally high transmissivity. Its transmissivity is so high that the drawdown caused by pumping or pressure buildup associated with injection are extremely small and masked by outside influences such as tidal change (tidal changes of as much as 0.8 feet have been observed at West Palm Beach) and loading and barometric effects (Geraghty & Miller 1975). Consequently, it is difficult to determine accurate values for the transmissivity of the zone. Estimates of Boulder Zone transmissivity vary from 3 to 25 million gallons per day per foot. At the Fort Lauderdale Port Everglades treatment plant, an average transmissivity value of 13 million feet squared per day was derived from pumping and injection tests (Geraghty & Miller 1984).

Owing to its extraordinarily high transmissivity and areal extent, the Boulder Zone is capable of accepting large quantities of injected fluids at comparatively low injection pressures. The writer has observed tests were injection rates in excess of 10,000 gpm (gallons per minute) were sustained at low injection pressures. It is common for an injection well to be designed to be equipped with a pump capable of injecting at an average rate of 7000 gpm. Water in the Boulder Zone is salty, having the same chemical composition as sea water. Additionally it is cold. Temperatures of 50 degrees F have been observed at the City of Fort Lauderdale injection-well facility (Geraghty & Miller 1984). With increasing distance inland from the coast, the temperature increases (Kohout et al. 1988). Figure 9 shows contours of water temperature. The comparatively cool temperature of Boulder Zone water is taken as an indication of a hydraulic connection between the Boulder Zone and the Atlantic Ocean at some distance offshore at a depth where the sea water is cold and the Boulder Zone crops out and is in contact with the ocean. There is no other explanation as to the source of cold ground water in a tropical setting.

It is believed water in the Boulder Zone is moving slowly (in South Florida) towards the west. Age dating of water from the Boulder Zone based on uranium ratios (Meyer, 1989) suggests water inland is older than that present at the coast. Because of the cavernous and fractured nature of the Boulder Zone, ground-water flow is best described as fracture or conduit flow as opposed the typical flow of ground water through porous media. It is likely that in an injection well operation, considerable mixing with native water and dispersion occurs as injected fluid moves outward from an injection well.

In the past 20 years or so, the Boulder Zone has been used increasingly for the disposal of treated sewage effluent. Large scale regional treatment facilities in Miami, Fort Lauderdale, Broward and Palm Beach Counties and a number of smaller plants routinely dispose in excess of several hundred million gallons per day. The presence of the highly transmissive Boulder Zone in the Lower Floridan Aquifer, overlain by the Middle Confining Sequence, and containing saline water, have been the bases for this practice.

Hawthorn Formation

The Hawthorn Formation is a complex sequence of sediments deposited in a variety of marine environments. Consequently, its character or composition varies depending on geographic location. This can be seen on Figure 13, reproduced from Snyder (1985). Depending on location, the Hawthorn can be composed of limestone, dolomite, clay, silt, and sand. Phosphate minerals are common. In fact, the Hawthorn is a major source of phosphate in the central part of the state. In southwest Florida, the Hawthorn contains beds of permeable materials, which are tapped for water supply. In that area, permeable beds are called the Intermediate Artesian aquifer. Typically, the Hawthorn Group is divided into two formations, the Peace River and Arcadia Formations.

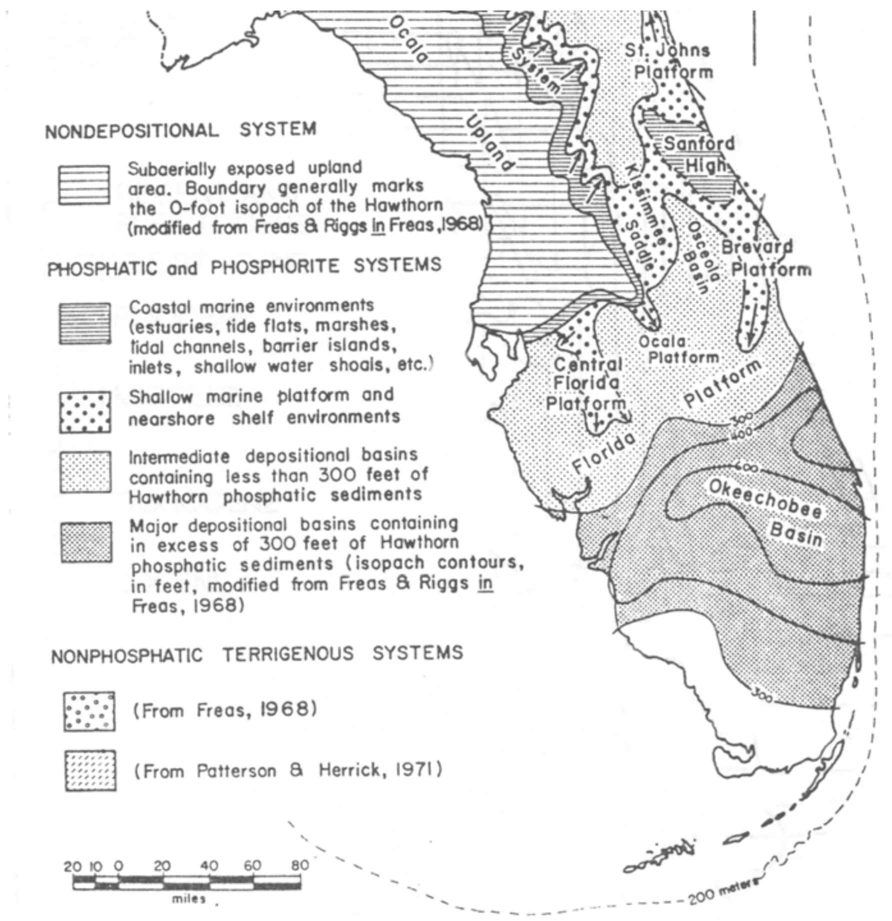


Figure 13. Structural Features of the Florida Peninsula (Snyder, 1985)

In the project area, the Hawthorn is predominantly composed of silt and clay. As shown on Figure 13, the thickness of these materials is in excess of 300 feet . Throughout most of South Florida, the Hawthorn serves as the confining sequence for the Floridan aquifer System. In the project area, the Hawthorn is predominantly clay/marl and confines brackish water under pressure from migrating upward and influencing the quality of the fresh ground water present in the Biscayne and other shallow aquifers in the area . For example, at the West Palm Beach injection well facility, the clay of the Hawthorn is almost 700 feet thick; core data from this interval have vertical permeabilities ranging from 3.15E-5 to 3.10E-8 cm/sec (Geraghty & Miller 1975). Examination of large fragments of the clay retrieved during drilling shows it has the consistency of heavy modeling clay. At the City of Fort Lauderdale, Port Everglades plant, the Hawthorn was found to be approximately 500 feet thick. At the City of Hollywood water treatment plant, the Arcadia Formation was found to be present from 480 to 926 feet, and is formed by soft, poorly lithified sandy, phosphatic marls.

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Pathways of Human and Ecological Exposure due to Injection Well Disposal

Buoyancy of the injected effluent due to its lower salinity is a driving force for vertical migration, and indicators of effluent have been found at middle elevations within the Floridan Aquifer, as noted in Section 3. Horizontal dispersion within the Floridan Aquifer and Boulder Zone are uncertain. However, migration through the Hawthorne Layer to the Biscayne Aquifer is considered unlikely. Reverse osmosis is generally required to treat the brackish water of the Floridan Aquifer prior to use for drinking. One route by which treated wastewater effluent could potentially reach surface waters from injection wells could include migration to a potable or non-potable aquifer storage and recovery (ASR). ASR wells store fresh water in a bubble within the brackish Floridan aquifer. Potable ASR water is treated prior to injection, and typically receives only chlorination upon withdrawal prior to distribution. However, withdrawals from the well are monitored for salinity, and ceased if elevated salinity is detected. Non-potable ASR water, on the other hand, is intended to be released in large volumes to receiving canals during the dry season, as part of the Everglades restoration effort. Regulations regarding monitoring and operation of such releases have not been determined at the time of study. Potentially exposed populations include potable water consumers, users of non-potable water for irrigation, consumers of vegetables irrigated with non-potable water, and consumers of fish caught in canals receiving water from non-potable ASR wells.

Wastewater Reuse

The State of Florida has encouraged utilities to consider the use of reclaimed water in several ways. In particular, the Florida Department of Environmental Protection enforces the Anti-Degradation Rule, prohibiting discharges that increase the pollutant loading on a body of water. FDEP also requires an evaluation of reclaimed water for all requested wastewater treatment plant expansions, and for all plants existing in a water resource caution area. Cost is considered in these evaluations, which are intended to identify areas or users that would benefit from the use of reclaimed water. Typically, identified potential recipients have been golf courses and other large irrigation areas. Throughout Florida, reclaimed water has been used for agricultural irrigation, wetlands restoration, and dual residential water supply systems, as well as for golf course irrigation. Section 62-610 of the Florida Administrative Code establishes reclaimed water guidelines, currently under review. Reuse is not considered a stand-alone disposal alternative, because during the wet season high water levels may prevent such reuse, and therefore a backup system of equivalent capacity is required. Systems of such capacity available currently in South Florida are surficial aquifer recharge, ocean outfall, or injection well disposal systems.

Aquifer Storage and Recovery Wells

Aquifer Storage and Recovery (ASR) wells have been recently proposed and employed as an alternative for management of water supplies in Florida. Such wells are formed by injection of fresh water into the upper Floridan Aquifer during wet or low-demand seasons, with subsequent withdrawal to meet demand for potable water, natural system flows, or aquifer level maintenance, at other times of the year. Figures 14 and 15 depict the process. Use for storage of raw groundwater has also been investigated. In Southeast Florida, it is intended that injected fresh water will not mix with the native brackish water, due to the density gradient. Thus, a bubble of fresh water is formed. Experience with such systems is limited. However, use on a large scale is planned as a foundation of the Everglades restoration effort.

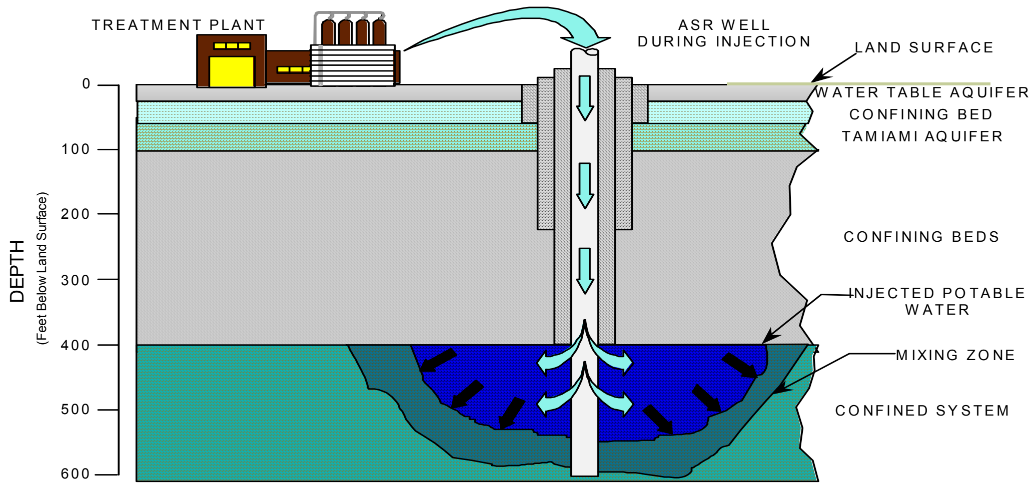

Figure 14. Schematic Diagram of Aquifer Storage and Recovery System for Brackish Water Aquifers.

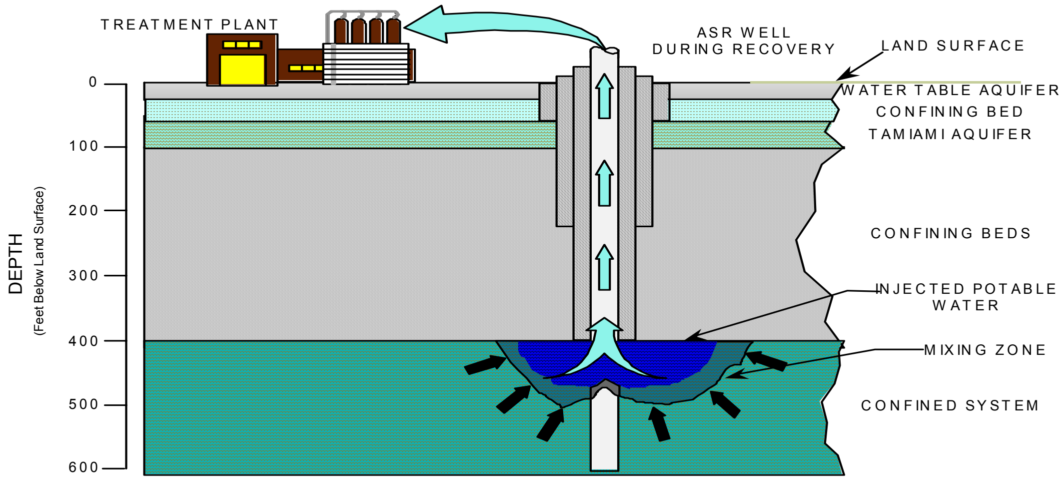

Figure 15. Schematic Diagram of Aquifer Storage and Recovery System for Brackish Water Aquifers.

Use of ASR technology can decrease the cost of municipal water treatment, by allowing the use of excess treatment plant capacity during the wet, low-demand seasons (June – October), for treatment of water and injection to potable ASR wells. Water can then be withdrawn when full treatment plant capacity is required by system demands. Withdrawals are disinfected and blended with newly treated water prior to distribution. Excess stored water can be used as reserve supply in case of high demand, drought, or treatment plant failure. Thus, the technology allows treatment plants to be sized for average, rather than seasonal high, demands, thereby saving capital infrastructure costs. Miami-Dade County is also experimenting with a system for storage of raw ground water. Retrieved water will then be treated at the existing water treatment plants, and distributed.

ASR systems involving injection of freshwater into saltwater aquifer systems will incur some loss of freshwater due to mixing with native waters. Such mixed water will not be recoverable without treatment to remove dissolved solids (chlorides). It has been estimated that as much as 300 to 500 million gallons may be lost from a single well, and more from a field of ASR wells. After this loss, 70 to 100 percent recovery of injected water has been estimated.

ASR system efficiency and success are determined largely by aquifer characteristics, including hydraulic gradient, transmissivity, static head, storage coefficient/effective porosity of the aquifer, salinity, and confinement and structure of the aquifer, including fractures, facies changes and stratigraphy of the system. Hydraulic gradient, transmissivity, and structure of the aquifer affect speed and direction of movement of the bubble. High transmissivity and gradient favor migration of the bubble. Incomplete confinement, or intersecting fractures, may allow injected water to migrate away from the well. The differential density of the waters will also affect separation of the bubble from native waters.

5. RELATIVE RISK ASSESSMENT

Disposal of wastes by living things to the environment has many and varied effects on the ecosystem, both beneficial and harmful to various populations. Disposal of treated municipal wastewater effluent in Southeast Florida often involves flows of water in excess of 100 million gallons per day (MGD) per plant, and associated mass loadings of other constituents. These loadings alter the flow of water, carbon, oxygen, nutrients, and other constituents through the ecosphere. In considering the sustainability of alternatives for disposal of effluent, one important consideration is human and ecological health.

Because of the complexity of potential exposure paths, time scales, and population variations, and the desire to avoid a site-specific assessment, a predictive Bayesian assessment of relative risks of the various alternatives was undertaken. Input to the analysis was principally professional judgment drawn from academic and industrial experts, and based upon available site-specific data, literature information, and experience. Bayesian methods allow the explicit and rigorous use of expert opinion and numeric data, in any combination. This advantage was considered to make them the method of choice in decision making, in contrast with resampling plans (e.g., the Jackknife and Bootstrap), which have no subjective capability, and fuzzy logic methods, which have little capability to use numeric data.

While Bayesian methods are useful, the generalized quantitative assessment developed in this project was made possible only through the use of predictive Bayesian methods. Predictive methods are an extension of traditional Bayesian approaches, in which unconditional distributions for the quantity of interest are found by integrating over probabilities of parameters of the distribution for the quantity of interest. The result is a distribution that becomes broader with decreasing levels of available information. These probabilities then incorporate both uncertainty and variability in the quantity of interest, and have been termed believed probabilities. The method requires no arbitrary assumption of confidence limits in interpretation. Results are more sensitive to the form of the distribution for the quantity of interest, and typically no account is taken of uncertainty in this form. However, this is a powerful advantage when there is theoretical or empirical basis for the form of the distribution, as it allows risk to be assessed from any level of available information. Only when information is so limited that a model cannot be developed, is the predictive Bayesian assessment impossible, as was the case for pharmaceutically active substances in this study.

5.1. Methods of Probabilistic Relative Risk Assessment

An initial assessment of health risks associated with the deep well injection disposal, ocean outfall, and surficial aquifer recharge by canal discharge was conducted. Because risks of discharge alternatives can be highly specific to geologic/hydrologic/environmental setting, population distribution, loading rates, and other factors, modeling of exposure rates was not possible or appropriate for a generalized assessment. Therefore, a Bayesian analysis based on available information for the region, including expert opinion assembled by the research team, was performed.

First, a meeting of Team members was convened to assemble conceptual diagrams of the wastewater discharge and environmental systems, showing pathways of potential exposure. Both pictorial and tree diagrams were developed, as shown in Appendix J. following this meeting, data on wastewater effluent, surface and ground water quality, and regulatory standards, were collected and analyzed for the Southeast Florida region, as presented in Section 2. A second Team meeting was convened to review the data, and develop a conceptual model for the risk analysis. At this meeting, two key assumptions for the assessment were agreed upon:

1. Based on available data for Miami-Dade County injection well systems, it was agreed that relative risks would be assessed for injection well systems assuming rapid vertical migration of effluent from the injection point to the upper Floridan aquifer, as the worst-case, and
2. Risk was defined, for the assessment, as the probability of being in violation of a regulatory water quality standard over a 30-year period. In the analysis, a violation day was defined as a day during which one or more water quality violations occurred.

It was further agreed at the meeting that expert judgment would be solicited for the assessment using a modification of the Delphi technique for eliciting expert opinion. Following Meeting 2, tree diagrams showing all potential exposure pathways were modified to show nodes for which regulatory standards exist. Original and modified tree diagrams are shown in Appendix J. Tabular questionnaires were then developed for electronic circulation. These surveys requested estimates of the risk of violating water quality standards, for each discharge alternative for each node of a modified tree diagram. Questionnaires were electronically circulated in three iterations, and initial results were used as input to compute believed risks. A probabilistic computer model was developed using the programming software package Matlab©, for computation of believed days of violation in 30 years. These initial results were presented at a third meeting of the team, and discussed for revision of both input and model form. Final input was then collected, and results computed for review by Team members. All Team members were interviewed regarding the final results, which were included in the final report and circulated all members for final review.

5.2. Wastewater Constituents Selected for Assessment of Health and Ecological Risk

Based on discussion at the first two Team meetings, four wastewater constituents were selected as indicators of human health risks, and one as an indicator of ecological risk, were selected for quantitative assessment. In addition, an emerging class of constituents of concern was selected as an indicator of both human and ecological risk. Constituents were selected based on the following considerations:

- Typical concentrations in wastewater effluents,
- Typical concentrations in potential receiving waters,
- Potential for migration in receiving environments, and
- Human health and ecological toxicity.

Specifically, arsenic, *Cryptosporidium parvum*, rotavirus, and n-nitrosodimethylamine (NDMA) were selected as indicators of human health risks. Arsenic was selected based on current concerns regarding toxicity and presence in the environment. *Cryptosporidium parvum* was used to indicate human health risk in surface and marine waters, based on previous experience and concern in such waters. *Rotavirus* was used as an indicator of microbial risk in ground waters, due to its mobility and because it is excreted in large numbers in the feces of infected individuals. The compound NDMA was selected to represent nitrosamines, an emerging class of toxins that have been found in wastewater effluent. NDMA is considered carcinogenic at extremely low doses (USEPA 1993). Total Kjeldahl nitrogen (TKN) was selected as an indicator of ecological risks, as it is the principal nutrient contained in wastewater, and therefore has the potential to cause eutrophication and ecological imbalance. Such eutrophication is thought related to the growth of pfisteria, blue-green algae, and other toxic microorganisms in the environment. Finally, pharmaceutically-active substances (PASs) were considered for qualitative assessment of human health and ecological risks. Such substances include endocrine-disrupting chemicals that have caused feminization of males and females of many species, and that have been found in wastewater effluent.

Arsenic, often considered a metal though it resides in the periodic table on the border between metal and non-metal, is often found naturally in groundwater. Arsenic has been the subject of current research and concern regarding toxicity, and may enter wastewater as a result of historical use as a pesticide, from use as a wood preservative, or from other industrial sources. Chronic effects at low concentrations include:

- Cancer, including skin, bladder, lung, and prostate cancer,
- Non-cancer effects on skin pigmentation and keratosis (often callus-like skin growths), and gastrointestinal, cardiovascular, hormonal (e.g., diabetes), hematological (e.g., anemia), pulmonary, neurological, immunological, reproductive/developmental functions, and
- Endocrine disruption.

Total Kjeldahl nitrogen (TKN) is an indicator of the excess nutrient present in wastewater, as noted. In addition, it is present in much higher concentrations than in receiving waters, and was used as a tracer to indicate the presence of effluent. Nitrogen compounds present may include nitrate, nitrite, and ammonia. Long term exposure to nitrates and nitrites at levels above the MCL in drinking water have the potential to cause diuresis, increased starchy deposits, and hemorrhaging of the spleen. In addition, nitrites may react with amines to form nitrosamines, to be discussed subsequently. Excessive levels of nitrate in drinking water can cause serious illness and death in infants due to the conversion of nitrate to nitrite in the body, which can interfere with the oxygen-carrying capacity in the blood of the children (methemoglobinemia, or “blue baby syndrome”). Nitrogen compounds are removed only via advanced wastewater treatment, not currently in use in Southeast Florida. Nitrates and nitrites are highly mobile in ground water due to their high solubility and low affinity for soils and minerals in the subsurface.

Microbiological Agents

There are over 100 micro-organisms that are human pathogens (Feacham, et al, 1981). Exposure pathways include ingestion, inhalation, dermal contact, and entry through wounds or body orifices (Hurst, 1996). Infected persons excrete large numbers of these pathogens, which often enter ground and surface waste systems. Each organism has a particular dose response relationship. Threshold doses for infection are vastly different among organisms (Gerba and Bitton, 1984). Typically, many bacteria are required to cause infection, whereas, for certain viruses, one organism may be sufficient. Available studies indicate that removal of bacteria during wastewater treatment and disinfection is generally high, but depending on the treatment process employed, viruses may undergo only 50 percent removal (Yates, et al, 1987).

Indicator organisms relative to human health risks were chosen for modeling based on consideration of the following characteristics:

- Number of organisms excreted,
- Fate of the organisms in the environment,
- Minimum infectious dose, and
- Severity of human health response.

Cryptosporidium parvum was selected to indicate risk in surface waters, and *rotavirus* was selected as the indicator in ground water, as mentioned. While *polio*-, *echo*-, and *ep*-viruses have been extensively studied, *rotaviruses* have been shown most virulent. In addition, large quantities of *rotaviruses* are excreted in the feces of infected individuals. *Rotaviruses* have been recognized as a major cause of severe intestinal and gastro-enteritis in all temperate, tropical and sub-tropical climates.

Nitrosomines (NDMA)

Nitrosamines are an emerging contaminant of concern throughout North America, and have been found in polluted air and water (Bolton, 2000). The major concern has been the occurrence of N-Nitrosodimethylamine (NDMA) in potable water systems, first noted in California in 1998, but found throughout the United States and Canada at levels significantly higher than in the past (Yoo, et al, 2000). Industrial contamination was initially investigated as an NDMA source in Canada, leading to investigation of potential formation of NDMA in the drinking water treatment process. NDMA is also being found in ground waters, and current research is expanding to include other nitrosamines (Andrews and Taguchi, 2000).

NDMA is not currently regulated under U.S. EPA drinking water rules. NDMA is classified as a Class I carcinogen in Canada, and a Class B2 probable human carcinogen in the United States. The compound has been known to cause carcinomas and tumors, primarily in the liver, kidney, and lungs (Andrews and Taguchi, 2000). Due to its carcinogenocity, the Ontario Drinking Water Objective has been set at 9 ng/L, based on a $5x10^{-6}$ risk factor estimated by the US EPA (Andrews and Taguchi, 2000). In California, the original action level was for NDMA at 2 ng/L based on a 10^{-6} lifetime cancer risk develop by the State, similar to the federal MCLs (CDHS, 2000). However, the State action level was changed to 20 ng/L to allow utilities to study the problem, because many sites sampled exceeded the 2 ng/L action level (Davis, et al, 2000). The target set by U.S. EPA for an estimated 10^{-6} risk level is 0.7 ng/L (CDHS, 2000). This risk was assessed assuming an average ingestion of two liters per day for 70 years (Kruger, 2000).

The existence of NDMA in the environment is generally attributed to human activity. NDMA has not been manufactured in the United States since 1976, when it was manufactured primarily as an intermediate in the electrolytic production of 1,1 – dimethylhydrazine for liquid rocket fuel (USEPA, 2000). NDMA was a 0.1% impurity in storable rocket fuel. Current use is primarily in research (CDHS, 2000). While not manufactured in the United States, NDMA may be formed in manufacturing processes in which alkylamines are used or generated. Man-made and naturally occurring alkylamines are widely distributed in the environment (Liang, 2000). NDMA is a by-product of the manufacture of rubber, pesticides, lubricants, polymers, copolymers, high energy batteries, solvents and liquid rocket fuel. Other uses include inhibition of nitrification of soil and for nematode control for crops. NDMA is commonly found in household products, including cosmetics, canned fruit, fish, cheese, milk, cured meats (ham, frankfurters, bacon), tobacco smoke and beer (Davis, et al, 2000). NDMA concentrations in food range from 90 to 100 ng/L for pasteurized milk, 600 to 1000 ng/kg of bacon, and 50 to 59000 ng/kg in beer (Gloria, 1997 (1) and (2)). Exposure is generally via inhalation, ingestion and dermal contact. Potential exposure depends on the ability of the nitrosamine to migrate from the product to the body (U.S. EPA, 2000)

Nitrosamines are generally resistant to air stripping, biodegradation, and granular activated carbon (Andrews and Taguchi, 2000). Reverse osmosis is not considered effective as a treatment method as a result of the polar nature of the molecule (Liang, 2000). Research into low-pressure ultra-violet irradiation treatment has shown mixed results. In addition, NDMA can be reformed or regenerated if chlorination occurs after UV treatment (Liang, 2000). Advanced oxidation/irradiation processes have also been promoted as alternative treatment technologies, though these processes tend to be expensive. Sunlight was found to cause the rapid decay of nitrosamines in a Canadian study (Yoo, et al, 2000).

NDMA concentrations as high as 10 ppb have been found in groundwater (Bolton, 2000). The more persistent problem has been the detection of NDMA in potable drinking water systems. Metropolitan Water District has reported raw water samples as high as 24 ng/L at a residence, and consistent values of 3 to 7 ng/L throughout their member agencies (Davis, et al, 2000). NDMA was found in Sacramento County drinking water wells at 140 and 150 ng/L, and in wells in the San Gabriel Basin in California at 70 to 300 ng/L (Liang, 2000). Other research indicates that NDMA is present in wastewater after chlorination and in potable drinking water supplies (Liang, 2000). Several studies found NDMA in treated water, though the raw water had no detectable NDMA, indicating NDMA formation during treatment (Davis, et al, 2000; Andrews and Taguchi, 2000). Polymers and alum were identified as likely sources of NDMA precursors (Davis, et al, 2000).

Andrews and Taguchi (2000) concluded that the use of polymers other than alum, such as ferric chloride, might reduce NDMA formation. Other precursors that have been identified are nitrate, nitrites and ammonia. Other tests showed that removal of organic precursors via GAC prior to disinfection helped to reduce NDMA formation potential, but that the use of chloramines for disinfection increased the amount of NDMA formed (Njam, 2000). However free residual chorine did not form NDMA even in the presence of large quantities of organics (Njam, 2000).

In wastewater, NDMA has been reported in both sludge and wastewater effluent. Mumma et al. (1984) reported NDMA levels ranging from .6 to 45 ug/L in dried sludge in a survey of 14 American wastewater plants. Analysis of effluent samples in California indicates that NDMA formation is related to the presence of thiram in the effluent and its reaction with chlorine, and/or the amount of nitrite and ammonia in the effluent (Njam, 2000). At Water Factory 21, where tertiary or full treatment and disinfection is practiced, levels of NDMA over 100 ng/L have been found (Njam, 2000). As a result, testing for NDMA is required at all new wastewater reclamation facilities in California. Njam (2000) found levels of 97 ng/L of NDMA in the effluent of an advanced secondary treatment facility. Split samples from this facility were used to evaluate the impact of chloramines, a common wastewater by-product on the formation of NDMA. NDMA amounts were high at common chlorination dosage levels. Typically wastewater plants in South Florida apply doses of 10 to 15 mg/L free chlorine, which are converted to chloramines within seconds (Fergen, 1997, unpublished notes). Based on the results of Njam (2000) and typical chloramine dosages used in South Florida wastewater treatment plants, effluent concentrations on the order of 500 ng/L may be assumed.

Pharmaceutically Active Substances

It has been estimated that 70% of pharmaceuticals consumed pass through the body unchanged. Further, because concentrations of these substances are typically less than 1 μg/L, the microorganisms in wastewater treatment facilities are not induced to metabolize these substances as an energy source. As a result, current research indicates that many of these substances survive the biodegradation process and are discharged into receiving waters. Those that are altered can revert to their original form in the environment (Daughton and Ternes, 1999). Recent research also indicates the presence of chemicals in water and wastewater that may disrupt the endocrine system of many species, including humans. Endocrines are chemicals used by organisms to regulate important metabolic activities, such as ion balance, reproduction, basal metabolism and fight or flight responses, through changes in hormones secreted by the thyroid, parathyroid, pituitary, adrenal, sex, and other glands. Because endocrine systems are interconnected, effects on one will affect others as well. Chemicals, whether derived from pharmaceuticals, industrial emissions, or natural sources, that interfere with endocrine systems of humans and wildlife are termed endocrine disruptors. Chemicals and pharmaceuticals in general that elicit a pharmaceutical response in humans are termed pharmaceutically active substances (PASs). Research has identified more than 60 PASs that impact the endocrine system of animals and humans in ng/L or lower concentrations in the ecosystem.

The first regulations requiring eco-toxicity testing for the registration of pharmaceuticals were established in Germany in 1995. As a result, most research involving the identification and characterization of PASs in wastewater effluents and receiving waters has occurred in Germany. In the United States, the 1996 Safe Drinking Water Act Amendments and the Food Quality Protection Act of 1996 mandate comprehensive screening for estrogenic and anti- estrogenic chemicals. Research initiatives by the American Water Works Association Research Foundation and the Water Environment Federation Research foundation address the problem.

Effects of endocrine disruptors in the environment can be startling. While both natural and synthetic chemicals may have disrupting effects, most observations involve species feminization and have been attributed to estrogenic compounds found in wastewater effluents (Lutz, 1999). The reverse also occasionally occurs as in North Florida, wastewater effluent from a paper mill is suspected in the masculinization of fish through the development of androgenic compounds in the process (Raloff, 2001). In both cases, the sex change effect results in radically reduced resident fish populations, sexually shifted remaining populations, and potential loss of sustainability of the resident population. Also in Florida, alligator populations have been found to have greatly reduced fertility, traced to a feminization and lack of development of reproductive organs in the male (Guillette, et al, 1994). Nationally, many species have reportedly been affected (Colburn, et al, 1997).

Until recently, the problem of PASs in the environment was not noticed due to the low concentrations and difficulty in tracing the compounds. Tracing drug residues is problematic because many potential endocrine disrupting chemicals have little in common structurally or in terms of chemical properties (Depledge, 1999). Analytical methods for detecting the trace levels of PASs found in the environment are not well-developed. In addition, often lists of active ingredients in pharmaceutical products are not made available due to patent limitations, hindering the development of spectral signatures needed for analysis by gas chromatography-mass spectroscopy (Daughton and Ternes, 1999). Furthermore, current effluent toxicity screening tests are not designed to detect endocrine disrupting and other effects of PASs, the effects of chronic exposure, or prenatal effects realized in offspring.

Limited research has been conducted on the eco-toxicity of PASs, and subtle changes in the behavior and development of aquatic organisms may be the greatest concern. Pharmaceutically active substances and their ecological effects can be categorized (Daughton and Ternes, 1999; Hirsch, et al., 1999; Raloff, 2001; Buser, 1998; Ternes, 1998) as shown in Table 4.

Table 4. Summary of Pharmaceutically Active Substance Occurrence

	Substance	Uses	Quantity	Impacts
1	Estrogenic Compounds	Contraceptive	1-5 ug/L	Feminization
2	Steroids (non estrogens like androgen, testosterone, etc)	Muscle development, various	above 1 ug/L	Masculinization
3	Anti-biotics	Reduce bacterial infection	varies	Resistant pathogens
4	Blood Lipid Regulatos	Cholesterol control	to .165 ug/L	Unknown
5	Non-lipid analgesics	Anti-inflamatory	.5-1 ug/L	Unknown
6	Beta Blockers		.2 ug/L	Stimulate reproduction
7	Antidepressents	Increase seratonin, control behaviour (Prozac, ritalin)	varies	Stimulate reproduction
8	Anti-epileptics	Epilepsy control	to 6.3 ug/L	Unknown
9	Anti-neoplastics	Chemotherapy	.017 ug/L	Toxicity, birth defects
10	Impotence Drugs	Erectile dysfunction,blood stimulant	unknown	Unknown
11	Retinoids	Skin diseases, anti-aging, cancer	unknown	Birth deformaties
12	Contrast Media chemicals	X-rays, CAT scans,diagnostics	15 ug/L	None
13	Fragrances and Musks	Perfumes, colognes	to .4 ug/L	Toxicity
14	Preservatives	Anti-microbial	unknown	Feminization
15	Disinfectants	Bacteriocides	.05-.15 ug/L	
16	Herbal Remedies	Various	varies	Various
17	Sunscreens	Protect skin from UV light	unknown	Unknown

Secondary wastewater treatment plants are designed principally to remove the oxygen demand of influent wastewater, through the degradative action of a series of resident microorganisms. Wastewater facilities that have received PASs in the influent for years may support resident organisms that have adapted to the metabolization of PASs. However, marketed pharmaceuticals evolve continuously, and therefore may escape treatment in typical biological reactors. In addition, PAS concentrations may be below that needed to initiate the enzyme affinity of the organisms (Daughton and Ternes, 1999). Reverse osmosis and granular activate carbon have been suggested for removal of PASs. However, it appears that neither process completely removes the low levels of PASs found in wastewater, and further study is needed. Chemical oxidation has also been proposed for study.

Future regulations addressing both sources and sinks of PASs in the environment are needed. Ultimately, the utility community can expect additional regulation concerning PASs, especially estrogenic and androgenic compounds. Because the potential costs may be high, further research into prevention and treatment is needed.

5.3. Elicitation of Expert Judgment and Assumptions of the Assessment

The Delphi method is a technique for achieving consensus among a group systematically. The method was developed in the early 1950s for the purpose of estimating the probable effects of an atomic bomb attack on the United States, and has since been used in technological forecasting and many other applications (Linstone and Turoff, 1975). The approach involves iterative questionnaires, which protect the anonymity of respondents. Analysis of responses after each iteration involves successive elimination of opinions at the extremes, to achieve convergence of opinion. At the end of the procedure consensus among experts is attained (Sackman, 1975).

The traditional Delphi process involves a group of expert respondents in the field of study. The principal investigator designs a questionnaire and sends it to the larger respondent group. After the questionnaire is returned, the principal investigator summarizes the results and sends the questionnaire back to the respondents, preserving anonymity. The respondent group is given multiple opportunities to reevaluate their original answers based on their review of the group response (Linstone and Turoff, 1975). In a true Delphi process, responses outside the range of the central 50 percent of responses are eliminated prior to each iteration, with the ultimate goal of reaching a consensus likelihood of the group response. Significant commitment of time from the response group, and extensive study review, may be required. Modification of the full Delphi process is common.

The Delphi method avoids some of the pitfalls of group polarization, by preserving anonymity in the process. Group polarization is the term used to describe the shifting of group opinion in response to the interactive dynamics of the group (El-Shinnawy and Vinze 1998). Group decisions have been found to shift in either the direction of lower or higher risk, and can tend to coalesce around the opinions of dominant members or otherwise change without a corresponding change in the underlying facts. While polarization can be a positive force for agreement when value or preference-based choices are made, it can have a negative influence on the reduction of uncertainty.

Because of the generalized nature of the assessment, there was an inherent uncertainty associated with all modes of effluent discharge. That is, different disposal methods have different risks in different settings, given different loadings, population distributions, and geology, for example. In addition, uncertainty was increased due to the lack of data available regarding some of the alternatives. Thus, the Bayesian approach was used to account for these uncertainties, and consensus was not a prime objective. Therefore, the Delphi method was modified as follows.

A modified Delphi questionnaire was prepared as a Microsoft Excel Workbook, consisting of three sheets. Appendix K shows the form, with final Team responses and comments entered. Each sheet was dedicated to a method of disposal, corresponding to the three modified tree diagrams of Appendix J. The questionnaire posed a series of questions that followed exposure pathways from the point of discharge through to each point in the environment or water management system where a water quality standard existed. Each of these points represented a point of potential water quality violation due to the discharge alternative, and was represented by a node in the corresponding decision tree. For each node and each discharge alternative, the Team was asked four principal questions, worded as follows:

1. How many times in 30 years will the regulatory standard be exceeded at the receiving node? (One such exceedance event may last any number of days.)
2. What is your confidence in the numbers of exceedance events you entered? Please select low (L), medium (M) or high (H).
3. How many days will exceedence events last (min., mean, max.)?

4. What is your confidence in the event sizes you entered? Please select from low (L), medium (M) or high (H).

For each node, the following three types of information were provided to the team members, for use in answering the questions posed:

1. Applicable effluent concentrations found in Southeast Florida effluent, as collected during the project and presented in Section 2,
2. Applicable actual or assumed regulatory standard, and
3. Relevant assumptions and supporting information were provided in the questionnaire.

Principal assumptions of the analysis for injection well disposal were:

1. Injected effluent has migrated vertically to the upper Floridan Aquifer (however, it must pass approximately 500 ft. of Hawthorn clays to reach the Biscayne Aquifer),
2. Each injection well has four casings in the Biscayne Aquifer, and three in the Hawthorn, as shown in supporting information (Appendix L);
3. ASR potable and non-potable wells are located one mile from the effluent injection well system (conservative);
4. Drinking water derived from source wells in the Biscayne Aquifer Lime receives lime softening and chlorination;
5. Biscayne aquifer water drains continually into canals (relative to exceedence of surface water standards in canals due to contamination in the Biscayne aquifer);
6. Non-potable ASR water will be discharged directly to canals without treatment, dilution will be minimal, and discharges will be monitored and ceased if elevated salinity is detected;
7. Lime softening and chlorination of treated drinking water derived from canals in the Biscayne Aquifer, with: four logs removal of viruses required (Surface Water Treatment Rule); two logs removal Cryptosporidium required (Interim Enhanced Surface Water Treatment Rule); one log typical removal of arsenic by lime softening (AWWA 1999); no removal of TKN; and no removal or formation of NDMA (Tchobanoglous 2000);
8. Chlorination and blending only, prior to consumption, of drinking water treated, stored, and withdrawn from potable ASR wells: one log removal of viruses (based on Rose and Carnahan 1992), no removal of Cryptosporidium (based on Rose and Carnahan 1992), no removal of Arsenic or TKN, and no removal or formation of NDMA (Tchobanoglous 2000); when ASR monitoring system detects elevated salinity, withdrawals should stop; and
9. Reverse osmosis treatment of marine water withdrawn for potable water production.

Principal assumptions of the analysis for ocean outfall disposal were:

1. Secondary treatment and chlorination of discharged effluent;
2. A minimum of 20:1 dilution in boil required to be maintained more than 9 days in 90; violations of this rate may be related to movement of the Gulfstream current;

3. Relative to breaks in the outfall pipeline (upstream of the diffuser), leakage released to the Biscayne Aquifer in an area of minimal current, outside the influence of the Gulfstream; and
4. Reverse osmosis treatment of ocean water withdrawn for drinking water production.

Principal assumptions of the analysis for disposal by surficial aquifer recharge were:

1. AWT preceding discharge;
2. Minimal dilution in canals;
3. Relative to exceedance of MCL drinking water standards in Biscayne aquifer well water due to leakage from canals to well: canal levels higher than the ground water table, not the typical condition (Bloetscher 2000); and
4. Lime softening and chlorination of treated potable water derived from Biscayne aquifer wells.

The questionnaire set was circulated electronically three times to develop input for the initial assessment presented at Meeting 3. A final iteration was conducted to refine input based on group discussion at Meeting 3, to develop input for the final assessment. After each iterative circulation of the questionnaires, results were analyzed. After each iteration, geometric mean, weighted geometric mean, maximum, and minimum answers were tabulated and reported to the group for each question anonymously, along with reasons given for individual answers, if any. Reasons were particularly requested for answers outside the range of the group in general. Team members were asked to review and refine their individual opinions, based on the opinions and reasons of other members. The Principal Investigator did not remove extreme answers, and differences in opinion were allowed.

5.4. Predictive Bayesian Assessment Model

A predictive Bayesian model of health risks associated with injection well, ocean outfall, and surficial aquifer recharge by canal discharge was constructed, based on available data and other information, including expert opinion assembled by the Research Team. The approach involved the assignment of probability distributions, termed *sampling distributions*, to (a) the number of water quality standard violations expected in 30 years due to a discharge alternative, and (b) the expected magnitude (number of days) of individual violations. The Poisson distribution can be theoretically and empirically shown to predict the number of incidents, or infrequent events, over a period, and is widely used for this purpose. Therefore, the Poisson distribution was chosen as the sampling distribution for the number of violations in 30 years. The Pareto distribution is known to predict the size of individual incidents [Englehardt, 1995].

Sampling distributions describe the natural variability in, for example, the number of violations. That is, they describe the variability in the number of violations experienced among several imagined, repeated 30-year periods. The parameters of these distributions determine the location and scale (roughly, the mean and standard deviation) of the distributions. When little or no data are available to specify the parameters of these distributions, probability distributions, termed *prior distributions*, can then be assigned to the parameters themselves. Priors can be determined based on any combination of subjective or numeric information using Bayes Theorem. For the site-general assessment to be conducted, data could not be used. Therefore, model input consisted of professional judgment based on available data (e.g., effluent and water quality, hydraulic conductivity, and dispersion data collected during SEFLOE) and other local knowledge.

An extension of Bayesian methods was applied in this project, termed predictive Bayesian assessment. Predictive methods involve finding the unconditional probability of the numbers and sizes of violations, given the forms of the sampling distributions, and the specified distributions for sampling distribution parameters. That is, uncertainty in the parameters was integrated into the sampling distributions, resulting in *predictive distributions* for the numbers and sizes of violations. Predictive Bayesian distributions evolve in shape systematically in response to information content. As predicted by information theory, predictive distributions are broader when less is known, becoming narrower as information increases, converging on the underlying sampling distribution of variability. The increased breadth of a predictive distribution given limited information accounts for uncertainty due to information limitations. For example, because an ocean outfall in one location may have one expected number of violations and the same outfall in another setting may have another, the distribution in the number of violations is broader for the alternative to account for this range (essentially, uncertainty in location).

Predictive distributions were then used to compute distributions for total losses over the period. The model used to compute cumulative risks over a planning period is the compound Poisson model, in which the number of incidents over the period are described by a Poisson distribution, and the severity of individual incidents is described by a Pareto distribution. An example predictive Bayesian, compound Poisson risk assessment is diagramed in Figure 16. Dotted lines portray distributions with varying information content. Broader distributions represent less available information. In Figure 16, *N* is the number of injury or disease incidents of a particular type over the planning period, *Z* is the magnitude of the health impairment for individual incidents of that type, and *X* is the total (uncertain) health loss accumulated over the period.

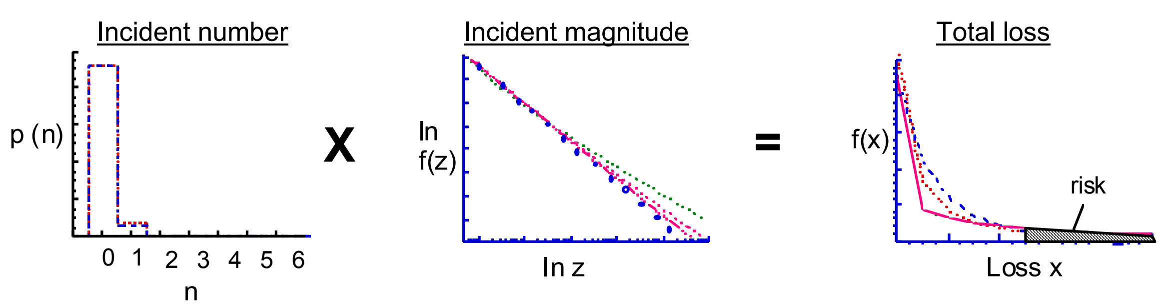

Figure 16. Schematic of the predictive Bayesian risk assessment model for probabilities of total violation-days, *X*, from distributions for number of violation events over the period, *N*, and individual violation magnitude, *Z*, based on available information.

Resulting probability distributions give mean impacts, as well as variability around the mean. For example, the levels of total loss having a 5% exceedance probability for the planning period, are indicated.

5.5. Estimation of Parameters for Incident Number

Because no data, inherently site-specific, were used explicitly in the analysis, the predictive Bayesian distributions used for incident number and incident size were equivalent to what are termed second-order probability distributions. For incident number, the distribution was based on the Poisson distribution of the number of incidents over a period, which can be written:

$$f_n(n) = \frac{\lambda^x}{n!} e^{-\lambda} \quad , \; n = 0, 1, 2, \ldots \qquad (1)$$

in which λ is the mean number of incidents over the period (and may be a fraction).

Team members were asked not to assess the expected number of occurrences in 30 years at zero for events considered highly unlikely, but rather to estimate such a mean in terms of small fractions. In a few cases where team members felt this to be impossible, a default value of 10^{-12} was used. For incident number, estimates of incident number varied over several orders of magnitude. An analytical predictive Bayesian distribution with a gamma prior could not be used to account for this range of variability, due to computational demands. Instead, a normal distribution of orders of magnitude of mean incident numbers was assumed. That is, mean incident number was assumed lognormally distributed, and the predictive Bayesian version with no available data (second order distribution) was computed numerically.

Because responses regarding mean numbers of occurrences in 30 years varied over several orders of magnitude, geometric means (equal to the average of the logs) were used as the measure of central tendency. The reported confidence of each Team member was accounted for by counting high-confidence answers three times, moderate-confidence answers two times, and low-confidence answers once, in calculating a weighted geometric mean. For example, for the three answers 10^{-4} (moderate confidence), 10^{-6} (high confidence, and 10^{-2} (low confidence), the weighted geometric mean would be found as $(10^{-4} \times 10^{-4} \times 10^{-6} \times 10^{-6} \times 10^{-6} \times 10^{-2})^{1/6} = 2.15 \times 10^{-05}$. The log of this weighted geometric mean (equivalent to the weighted mean of the logs) was then used as the mean of a normal distribution for mean incident number. Because Team member confidence, averaged over members, was low to moderate for all discharge alternatives, the standard deviation of this normal distribution was fixed at unity. That is, it was assumed that the weighted mean incident number could vary over ± two orders of magnitude, with 95% confidence.

5.6. Estimation of Parameters for Incident Size

For incident size, a predictive Bayesian version of the Pareto distribution due to Englehardt (1995), that assumes a gamma prior distribution for the scale parameter, was used in the analysis. The Pareto distribution can be written:

$$f_z(z \mid a) = \frac{a Z_o^a}{z^{a+1}} \tag{2}$$

in which Z_0 is the location parameter equal to the minimum event size of interest, a is the scale parameter equal to the slope of the log-log plot of the CDF, and z is a realization of the size of an incident measured, in this case, in days of violation. The Pareto I distribution is very highly skewed, so much so that it is not distinguishable from the axes on linear plots. Therefore it is generally plotted on log-log scale. The parameter a largely determines the risk of large losses, and was considered uncertain. The conjugate prior for a is the gamma distribution, which can be written as follows:

$$f_a(a \mid \alpha, \beta) = \frac{\beta^{\alpha} a^{\alpha-1} e^{-a\beta}}{\Gamma(\alpha)}, \quad a \geq 0 \tag{3}$$

in which α and β are greater than zero. The predictive Bayesian version of the Pareto distribution with gamma prior is then as follows (Englehardt 1995):

$$f_z(z \mid Z_0, \alpha, \beta, J, \overline{\ln z_j}) = \frac{(\beta + J\overline{\ln z_j} - J \ln Z_0)^{J+\alpha} (J + \alpha)}{z\left[\ln z + \beta + J\overline{\ln z_j} - (J+1)\ln Z_0\right]^{J+\alpha+1}} \tag{4}$$

The corresponding cumulative distribution function (CDF) is:

$$F_z(z) = 1 - \left(\frac{\beta + J\overline{\ln z_j} - J \ln Z_0}{\ln z + \beta + J\overline{\ln z_j} - (J+1)\ln Z_0} \right)^{J+\alpha} \tag{5}$$

For the assessment, the levels of confidence reported by individual Team members were assigned values of 1, 5, and 20, for low, medium and high confidence, respectively. These values represented increasingly narrow prior distributions for the mean incident size, as confidence increased. The value of the parameter α in Equation 4 was then specified as the average of the individual values. Weighted geometric means were then used to specify β using the relationship for the gamma prior that the (estimated) mean is equal to α/β. Because no numeric data was available for the generalized risk events assessed, the number of data points, J, was set equal to zero. Therefore, the remaining term representing the logarithmic mean of the data dropped out. Weighted geometric means and calculated alpha values, indicating group confidence, for the nodes indicated in results of the survey to have significant risk, are given in Table 4 and in more detail in Appendix M.

Values in Table 4 were used, as discussed above, to compute distributions of believed probability for the total number of days of violation in 30 years for each node indicated by Team responses to have significant risk. Arsenic, NDMA, and *Cryptosporidium parvum* (for surface water) or rotavirus (for ground water) were used as indicators of human health risk, and were therefore computed at drinking water nodes. In the case of ocean outfall disposal, the drinking water node assumed RO treatment and therefore was considered to have negligible risk. Therefore, human health risk for ocean outfall disposal was based on violation of surface water standards at the beach, assuming accidental ingestion of ocean water by bathers at the beach. TKN was used as an indicator of ecological risk, and was computed at surface water nodes. Where more than one node contributed significantly to either health or ecological risk for a discharge alternative, a distribution for the total believed violation days was computed by Monte Carlo simulation. Distributions for the number of violations, and for the total violation days, were truncated at 10,950, the total number of days in 30 years. That is, a violation day was defined as a day during which one or more water quality violations occurred.

Table 4. Parameter Values Specified for the Nodes having Significant Risk of Water Quality Violation due to a Discharge Alternative.

Link	Constituent	Event number		Event size	
		Weighted geo. mean	Avg. conf.(1)	Weighted geo. Mean	Avg. conf(1)
DEEP WELL INJECTION					
From Node 1.1 to Node 1.n.1.1					
Exceedance of MCL drinking water stds. in Biscayne Aquifer due to leakage from injection well casing	TKN	5.7E-06	4	0.655	4
From Node 1.n.1to Node 1.n.1.1					
Exceedence of MCL drinking water stds. in Biscayne Aquifer due to upward migration of effluent from upper Floridan through Hawthorn Formation	TKN	4.9E-07	4	0.372	4
From Node 1.n.1.2 to Node 1.n.1.2.1					
Exceedence of surface water stds. in canals due to discharge of non-potable ASR water to canals	TKN	0.098	2	14.2	2
From Node 1.n.1.2.1 to Node 1.n.1.2.1.1					
Exceedence of MCL drinking water stds. in treated drinking water deriving from canals in Biscayne Aquifer due to non-potable ASR releases to canals	rotavirus	0.002	3	2.39	3
	Arsenic	0.004	3	1.2	3
	NDMA	0.005	3	15.9	3
OCEAN OUTFALL					
From Node 2.1 to Node 2.n.2					
Exceedance of surface water std. in the farfield and benthic zones	TKN	0.28	2	1.16	2
From Node 2.2 to Node 2.n.2					
Exceedence of surface water std. in the farfield and benthic zones	TKN	0.36	2	1.54	2
From Node 2.1 to Node 2.n.3					
Exceedence of surface water stds. in beach waters due to ocean outfall discharge	*Crypto. parvum*	0.015	2	2.40	2
	Arsenic	0.001	2	0.26	2
	TKN	0.05	2	0.79	2
	NDMA	0.14	1	0.85	1
From Node 2.2 to Node 2.n.3					
Exceedence of surface water stds. in beach waters due to outfall pipeline leak	*Crypto. parvum*	1.12	1	8.94	4
	Arsenic	0.097	1	0.79	1
	TKN	0.64	1	1.94	2
	NDMA	0.62	1	4.23	1
CANAL AQUIFER RECHARGE					
From Node 3 to Node 3.1					
Exceedance of surface water stds. In canals due to discharge of AWT water	TKN	20.0	2	12.1	2
From Node 3.1 to 3.2					
Exceedance of MCL drinking water std. in Biscayne aquifer well water due to leakage from canals to well	TKN	1.18	1	3.91	2
From Node 3.2 to Node 3.2.1					
Exceedance of MCL drinking water stds. in treated potable water derived from Biscayne aquifer wells	*Crypto. parvum*	0.019	2	3.35	2
	Arsenic	0.002	2	1.60	2
	NDMA	0.38	1	71.6	1

(1) *Average of confidence reported by individual team members, in which 1 equals low, 5 equals moderate, and 20 equals high confidence.*

6. RESULTS AND DISCUSSION

Results of all computed believed probability distributions for numbers and durations of water quality violations, and total believed violation days, computed for each constituent at all nodes and for all discharge alternatives, are shown in Appendix M. Mean, standard deviation, 5% exceedance values, and full distributions, for believed probabilities, and weighted geometric means computed from expert judgment elicitation, are given. The values of total believed violation days for which there was a 5% risk of exceedance were generally lower (or zero) than the mean values. This was attributed to the high skew of the distributions, and the extremely low mean values, rather than to differences among alternatives, and were not considered in the evaluation of relative risk.

Summarized results of the probabilistic assessment are shown in Tables 5 through 7. In Table 5, the believed number of days during which one or more violations were assessed to occur are shown for human health indicators arsenic, microbes, and NDMA. In Table 6, the believed number of days during which one or more violations were assessed to occur are shown for the ecological health indicator TKN. These numbers are larger than the expected number of days on which violations would occur, because they reflect uncertainty in addition to inherent variability. In addition, they are based upon multiple assumptions, as detailed in Sections 5.1 and 5.3. In particular, the following assumptions were considered important to the results obtained:

1. Rapid vertical migration to the Upper Floridan Aquifer from deep injection wells in the Lower Floridan Aquifer was assumed. This assumption is equivalent to assuming that the Floridan Aquifer will be "impacted" with water of generally much lower dissolved solids and inorganics than native water of the aquifer, as discussed in Section 3.3. However, concentrations of organics and nutrients, including cyanide, nitrogen and phosphorous compounds, color, odor, foaming agents, total trihalomethanes (THMs), biochemical oxygen demand (BOD), and total coliform count, were found in higher concentrations in the treated effluents than in Floridan water. In addition, treated effluents were somewhat higher in temperature and lower in pH, on average. Of note based on wastewater effluent analyses obtained, on average, treated effluents met both primary and secondary standards for drinking water, with the exceptions of primary standards for antimony and total coliform, and secondary standards for color, odor, TDS, and foaming agents. The assumption of rapid vertical migration to the upper Floridan was equivalent to assuming a violation of the USDW with 100% probability. This probability of violation was therefore not computed and is not reflected in the numbers in Table 1;

2. ASR wells were assumed located one mile from effluent injection wells. It was further assumed that, as water is withdrawn from potable and non-potable ASR wells, salinity would be monitored, and withdrawals would stop if elevated levels were detected. However, the Team assessed the risks associated with the discharge of non-potable ASR water (to canals without treatment) to be higher than those associated with discharge of water from potable ASR wells (to distribution systems following chlorination and blending). Assumptions of Team members regarding the future

levels of operational control and treatment to be required before and after ASR withdrawals undoubtedly affected these judgments, and are considered to affect the risks associated with contamination of ASR wells from injection wells;

3. Because marine raw water for drinking was assumed to receive RO treatment, consumption risks were assumed driven by accidental ocean water ingestion by bathers at the beach, as indicated by the probability of violating surface water standards at the beach. In general, surface water standards are comparable to drinking water standards, though consumption of surface water in South Florida is probably three orders of magnitude less than consumption of drinking water. Assumed surface water standards for NDMA (based on California action levels) and *Cryptosporidium parvum* were adjusted by a factor of 1000 to account for this difference; the existing standard for arsenic was not (nor was the existing TKN standard, indicating ecological risk). Therefore, results for arsenic may be less indicative of actual risks; and

4. Levels of treatment assumed to be received by discharged effluent and treated drinking water varied according to regulatory requirements; only effluent released to surficial aquifers was assumed to receive AWT. Surficial aquifer recharge by canal discharge was assessed at lower risk than ocean outfalls for *Cryptosporidium parvum*, because (a) the filtration step included in AWT treatment preceding canal discharge provides efficient removal of *cryptosporidium parvum*, and (b) persistent onshore winds could result in inadequate dilution of ocean outfall plumes at the shore. Risks of surficial aquifer recharge by shallow well injection would have been much lower, assuming reverse osmosis treatment of discharged water. Thus, these assessed risks, and others evaluated in the study, depended upon the level of treatment assumed. Consideration of cost, including those of treatment, was outside the scope of this study.

Team members varied in their use of assumptions and information provided in the questionnaires, and in general drew on experience and background with the systems modeled in assessing probabilities. In general, it was felt that the conduction of ground water or other modeling exercises would not appropriate for the analysis unless conducted for all alternatives, due to the scope of the project and the number of would-be site-specific assumptions that such modeling would require. However, in light of the assumptions used, generalized scenarios represented, and uncertainties reflected, the results shown in Tables 1 and 2 should be evaluated only on a relative basis. In addition, results should not be compared among constituents. For example, arsenic risks are expected to be lower than other risks, because average arsenic concentrations in the effluent samples analyzed were lower than either existing or proposed surface and drinking water standards, in contrast with other constituents selected for assessment. While the results of Tables 1 (a) and (b) do not reflect the lower arsenic risk, the relative risks of arsenic are shown to be comparable among discharge alternatives in Table 1 (c), as expected.

Relative, or comparative, risks were defined as the ratio of believed violation days for injection well disposal to those for each of the alternatives, and are shown in Table 7. Results are considered significant in terms of orders of magnitude only. Under assumption

(1), and the definition of risk adopted by the Team, the injection well alternative would entail 10^4 violation-days because effluent would be present above the USDW every day over the 30 year planning period. Not considering violations of the USDW, the relative risks listed in Table 1 were assessed. Health risks shown for injection wells are generally lower than for other alternatives, assuming potential changes in Floridan Aquifer water quality in the vicinity of injection wells. Ecological risks within the three urban counties studied were also lower. However, impacts to the Everglades system associated with urban water use/reuse were not evaluated as part of this study.

There are important limitations to the results presented in this report. Some of these are related to the broad scope and generalized nature of the assessment, the currently limited implementation and regulation of ASR technology, uncertainties associated with emerging wastewater constituents of concern such as NDMA and PASs, and associated assumptions for the assessment. The definition of risk as the probability of violation of a standard allowed a broad assessment based on limited available information. However, the definition limits the interpretation of results. In particular, numbers of exposed individuals were not explicitly compared. Further, the assessment was based on professional judgment, educated on the basis of current data for the region, applicable published literature information, and the experience of the Team. Results represent the first quantitative assessment of wastewater discharge risks of such scope, and are therefore considered a starting point rather than an end. Never the less, results are considered important for water management planning and as a basis for further studies, and the approach taken may represent an example for future assessments. It was felt that in future studies, the number of individual risk events which expert teams are asked to assess should be reduced through preliminary screening, to more narrowly focus attention on significant risk events. Such screening is particularly important in analyses such as these in which questions require considerable thought, consideration of extensive supporting information, experience, and attention to detail. Some discussion of questions in group format may help illuminate certain issues, as well.

It was not possible to conduct a quantitative assessment of risks associated with pharmaceutically active substances (PASs), because such compounds are still being identified chemically, concentrations in treated and natural waters are largely unknown, and environmental fates are uncertain. However, the widespread use of birth control other hormonally active drugs, and the lack of removal of PASs in conventional wastewater treatment, suggest that associated potential risks requires significant further study. Specifically, Team members noted that PASs are becoming constituent of concern. Currently these substances are not monitored. Most direct evidence of toxicity is in the form of animal data; evidence in humans is limited at the present time. However, it has been shown that such chemicals are present in concentrations not previously recognized. Questions include whether PASs would be removed by advanced wastewater treatment prior to canal discharge, and what are the effects of microbial degradation, sunlight, dilution, adsorption, and other natural processes on the fate of PASs in the environment. It was suggested that estrogens may be useful as an indicator in future risk assessment, because the compounds and their health effects are measurable.

In addition to PASs, the Team felt that potential risks of blue-green algae related to the discharge of treated wastewater effluent, also outside the scope of the current project, also deserve further study. Several species of freshwater or freshwater-estuarine cyanobacteria, or blue-green algae, that are toxic or potentially toxic occur in Florida waters (Burns 2000). Recent monitoring studies in Florida (SJRWMD 2000) of recreational and surface drinking water supplies (75 individual water bodies) with algal blooms, found 87/167 samples with significant levels of blue green algae (Fleming et al. 2000). All of these samples were positively identified to contain blue green algal toxins with 80% lethal in mice. Burns (2000) reported that microcystin(s) and cylindrospermopsin were the cyanotoxins most often encountered in fresh and brackish water bodies in Florida, and demonstrated toxicity by mouse bioassay. Because such algae are nitrogen-fixing, their growth rate is independent of TKN releases in wastewater effluent. However, growth is enhanced with phosphorus concentration, and even AWT effluents contain concentrations of phosphorus approximately two orders of magnitude greater than are found in natural surface waters of South Florida. Furthermore, efficiencies of removal of cyanotoxins by conventional flocculation and filtration are not high (Burns 2000). Therefore, eutrophication associated with the release of treated wastewater effluent pose potential health risks that were not evaluated in this study. Information on blue-green algae toxicity in Florida is limited at present, and further study is suggested.

Table 5. Comparison of Human Health Risk Indicators for three Discharge Alternatives Not Considering Violation of the USDW

Alternative Disposal Methods	**Mean Believed Violation Days In 30 Years[1]**		
	Arsenic	**Microbial[2]**	**NDMA**
Deep Well Injection	1	0.1	0.5
Ocean Outfall	10	50	30
Canal Aquifer Recharge	0.3	5	40

[1]*Results reflect input developed on a relative basis, and should not be evaluated individually.*
[2]*rotavirus for ground water nodes; Cryptosporidium parvum for surface water nodes*

Table 6. Comparison of an Ecological Risk Indicator for three Discharge Alternatives Not Considering Violation of the USDW

Alternative Disposal Methods	**Mean Believed Violation Days In 30 Years**[1]
	TKN
Deep Well Injection	10
Ocean Outfall	40
Canal Aquifer Recharge	100

[1]*Results reflect input developed on a relative basis, and should not be evaluated individually.*

Table 7. Relative Risk Indicators for Three Disposal Alternatives Not Considering Violation of the USDW

Alternative Disposal Methods	**Relative Mean Believed Violation Days In 30 Years**[1] **(days/days)**			
	Arsenic	**Microbial (rotavirus or *Cryptosporidium parvum***	**NDMA**	**TKN**
Injection Well/Ocean Outfall	10^{-1}	10^{-3}	10^{-2}	10^{-1}
Injection Well/Canal Aquifer Recharge	10^{0}	10^{-2}	10^{-2}	10^{-1}

[1]*Higher values represent higher potential frequency of, and/or higher uncertainty in the probability of, violating surface and drinking water standards given current treatment requirements, for a generalized scenario in Southeast Florida. Values less than one indicate a lower believed risk of violating standards for injection well disposal relative to the alternative.*

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APPENDIX A. SUMMARY DATA TABLES FOR ADVANCED WASTEWATER TREATMENT EFFLUENT, RECLAIMED WATER, SECONDARY EFFLUENT, EFFLUENT INJECTION ZONE, LOWER MONITORING ZONE, UPPER MONITORING ZONE, ASR INJECTION ZONE, AND BISCAYNE MONITORING ZONE

Table A7 - ASR Injection Zone Analysis

Parameter Name	Standard mg/L	Number of Data	Min-0	Min-dl	Max-0	Max-dl	Mean-0	Mean-dl	Std Dev-0	Std Dev-dl
Inorganic Analysis										
Arsenic (mg/L)	0.05	5	0	0.002	0	0.01	0	0.00438	0	0.0034
Barium (mg/L)	2	5	0	0.012	1.506	1.506	0.3788	0.4288	0.65	0.62
Cadmium (mg/L)	0.005	5	0	0.003	0	0.005	0	0.0038	0	0.001095
Chromium (mg/L)	0.1	5	0	0.006	0.019	0.02	0.0038	0.017	0.0085	0.0062
Cyanide (mg/L)	0.2	4	0	0.004	0	0.006	0	0.0045	0	0.001
Fluoride (mg/L)	4	5	1.3	1.3	1.86	1.86	1.58	1.58	0.24	0.24
Lead (mg/L)	0.015	5	0	1E-04	0.005	0.01	0.001	0.00342	0.0022	0.0041
Mercury (mg/L)	0.002	5	0	2E-04	0	0.001	0	0.00084	0	0.0004
Nickel (mg/L)	0.1	4	0	0.005	0	0.01	0	0.00875	0	0.0025
Nitrate (mg/L)	10	4	0	0.01	0.11	0.11	0.0275	0.0375	0.055	0.049
Nitrite (mg/L)	1	4	0	0.01	0	0.02	0	0.0125	0	0.005
Selenium (mg/L)	0.05	5	0	0.002	0.013	0.013	0.0026	0.0066	0.006	0.005
Sodium (mg/L)	160	4	950	950	1827	1827	1214.8	1214.8	410.5	410.5
Antimony (mg/L)	0.006	4	0	0.005	0	0.017	0	0.008	0	0.006
Beryllium (mg/L)	0.004	4	0	3E-04	0	0.002	0	0.00158	0	0.0009
Thallium (mg/L)	0.002	4	0	6E-04	0	0.002	0	0.00165	0	0.0007
Secondary Analysis					0					
Aluminum (mg/L)	0.2	4	0	0.05	0	0.2		0.1625		0.075
Chloride (mg/L)	250	5	1920	1920	3524	3524	2448.4	2448.4	641.7	641.6902
Copper (mg/L)	1	5	0	0.005	0.023	0.023	0.0098	0.011	0.0086	0.0072
Iron (mg/L)	0.3	5	0.022	0.022	4.295	4.295	1.0782	1.08	1.81	1.81
Manganese (mg/L)	0.05	5	0	0.012	0.165	0.165	0.0412	0.045	0.07	0.067
Silver (mg/L)	0.1	5	0	0.004	0	0.01	0	0.0078	0	0.003
Sulfate (mg/L)	250	5	238	238	725	725	521.8	521.8	189.2	189.2
Zinc (mg/L)	5	5	0	0.003	0.324	0.324	0.0814	0.083	0.14	0.14
Color (PtCo units)	15	5	0	0	31	31	12	12	12.5897	12.59
Odor (TON)	3	4	1	1	50	50	13.5	13.5	24.34	24.34
pH (std. units)	6.5-8.5	5	6.91	6.91	8.39	8.39	7.526	7.526	0.57	0.57
TDS (mg/L)	500	5	3910	3910	7880	7880	5240	5240	1691.8	1691.8
Foaming Agents (mg/L)	1.5	5	0	0.01	0.18	0.18	0.07	0.077	0.081	0.074
Trihalomethane Analysis					0					
Total THMs (mg/L)		4	0	0.002	9.93	9.93	2.48	2.73293	4.96	4.8
Radiological Analysis					0					
Gross Alpha (pCi/L)		5	7.8	7.8	47	47	24.66	24.66	14.89	14.89
Miscellaneous Analysis					0					
Ammonia-N (mg/L)		4	0.4	0.4	0.73	0.73	0.575	0.575	0.16	0.156
Nitrogen, total (mg/L)			0	0	0	0				
Nitrogen, organic (mg/L)		3	0.19	0.19	0.42	0.42	0.3067	0.30667	0.12	0.12
Nitrogen, total Kjeldahl (mg/L)		3	0.71	0.71	0.91	0.91	0.83	0.83	0.11	0.11
Ortho-phosphate (mg/L)		3	0	0.02	0.2	0.2	0.13	0.13667	0.11	0.1
Phosphorus, total (mg/L)		2	0.22	0.22	0.29	0.29	0.255	0.255	0.05	0.05
BOD (mg/L)		3	0	1	1.9	1.9	1.23	1.57	1.07	0.49
Total Coliform (col/100ml)		1	6	6	6	6	6	6	one data	one data
Water Temperature (°C)				0		0				

0: Non-detects are assumed to be zero

dl: Non-detects are assumed to be detection limit values

TableA2 - Reclaimed Water Analysis

Parameter Name	Standard mg/L	Number of Data	Min-0	Min-dl	Max-0	Max-dl	Mean-0	Mean-dl	Std Dev-0	Std Dev-dl
Inorganic Analysis										
Arsenic (mg/L)	0.05	11	0	0.0004	0	0.01	0	0.00633	0	0.003784
Barium (mg/L)	2	11	0	0.01	0	0.7	0	0.18727	0	0.2514
Cadmium (mg/L)	0.005	11	0	0.0001	0.003	0.005	0.0003	0.00234	0.000905	0.001966
Chromium (mg/L)	0.1	11	0	0.001	0.0017	0.01	0.0002	0.00552	0.000568	0.003754
Cyanide (mg/L)	0.2	5	0	0.002	0	0.004	0	0.0036	0	0.000894
Fluoride (mg/L)	4	11	0	0.25	0.69	0.72	0.371	0.46373	0.255291	0.202166
Lead (mg/L)	0.015	11	0	0.0005	0	0.005	0	0.0023	0	0.001942
Mercury (mg/L)	0.002	11	0	0.0001	0.001	0.001	0.0002	0.00039	0.000405	0.000394
Nickel (mg/L)	0.1	5	0	0.005	0	0.01	0	0.009	0	0.002236
Nitrate (mg/L)	10	11	0.21	0.21	9.1	9.1	3.6895	3.68945	3.399235	3.399235
Nitrite (mg/L)	1	5	0	0.02	0	0.05	0	0.026	0	0.013416
Selenium (mg/L)	0.05	11	0	0.0015	0	0.01	0	0.00695	0	0.003086
Sodium (mg/L)	160	10	58.2	58.2	107	107	74.91	74.91	13.73903	13.73903
Antimony (mg/L)	0.006	6	0	0.005	0.81	0.81	0.1363	0.14715	0.330051	0.325213
Beryllium (mg/L)	0.004	5	0	0.002	0	0.03	0	0.0082	0	0.012194
Thallium (mg/L)	0.002	5	0	0.001	0	0.002	0	0.0018	0	0.000447
Secondary Analysis										
Aluminum (mg/L)	0.2	4	0	0.1	0	0.1	0	0.1	0	0
Chloride (mg/L)	250	11	75	75	148	148	116.85	116.855	21.67378	21.67378
Copper (mg/L)	1	11	0	0.0002	0.1	0.1	0.015	0.02635	0.031346	0.031366
Iron (mg/L)	0.3	11	0	0.01	0.4	0.4	0.1722	0.18218	0.130155	0.118543
Manganese (mg/L)	0.05	11	0	0.0086	0.0976	0.0976	0.0214	0.02598	0.026029	0.026276
Silver (mg/L)	0.1	11	0	0.0005	0.002	0.005	0.0002	0.00173	0.000603	0.001587
Sulfate (mg/L)	250	11	27	27	190	190	76.236	76.2364	58.31295	58.31295
Zinc (mg/L)	5	11	0	0.01	0.063	0.063	0.0202	0.02564	0.020576	0.015762
Color (PtCo units)	15	5	25	25	40	40	33	33	6.708204	6.708204
Odor (TON)	3	5	0	1	8	8	2.4	2.6	3.209361	3.04959
pH (std. units)	6.5-8.5	10	6.2	6.2	7.6	7.6	7.049	7.049	0.397952	0.397952
TDS (mg/L)	500	11	354	354	1119	1119	528	528	221.2569	221.2569
Foaming Agents (mg/L)	1.5	11	0	0.01	0.29	0.5	0.1202	0.16564	0.108449	0.149901
Trihalomethane Analysis										
Total THMs (mg/L)	100	10	11	11	61.3	61.3	26.85	26.85	15.38327	15.38327
Radiological Analysis										
Gross Alpha (pCi/L)		9	0.5	0.5	6.7	6.7	3.6	2.73333	4.384062	3.444319
Miscellaneous Analysis										
Ammonia-N (mg/L)		0								
Nitrogen, total (mg/L)		4	10	10	16	16	13.3	13.3	2.473863	2.473863
Nitrogen, organic (mg/L)		0								
Nitrogen, total Kjeldahl (mg/L)		4	3.3	3.3	4.5	4.5	4.075	4.075	0.567891	0.567891
Ortho-phosphate (mg/L)		0								
Phosphorus, total (mg/L)		4	1.1	1.1	2	2	1.375	1.375	0.4272	0.4272
BOD (mg/L)		0								
Total Coliform (col/100ml)		0								
Water Temperature (°C)										

0: Non-detects are assumed to be zero

dl: Non-detects are assumed to be detection limit values

Table A3 - Secondary Effluent Analysis

Parameter Name	Standard mg/L	Number of Data	Min-0	Min-dl	Max-0	Max-dl	Mean-0	Mean-dl	Std Dev-0	Std Dev-dl
Inorganic Analysis										
Arsenic (mg/L)	0.05	29	0	0.0006	0.001	0.0102	8.2E-05	0.0053	0.000251	0.004269
Barium (mg/L)	2	13	0	0.0053	0.008	0.2	0.00205	0.0447	0.003253	0.059476
Cadmium (mg/L)	0.005	30	0	5E-05	0.0009	0.005	3.7E-05	0.002	0.000167	0.002122
Chromium (mg/L)	0.1	29	0	0.0008	0.005	0.05	0.00025	0.009	0.000963	0.014684
Cyanide (mg/L)	0.2	27	0	0.004	0.03	0.2	0.00349	0.0272	0.007952	0.05269
Fluoride (mg/L)	4	12	0	0.289	2.37	2.37	0.73475	0.8381	0.576867	0.543375
Lead (mg/L)	0.015	29	0	0.0003	0.0492	0.0492	0.00366	0.0051	0.009075	0.009886
Mercury (mg/L)	0.002	29	0	6E-05	0.0009	0.0002	0.00005	0.0119	0.00026	0.052274
Nickel (mg/L)	0.1	27	0	0.0021	0.038	0.038	0.00952	0.0115	0.008941	0.008017
Nitrate (mg/L)	10	17	0.05	0.05	15.1	15.1	3.81869	3.8187	4.839476	4.839476
Nitrite (mg/L)	1	10	0	0.015	2.12	2.12	0.5677	0.5812	0.726813	0.715296
Selenium (mg/L)	0.05	28	0	0.0004	0.025	0.025	0.00129	0.0074	0.004757	0.00759
Sodium (mg/L)	160	13	48.1	48.1	361	361	114.077	114.08	90.88082	90.88082
Antimony (mg/L)	0.006	11	0	0.0002	0.0053	0.2	0.00044	0.0255	0.00153	one data
Beryllium (mg/L)	0.004	27	0	0.0001	0.0005	0.003	3.3E-05	0.0012	0.000121	0.000962
Thallium (mg/L)	0.002	25	0	0.0002	0.0133	0.0133	0.00054	0.0027	0.002559	0.004052
Secondary Analysis										
Aluminum (mg/L)	0.2	17	0	0.0473	0.226	0.226	0.03926	0.1084	0.066301	0.056661
Chloride (mg/L)	250	12	21.9	21.9	530	530	151.846	151.85	134.0317	134.0317
Copper (mg/L)	1	29	0	0.0013	0.0206	0.0206	0.00259	0.0054	0.004005	0.005428
Iron (mg/L)	0.3	13	0.03	0.03	0.459	0.459	0.183	0.183	0.143084	0.143084
Manganese (mg/L)	0.05	12	0	0.0076	0.0321	0.05	0.01005	0.0256	0.011728	0.015478
Silver (mg/L)	0.1	28	0	5E-05	0.0048	0.02	0.00018	0.0031	0.00089	0.006098
Sulfate (mg/L)	250	13	23.2	23.2	160	160	56.6231	56.623	39.30592	39.30592
Zinc (mg/L)	5	29	0	0.004	0.08	0.08	0.00883	0.0194	0.016222	0.017668
Color (PtCo units)	15	11	10	10	133	133	43.9091	43.909	33.06193	33.06193
Odor (TON)	3	9	0	1	75	75	10.6667	11.24	24.65766	24.40017
pH (std. units)	6.5-8.5	16	6.1	6.1	7.81	7.81	6.8625	6.8625	0.5634	0.5634
TDS (mg/L)	500	14	362	362	1260	1260	550.714	550.71	227.1639	227.1639
Foaming Agents (mg/L)	1.5	11	0	0.02	26.6	26.6	2.49	2.5451	7.996706	7.979272
Trihalomethane Analysis									0	
Total THMs (mg/L)	100	7	0	0.0063	222	222	56.8466	66.321	82.49571	86.09661
Radiological Analysis									0	
Gross Alpha (pCi/L)		7	0	0.1	1	1	0.25	0.55	0.5	one data
Miscellaneous Analysis									0	
Ammonia-N (mg/L)		10	0	2.47	18.8	18.8	8.33636	9.17	5.386528	4.872855
Nitrogen, total (mg/L)		1	17	17	17	17	17	17	one data	one data
Nitrogen, organic (mg/L)		5	0.13	0.13	2.94	2.94	1.584	1.584	1.328431	1.328431
Nitrogen, total Kjeldahl (mg/L)		12	1.8	1.8	21.7	21.7	9.78333	9.7833	6.038319	6.038319
Ortho-phosphate (mg/L)		11	0.23	0.23	4.08	4.08	1.43091	1.4309	1.175955	1.175955
Phosphorus, total (mg/L)		17	0.46	0.46	2.54	2.54	1.32706	1.3271	0.578109	0.578109
BOD (mg/L)		10	0.6	0.6	33	33	8.3	8.3	10.22937	10.22937
Total Coliform (col/100ml)		8	-10	-10	2100	2100	425	363.14	829.114	774.3699
Water Temperature (°C)		3	25	25	26	26	25.3333	25.333	0.57735	0.57735

0: Non-detects are assumed to be zero

dl: Non-detects are assumed to be detection limit values

Table A4 - Injection Zone Analysis

Parameter Name	Standard mg/L	Number of Data	Min-0	Min-dl	Max-0	Max-dl	Mean-0	Mean-dl	Std Dev-0	Std Dev-dl
Inorganic Analysis										
Arsenic (mg/L)	0.05	13	0	0.002	0.07	0.07	0.0068	0.0125	0.01918	0.01864
Barium (mg/L)	2	7	0	0.004	0.91	0.91	0.1686	0.2003	0.34207	0.33175
Cadmium (mg/L)	0.005	11	0	0.003	0.014	0.014	0.0027	0.0055	0.00451	0.00309
Chromium (mg/L)	0.1	4	0	0.002	0.037	0.037	0.0098	0.0173	0.01819	0.01509
Cyanide (mg/L)	0.2	3	0	0.006	0	0.02	0	0.012	0	0.00721
Fluoride (mg/L)	4	14	0.51	0.51	1.31	1.31	0.7021	0.7021	0.22105	0.22105
Lead (mg/L)	0.015	14	0	0.001	0.336	0.336	0.0673	0.0706	0.09334	0.09098
Mercury (mg/L)	0.002	14	0	2E-04	0.0006	0.001	0.0001	0.0004	0.00021	0.0003
Nickel (mg/L)	0.1	4	0	0.01	0.042	0.05	0.0105	0.0355	0.021	0.01754
Nitrate (mg/L)	10	19	0	0.01	6	6	0.4224	0.4255	1.35584	1.35485
Nitrite (mg/L)	1	4	0	0.004	0	0.05	0	0.0185	0	0.02119
Selenium (mg/L)	0.05	4	0	0.007	5	0.05	1.2518	0.023	2.49884	0.01965
Sodium (mg/L)	160	21	1920	1920	12629	12629	8061.8	8061.8	2854.66	2854.66
Antimony (mg/L)	0.006	3	0	0.002	0	0.01	0	0.006	0	0.004
Beryllium (mg/L)	0.004	4	0	1E-04	0.01	0.04	0.0025	0.0126	0.005	0.01886
Thallium (mg/L)	0.002	4	0	0.009	1.2	1.2	0.3	0.3098	0.6	0.59352
Secondary Analysis										
Aluminum (mg/L)	0.2	13	0	0.03	0.62	0.62	0.1731	0.2262	0.23286	0.2037
Chloride (mg/L)	250	25	2080	2080	21884	21884	15302	15302	7006.64	7006.64
Copper (mg/L)	1	14	0	0.002	5	0.16	0.3875	0.0323	1.32822	0.04152
Iron (mg/L)	0.3	16	0.018	0.018	16.8	16.8	3.1507	3.1507	3.91199	3.91199
Manganese (mg/L)	0.05	14	0	0.019	0.19	0.19	0.0256	0.0513	0.0532	0.04254
Silver (mg/L)	0.1	4	0	0.01	0.068	0.068	0.0358	0.0383	0.03335	0.02998
Sulfate (mg/L)	250	21	120	120	2884	2884	2379.2	2379.2	785.022	785.022
Zinc (mg/L)	5	4	0	0.005	0.013	0.02	0.0033	0.012	0.0065	0.00627
Color (PtCo units)	15		0	0	95	95	7.3889	7.3889	22.6408	22.6408
Odor (TON)	3	3	0	1	2	2	1	1.3333	1	0.57735
pH (std. units)	6.5-8.5	21	7.23	7.23	9.33	9.33	7.6976	7.6976	0.4425	0.4425
TDS (mg/L)	500	25	4640	4640	39800	39800	28682	28682	13049.7	13049.7
Foaming Agents (mg/L)	1.5	3	0	0.07	0.12	0.12	0.0633	0.0967	0.06028	0.02517
Trihalomethane Analysis										
Total THMs (mg/L)		3	0	4E-04	0	0.001	0	0.0006	0	0.0004
Radiological Analysis										
Gross Alpha (pCi/L)		3	0	8.7	8.7	21.3	4.35	15	6.15183	8.90955
Miscellaneous Analysis										
Ammonia-N (mg/L)		4	0	0.05	14.8	14.8	3.7475	3.785	7.36888	7.34356
Nitrogen, total (mg/L)		2	0	6.66	15.37	15.37	7.685	11.015	10.8682	6.1589
Nitrogen, organic (mg/L)		4	0.56	0.56	2.2	2.2	0.9975	0.9975	0.80218	0.80218
Nitrogen, total Kjeldahl (mg/L)		3	0.39	0.39	15.37	15.37	5.5267	5.5267	8.52729	8.52729
Ortho-phosphate (mg/L)		3	0.023	0.023	0.65	0.65	0.2337	0.2337	0.36056	0.36056
Phosphorus, total (mg/L)		4	0	0.064	0.82	0.82	0.2458	0.2958	0.38502	0.35422
BOD (mg/L)		3	0	1	2.5	20	0.8333	7.8333	1.44338	10.5633
Total Coliform (col/100ml)		3	0	1	54	54	33.333	33.667	29.1433	28.5715
Water Temperature (°C)		2	21.9	21.9	23.7	23.7	22.8	22.8	1.27279	1.27279

0: Non-detects are assumed to be zero

dl: Non-detects are assumed to be detection limit values

Table A5 - Lower Monitoring Zone Analysis

Parameter Name	Standard mg/L	Number of Data	Min-0	Min-dl	Max-0	Max-dl	Mean-0	Mean-dl	Std Dev-0	Std Dev-dl
Inorganic Analysis										
Arsenic (mg/L)	0.05	10	0	0.006	0.024	0.025	0.003	0.011	0.008	0.007
Barium (mg/L)	2	4	0	0.01	1.33	1.33	0.362	0.365	0.646	0.644
Cadmium (mg/L)	0.005	10	0	0.002	0.073	0.073	0.011	0.013	0.023	0.022
Chromium (mg/L)	0.1	4	0	0.01	0	0.05		0.023		0.019
Cyanide (mg/L)	0.2	4	0	0.004	0	0.01		0.009		0.003
Fluoride (mg/L)	4	13	0.13	0.13	1.92	1.92	0.861	0.861	0.502	0.502
Lead (mg/L)	0.015	10	0	0.005	0.56	0.56	0.106	0.111	0.177	0.174
Mercury (mg/L)	0.002	10	0	2E-04	0.0022	0.002	0.001	0.001	0.001	0.0007
Nickel (mg/L)	0.1	4	0	0.04	0.082	0.082	0.021	0.051	one data	0.021
Nitrate (mg/L)	10	14	0	0.01	0.233	0.233	0.059	0.071	0.070	0.065
Nitrite (mg/L)	1	5	0	0.004	0	0.05		0.025		0.023
Selenium (mg/L)	0.05	4	0	0.004	0	0.01		0.007		0.003202
Sodium (mg/L)	160	16	153	153	11250	11250	5514.3	5514.3	3786.8	3786.8
Antimony (mg/L)	0.006	5	0	0.003	0	0.05		0.019		0.021
Beryllium (mg/L)	0.004	5	0	6E-04	0	0.04		0.010		0.017
Thallium (mg/L)	0.002	4	0	0.002	0	0.02		0.013		0.009
Secondary Analysis										
Aluminum (mg/L)	0.2	10	0	0.036	3.7	3.7	0.877	0.957	1.239	1.18
Chloride (mg/L)	250	18	251	251	19500	19500	9897	9897	6580	6580
Copper (mg/L)	1	10	0	0.004	0.119	0.119	0.029	0.036	0.038	0.033
Iron (mg/L)	0.3	11	0.3	0.3	15.8	15.8	4.450	4.450	4.851	4.851
Manganese (mg/L)	0.05	10	0	0.01	0.09	0.09	0.046	0.046	0.036	0.032
Silver (mg/L)	0.1	4	0	0.01	0.017	0.017	0.004	0.012	one data	0.0035
Sulfate (mg/L)	250	18	48	48	2720	2720	1118	1118	873	873
Zinc (mg/L)	5	4	0	0.016	0.022	0.022	0.010	0.020	0.011	0.0025
Color (PtCo units)	15	10	0	0	20	20	6.000	6.500	7.2	6.9
Odor (TON)	3	4	1	1	4	4	3.250	3.250	1.5	1.5
pH (std. units)	6.5-8.5	15	6.93	6.93	10.61	10.61	7.925	7.925	0.8	0.85
TDS (mg/L)	500	19	844	844	40000	40000	18328	18328	12414	12414
Foaming Agents (mg/L)	1.5	4	0.14	0.14	0.52	0.52	0.253	0.253	0.157	0.157
Trihalomethane Analysis										
Total THMs (mg/L)		4	0	1	1.1	1.1	0.275	1.025	one data	0.05
Radiological Analysis										
Gross Alpha (pCi/L)		3	7.3	7.3	7.3	7.3	7.300	7.300	one data	one data
Miscellaneous Analysis										
Ammonia-N (mg/L)		10	0.18	0.18	1.5	1.5	0.561	0.561	0.386	0.386
Nitrogen, total (mg/L)		5	0	0.56	1.5	1.5	0.818	0.944	0.637	0.477
Nitrogen, organic (mg/L)		5	0	0.1	0.92	0.92	0.364	0.384	0.356	0.333
Nitrogen, total Kjeldahl (mg/L)		5	0.22	0.22	0.76	0.76	0.474	0.474	0.226	0.226
Ortho-phosphate (mg/L)		4	0	0.01	0	0.1		0.045		0.04
Phosphorus, total (mg/L)		6	0.01	0.01	0.7	0.7	0.261	0.261	0.289	0.289
BOD (mg/L)		5	0	1	0	20		5.400		8.17
Total Coliform (col/100ml)		3	0	1	20	20	6.667	7.333	one data	10.97
Water Temperature (°C)		4	21.8	21.8	26	26	23.475	23.475	1.784	1.784

0: Non-detects are assumed to be zero

dl: Non-detects are assumed to be detection limit values

Table A6 - Upper Monitoring Zone Analysis

Parameter Name	Standard mg/L	Number of Data	Min-0	Min-dl	Max-0	Max-dl	Mean-0	Mean-dl	Std Dev-0	Std Dev-dl
Inorganic Analysis										
Arsenic (mg/L)	0.05	8	0	0.003	0.0025	0.025	0.00031	0.00944	0.00088	0.00683
Barium (mg/L)	2	4	0	0.01	0.275	0.275	0.08775	0.09025	0.12687	0.12465
Cadmium (mg/L)	0.005	7	0	5E-04	0.44	0.44	0.06414	0.06664	0.16577	0.16465
Chromium (mg/L)	0.1	4	0	0.01	0	0.02	0	0.0125	0	0.005
Cyanide (mg/L)	0.2	4	0	0.004	0	0.01	0	0.0085	0	0.003
Fluoride (mg/L)	4	7	0.76	0.76	2	2	1.46571	1.46571	0.57824	0.57824
Lead (mg/L)	0.015	7	0	0.005	0.054	0.054	0.01771	0.02557	0.02316	0.02047
Mercury (mg/L)	0.002	7	0	2E-04	0.005	0.005	0.0011	0.00136	0.00199	0.00185
Nickel (mg/L)	0.1	4	0	0.039	0.039	0.04	0.00975	0.03975	0.0195	0.0005
Nitrate (mg/L)	10	8	0	0.01	0.11	0.11	0.03125	0.0525	0.0398	0.03694
Nitrite (mg/L)	1	5	0	0.004	0	0.05	0	0.0248	0	0.02313
Selenium (mg/L)	0.05	4	0	0.004	0	0.01	0	0.00725	0	0.0032
Sodium (mg/L)	160	7	702	702	2500	2500	1356.71	1356.71	604.651	604.651
Antimony (mg/L)	0.006	5	0	0.005	0	0.05	0	0.0194	0	0.02009
Beryllium (mg/L)	0.004	5	0	6E-04	0	0.04	0	0.00992	0	0.01689
Thallium (mg/L)	0.002	4	0	0.002	0	0.02	0	0.013	0	0.00872
Secondary Analysis										
Aluminum (mg/L)	0.2	7	0	0.09	3.76	3.76	0.68714	0.80143	1.40013	1.33737
Chloride (mg/L)	250	8	663	663	3874	3874	2203.25	2203.25	1020.45	1020.45
Copper (mg/L)	1	7	0	0.002	0.83	0.83	0.12629	0.13843	0.3109	0.30535
Iron (mg/L)	0.3	8	0.501	0.501	140	140	19.2939	19.2939	48.8208	48.8208
Manganese (mg/L)	0.05	7	0	0.011	0.055	0.055	0.02129	0.03271	0.02219	0.01748
Silver (mg/L)	0.1	4	0	0.01	0	0.01	0	0.01	0	0
Sulfate (mg/L)	250	8	260	260	680	680	401	401	172.143	172.143
Zinc (mg/L)	5	4	0	0.02	0.19	0.19	0.054	0.064	0.09149	0.08405
Color (PtCo units)	15	8	0	2	50	50	12.25	12.875	16.714	16.2783
Odor (TON)	3	4	0	1	4	4	2	2.25	1.63299	1.25831
pH (std. units)	6.5-8.5	9	5.88	5.88	8.94	8.94	7.73333	7.73333	0.8247	0.8247
TDS (mg/L)	500	9	2396	2396	7388	7388	4128	4128	1585.91	1585.91
Foaming Agents (mg/L)	1.5	5	0	0.03	0.2	0.2	0.108	0.128	0.08758	0.06535
Trihalomethane Analysis										
Total THMs (mg/L)		4	0	0.5	0.5	1	0.125	0.875	0.25	0.25
Radiological Analysis										
Gross Alpha (pCi/L)		3	4.1	4.1	4.1	4.1	4.1	4.1	#DIV/0!	one data
Miscellaneous Analysis										
Ammonia-N (mg/L)		6	0	0.05	2.28	2.28	0.64	0.64833	0.8282	0.82069
Nitrogen, total (mg/L)		1	0	2.66	0	2.66	0	2.66	#DIV/0!	one data
Nitrogen, organic (mg/L)		5	0	0.1	1.13	1.13	0.422	0.442	0.44218	0.42002
Nitrogen, total Kjeldahl (mg/L)		5	0.3	0.3	1.63	1.63	0.678	0.678	0.55306	0.55306
Ortho-phosphate (mg/L)		4	0	0.01	0	0.1	0	0.045	0	0.04041
Phosphorus, total (mg/L)		6	0	0.01	0.68	0.68	0.11833	0.14	0.27542	0.26683
BOD (mg/L)		5	0	1	16	16	6.7	7.3	7.42967	6.77864
Total Coliform (col/100ml)		3	0	1	0	1	0	1	0	0
Water Temperature (°C)		4	22.9	22.9	27	27	24.275	24.275	1.89099	1.89099

0: Non-detects are assumed to be zero

dl: Non-detects are assumed to be detection limit values

Table A7 - ASR Injection Zone Analysis

Parameter Name	Standard mg/L	Number of Data	Min-0	Min-dl	Max-0	Max-dl	Mean-0	Mean-dl	Std Dev-0	Std Dev-dl
Inorganic Analysis										
Arsenic (mg/L)	0.05	5	0	0.002	0	0.01	0	0.00438	0	0.0034
Barium (mg/L)	2	5	0	0.012	1.506	1.506	0.3788	0.4288	0.65	0.62
Cadmium (mg/L)	0.005	5	0	0.003	0	0.005	0	0.0038	0	0.001095
Chromium (mg/L)	0.1	5	0	0.006	0.019	0.02	0.0038	0.017	0.0085	0.0062
Cyanide (mg/L)	0.2	4	0	0.004	0	0.006	0	0.0045	0	0.001
Fluoride (mg/L)	4	5	1.3	1.3	1.86	1.86	1.58	1.58	0.24	0.24
Lead (mg/L)	0.015	5	0	1E-04	0.005	0.01	0.001	0.00342	0.0022	0.0041
Mercury (mg/L)	0.002	5	0	2E-04	0	0.001	0	0.00084	0	0.0004
Nickel (mg/L)	0.1	4	0	0.005	0	0.01	0	0.00875	0	0.0025
Nitrate (mg/L)	10	4	0	0.01	0.11	0.11	0.0275	0.0375	0.055	0.049
Nitrite (mg/L)	1	4	0	0.01	0	0.02	0	0.0125	0	0.005
Selenium (mg/L)	0.05	5	0	0.002	0.013	0.013	0.0026	0.0066	0.006	0.005
Sodium (mg/L)	160	4	950	950	1827	1827	1214.8	1214.8	410.5	410.5
Antimony (mg/L)	0.006	4	0	0.005	0	0.017	0	0.008	0	0.006
Beryllium (mg/L)	0.004	4	0	3E-04	0	0.002	0	0.00158	0	0.0009
Thallium (mg/L)	0.002	4	0	6E-04	0	0.002	0	0.00165	0	0.0007
Secondary Analysis					0					
Aluminum (mg/L)	0.2	4	0	0.05	0	0.2		0.1625		0.075
Chloride (mg/L)	250	5	1920	1920	3524	3524	2448.4	2448.4	641.7	641.6902
Copper (mg/L)	1	5	0	0.005	0.023	0.023	0.0098	0.011	0.0086	0.0072
Iron (mg/L)	0.3	5	0.022	0.022	4.295	4.295	1.0782	1.08	1.81	1.81
Manganese (mg/L)	0.05	5	0	0.012	0.165	0.165	0.0412	0.045	0.07	0.067
Silver (mg/L)	0.1	5	0	0.004	0	0.01	0	0.0078	0	0.003
Sulfate (mg/L)	250	5	238	238	725	725	521.8	521.8	189.2	189.2
Zinc (mg/L)	5	5	0	0.003	0.324	0.324	0.0814	0.083	0.14	0.14
Color (PtCo units)	15	5	0	0	31	31	12	12	12.5897	12.59
Odor (TON)	3	4	1	1	50	50	13.5	13.5	24.34	24.34
pH (std. units)	6.5-8.5	5	6.91	6.91	8.39	8.39	7.526	7.526	0.57	0.57
TDS (mg/L)	500	5	3910	3910	7880	7880	5240	5240	1691.8	1691.8
Foaming Agents (mg/L)	1.5	5	0	0.01	0.18	0.18	0.07	0.077	0.081	0.074
Trihalomethane Analysis					0					
Total THMs (mg/L)		4	0	0.002	9.93	9.93	2.48	2.73293	4.96	4.8
Radiological Analysis					0					
Gross Alpha (pCi/L)		5	7.8	7.8	47	47	24.66	24.66	14.89	14.89
Miscellaneous Analysis					0					
Ammonia-N (mg/L)		4	0.4	0.4	0.73	0.73	0.575	0.575	0.16	0.156
Nitrogen, total (mg/L)			0	0	0	0				
Nitrogen, organic (mg/L)		3	0.19	0.19	0.42	0.42	0.3067	0.30667	0.12	0.12
Nitrogen, total Kjeldahl (mg/L)		3	0.71	0.71	0.91	0.91	0.83	0.83	0.11	0.11
Ortho-phosphate (mg/L)		3	0	0.02	0.2	0.2	0.13	0.13667	0.11	0.1
Phosphorus, total (mg/L)		2	0.22	0.22	0.29	0.29	0.255	0.255	0.05	0.05
BOD (mg/L)		3	0	1	1.9	1.9	1.23	1.57	1.07	0.49
Total Coliform (col/100ml)		1	6	6	6	6	6	6	one data	one data
Water Temperature (°C)				0		0				

0: Non-detects are assumed to be zero

dl: Non-detects are assumed to be detection limit values

Table A8 - Biscayne Monitoring Zone Analysis

Parameter Name	Standard mg/L	Number of Data	Min-0	Min-dl	Max-0	Max-dl	Mean-0	Mean-dl	Std Dev-0	Std Dev-dl
Inorganic Analysis										
Arsenic (mg/L)	0.05	19	0	5E-04	0.051	0.051	0.0142	0.0154	0.016795	0.0158712
Barium (mg/L)	2	5	0.02	0.024	1.12	1.12	0.2442	0.2442	0.489599	0.4895994
Cadmium (mg/L)	0.005	13	0	1E-04	0.003	0.003	0.0003	0.0016	0.000826	0.0010074
Chromium (mg/L)	0.1	5	0	0.002	0.0027	0.02	0.0019	0.0059	0.001108	0.0078821
Cyanide (mg/L)	0.2	5	0	5E-04	0.0133	0.013	0.0027	0.0051	0.005948	0.0052529
Fluoride (mg/L)	4	14	0.12	0.12	0.36	0.36	0.1856	0.1856	0.066	0.0659995
Lead (mg/L)	0.015	13	0	0.001	0.026	0.026	0.0089	0.0097	0.008797	0.0082093
Mercury (mg/L)	0.002	14	0	2E-04	0.0022	0.002	0.0002	0.0004	0.00058	0.0005528
Nickel (mg/L)	0.1	5	0	8E-04	0.0041	0.01	0.0015	0.0035	0.001551	0.0038296
Nitrate (mg/L)	10	19	0	0.01	1.45	1.45	0.1933	0.1949	0.336738	0.3358004
Nitrite (mg/L)	1	5	0	0.01	0	0.01	0	0.01	0	0
Selenium (mg/L)	0.05	5	0	5E-04	0	0.004	0	0.0012	0	0.0015652
Sodium (mg/L)	160	13	15.9	15.9	153	153	80.169	80.169	55.7358	55.735796
Antimony (mg/L)	0.006	5	0	0.002	0	0.003	0	0.0027	0	0.0005814
Beryllium (mg/L)	0.004	5	0	2E-04	0	3E-04	0	0.0002	0	4.472E-05
Thallium (mg/L)	0.002	5	0	6E-04	0	0.001	0	0.0009	0	0.0001789
Secondary Analysis										
Aluminum (mg/L)	0.2	14	0	0.02	3.44	3.44	0.8219	0.8233	1.108805	1.1076768
Chloride (mg/L)	250	20	24	24	417	417	176.23	176.23	118.9342	118.9342
Copper (mg/L)	1	14	0	5E-04	0.011	0.011	0.0046	0.0053	0.003163	0.0031677
Iron (mg/L)	0.3	14	0	0.001	2.12	2.12	0.4204	0.4204	0.535206	0.535206
Manganese (mg/L)	0.05	14	0	0.003	0.049	0.049	0.0127	0.0135	0.013877	0.0134208
Silver (mg/L)	0.1	6	0	2E-04	0.0064	0.01	0.0011	0.0045	0.002613	0.0048904
Sulfate (mg/L)	250	16	0	1	99	99	38.7	38.9	25.78065	25.465973
Zinc (mg/L)	5	6	0	0.001	0.11	0.11	0.0247	0.0247	0.041991	0.0419911
Color (PtCo units)	15	14	3	3	50	50	21.929	21.929	15.4146	15.4146
Odor (TON)	3	6	0	1	1	1	0.3333	1	0.516398	0
pH (std. units)	6.5-8.5	18	6.76	6.76	11.7	11.7	8.0844	8.0844	1.359837	1.3598366
TDS (mg/L)	500	14	279	279	844	844	533.07	533.07	187.7693	187.76928
Foaming Agents (mg/L)	1.5	6	0	0.02	0	1	0	0.3867	0	0.4760952
Trihalomethane Analysis										
Total THMs (mg/L)		3	0	0.001	0.0397	0.04	0.0259	0.0263	0.022473	0.0218962
Radiological Analysis										
Gross Alpha (pCi/L)		2	0.4	0.4	10.7	10.7	5.55	5.55	7.2832	7.2831998
Miscellaneous Analysis										
Ammonia-N (mg/L)			0	0	0	0				
Nitrogen, total (mg/L)			0	0	0	0				
Nitrogen, organic (mg/L)			0	0	0	0				
Nitrogen, total Kjeldahl (mg/L)			0	0	0	0				
Ortho-phosphate (mg/L)			0	0	0	0				
Phosphorus, total (mg/L)			0	0	0	0				
BOD (mg/L)			0	0	0	0				
Total Coliform (col/100ml)			0	0	0	0				
Water Temperature (°C)		10	24	24	25.5	25.5	24.35	24.35	0.579751	0.5797509

0: Non-detects are assumed to be zero

dl: Non-detects are assumed to be detection limit values

APPENDIX B. TABLES OF DATA TOTALS AND STATISTICS, ASSUMING NON-DETECTED VALUES EQUAL TO ZERO

Table B1- AWT with Non-detects as zero

			Southgate Bioassay Composite									Gulf Gate WWTP Composite							
Parameter	**units**	**Detection limit**	#######	######	#######	#######	########	#######	########	#######	########	######	#######	########	**Number of Data**	**Min**	**Max**	**Mean**	**Stadard Deviation**
Inorganic Analysis																			
Arsenic	ug/L	2.6	0	0	0	0	0	0	0	0	0	0	0	0	12	0	0	0.0000	0.0000
Cadmium	ug/L	0.18	0	0	0	0	0	0	0	0	0	0.29			10	0	0.29	0.0290	0.0917
Calcium	mg/L	0.009	38.5	40.4	38.3	39.8	34.7	34.3	38.9	39.1	38.8	30.8	28.4	28.3	12	28.3	40.4	35.8583	4.4684
Chromium	ug/L	1	0	0	2.73	0	0	0	0	0	0	0	0	0	12	0	2.73	0.2275	0.7881
Copper	ug/L	1	16.2	6.9	4.1	2.66	3.46	1.78	1.46	0	0	0	0	0	12	0	6.9	3.0467	4.6693
Iron	ug/L	16	40	80	0.12	0.16	0.085	0.09	0.09	0.11	0.12	0.15	0.16	0.12	12	0.085	80	10.1004	24.8192
Lead	ug/L	0.5	0	0	0	0	0	0	0	0	0	0	0	0	12	0	0	0.0000	0.0000
Magnesium	mg/L	0.001	31	23.6	23.7	18.7	20.9	20.6	23.9	24.4	25	25.5	23.3	23.4	12	18.7	25.5	23.6667	3.0368
Mercury	ug/L	0.2	0	0	0	0	0	0	0	0	0	0	0	0	12	0	0	0.0000	0.0000
Molybdenum	ug/L	1	0	0	0	0	0	0	1.02	1.36	1.01	0	0	0	12	0	1.36	0.2825	0.5181
Nickel	ug/L	3.3	0	3.45	4.7	0	0	0	0	0	0	0	0	0	12	0	4.7	0.6792	1.6084
Potassium	ug/L	0.2	15.7	15.9	15.3	15.6	15.2	15	14.9	15.7	15.3	13.4	13.6	13	12	13	15.9	14.8833	0.9880
Selenium	ug/L	1.7	0	0	0	0	0	0	0	0	0	0	0	0	12	0	0	0.0000	0.0000
Sodium	mg/L	0.5	63.7	57.9	58.3	57	54.4	55.6	60.5	57.8	58.2	82.6	77.6	81.1	12	54.4	82.6	63.7250	10.3935
Zinc	mg/L	0.003	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.03	0.02	12	0.02	0.03	0.0217	0.0039
Bromide	mg/L	0.1	0.1	0.2	0.1	0.2	0.2	0.1	0.1	0.2	0.2	0.1	0.1	0.1	12	0.1	0.2	0.1417	0.0515
Fluoride	mg/L	0.1	0.82	0.85	0.93	0.92	0.95	0.9	0.84	0.96	0.86	1.12	1.08	1.09	12	0.82	1.12	0.9433	0.1026
Sulfate	mg/L	1	172	204	200	180	200	190	164	171	167	170	168	168	12	164	204	179.5000	14.8661
Strontium	mg/L	0.03	2.93	3.61	3.32	2.94	3.76	3.64	3.79	4.05	4.08	2.59	2.55	2.62	12	2.55	4.08	3.3233	0.5740
Secondary Analysis																			
Bicarbonate Alkalinity	mg/L	0.6	60.4	57.6	55.2	65.6	57.2	58.9	67.2	57.8	70.4	92.9	84.2	79.3	12	55.2	92.9	67.2250	12.2413
Chloride	mg/L	0.25	80.6	75	72.7	78.1	75.8	69	81	79.2	78	103	95.2	99.1	12	69	103	82.2250	10.8376

Table B2 - Reclaimed Water Analysis with Non-detects a

Parameter Name	Standard mg/L	Units	Boca Raton	City of Hollywood WWTP	Hollywood reuse filter	Boca Raton	Boca Raton	Boca Raton	Boca Raton	Hollywood Re-use filter	Hollywood Re-use filter	Hollywood Re-use filter	Boca Raton	No of Data	Min	Max	Mean	Std. Dev.	Mean-Reg. Std.
Date of the Analysis			2/2/00	4/25/96	4/17/00	2/17/98	1/29/97	1/10/96	1/17/95	12/16/99	4/17/00	7/10/00	1/26/99						
Inorganic Analysis																			
Arsenic	0.05	mg/L	0	0	0	0	0	0	0	0	0	0	0	11	0	0	0.00	0.00	-0.050
Barium	2	mg/L	0	0	0	0	0	0	0	0	0	0	0	11	0	0	0.00	0.00	-2.000
Cadmium	0.005	mg/L	0	0	0	0	0	0	0	0	0	0	0.003	11	0	0.003	0.00	0.00	-0.005
Chromium	0.1	mg/L	0.0017	0	0	0	0	0.001	0	0	0	0	0	11	0	0.0017	0.00	0.00	-0.100
Cyanide	0.2	mg/L		0	0					0	0	0		5	0	0	0.00	0.00	-0.200
Fluoride	4	mg/L	0	0	0.67	0.34	0.289	0.27	0.292	0.69	0.67	0.61	0.25	11	0	0.69	0.37	0.26	-3.629
Lead	0.015	mg/L	0	0	0	0	0	0	0	0	0	0	0	11	0	0	0.00	0.00	-0.015
Mercury	0.002	mg/L	0	0	0.001	0	0	0	0	0	0.001	0	0	11	0	0.001	0.00	0.00	-0.002
Nickel	0.1	mg/L	0	0	0					0	0	0		5	0	0	0.00	0.00	-0.100
Nitrate	10	mg/L	1.03	0.21	9.1	1.34	6.03	0.304	3.3	2.3	9.1	6.5	1.37	11	0.21	9.1	3.69	3.40	-6.311
Nitrite	1	mg/L		0	0					0	0	0		5	0	0	0.00	0.00	-1.000
Selenium	0.05	mg/L	0	0	0	0	0	0	0	0	0	0	0	11	0	0	0.00	0.00	-0.050
Sodium	160	mg/L		107	69	79.6	77.6	64.6	73.1	85	69	66	58.2	10	58.2	107	74.91	13.74	-85.1
Antimony	0.006	mg/L	0.81	0	0					0.0079	0	0		6	0	0.81	0.14	0.33	0.130
Beryllium	0.004	mg/L		0	0					0	0	0		5	0	0	0.00	0.00	-0.004
Thallium	0.002	mg/L		0	0					0	0	0		5	0	0	0.00	0.00	-0.002
Secondary Analysis																			
Aluminum	0.2	mg/L		0	0						0	0		4	0	0	0.00	0.00	-0.200
Chloride	250	mg/L	126	75	130	120	148	96	101	140	130	120	99.4	11	75	148	116.85	21.67	-133.1
Copper	1	mg/L	0.1	<0.01	0	0	0	0.021	0	0.025	0	0.0035	0	11	0	0.1	0.01	0.03	-0.985
Iron	0.3	mg/L	0.4	0.29	0.28	0.054	0	0.18	0	0.16	0.28	0.16	0.09	11	0	0.4	0.17	0.13	-0.128
Manganese	0.05	mg/L	0.0976	0	0.022	0.014	0.01	0.0086	0.0146	0.014	0.022	0.019	0.014	11	0	0.0976	0.02	0.03	-0.029
Silver	0.1	mg/L	0	0.002	0	0	0	0	0	0	0	0	0	11	0	0.002	0.00	0.00	-0.100
Sulfate	250	mg/L	36.1	150	120	27	39.4	28.7	35	64	120	190	28.4	11	27	190	76.24	58.31	-173.76
Zinc	5	mg/L	0	0	0.032	0.036	0.032	0	0.011	0.063	0.032	0.016	0	11	0	0.063	0.02	0.02	-4.98
Color	15	PtCo units		40	30					25	30	40		5	25	40	33.00	6.71	18.0
Odor	3	TON		0	1					2	1	8		5	0	8	2.40	3.21	-0.6
pH (units)	6.5-8.5	std units	6.87	6.8	7	7.5	7.2	7.6	7		7	6.2	7.32	10	6.2	7.6	7.05	0.40	
TDS	500	mg/L	385	1119	550	354	438	400	400	540	550	690	382	11	354	1119	528.00	221.26	28.0
Foaming Agents	1.5	mg/L	0.23	0.13	0.01	0.04	0.246	0	0.2	0.29	0.01	0.026	0.14	11	0	0.29	0.12	0.11	-1.4
Trihalomethane Analysis																			
Total THMs	100	mg/L	11		34.8	13.3	35	17.4	21	61.3	34.8	26.9	13	10	11	61.3	26.85	15.38	-73.2
Radiological Analysis																			
Gross Alpha		pCi/L	1.2+/-1.4	6.7	4.0+/-5.0	0.5	<1.0		n/a	0.0+/-0.7	4+/-5	3+/-5	0+/-0.6	9	0.5	6.7	3.60	4.38	3.6
Miscellenous Analysis																			
Ammonia-N		mg/L												0					
Nitrogen, total		mg/L			13.6					16	13.6	10		4	10	16	13.30	2.47	13.3
Nitrogen, organic		mg/L												0					
Nitrogen, total Kjeldahl		mg/L			4.5					3.3	4.5	4		4	3.3	4.5	4.08	0.57	4.1
Ortho-phosphate		mg/L												0					
Phosphorus, total		mg/L			1.1					2	1.1	1.3		4	1.1	2	1.38	0.43	1.4
BOD		mg/L												0					
Water Temperature		° C												0					

Table B3 - Secondary Effluent with Non-Detects as zero

Parameter Name	Standard mg/L	Units	Golden Gate WWTP (Naples)	Seacoast unchlorinated effluent	City of Hollywood	Sunrise (IW3) Sawgrass	North District WWTP	City of Ft. Lauderdale	Broward County	MDWSD N Dist IW3	Broward Co.	Hollywood WTP (reuse filter)	City of Hollywood WTP	City of Hollywood WTP	City of Hollywood WTP
Date of Analysis			1/13/2000	9/30/1988	4/25/1996		9/12/1995	2/2/2000		3/19/1999	3/18/1997	7/9/1999	5/3/2000	5/10/2000	5/17/2000
Inorganic Analysis															
Arsenic	0.05	mg/L	0	0	0			0	0.00101	0	0	0			
Barium	2	mg/L	0.00526	0	0	0		0	0.008	0		0			
Cadmium	0.005	mg/L	0	0.0009	0	0		0	0	0	0	0			
Chromium	0.1	mg/L	0	0	0			0	0.005	0	0	0			
Cyanide	0.2	mg/L			0			0	0	0	0	0			
Fluoride	4	mg/L	0	0.29	0.72			0.898	0.76	0.75		0.67			
Lead	0.015	mg/L	0.001	0.002	0			0.0492	0.0008	0	0.00289	0			
Mercury	0.002	mg/L	0	0.0003	0			0.0002	0	0	0.000405	0			
Nickel	0.1	mg/L			0			0.038	0.00549	0	0.0173	0			
Nitrate	10	mg/L	4.34		0.24			0.507	0.05	0.64		15	2.5	2.2	2.1
Nitrite	1	mg/L			0			0.607	0	0		0			
Selenium	0.05	mg/L	0	0	0			0	0	0	0	0			
Sodium	160	mg/L	109	82	48.1	66.2		361	226	181		53			
Antimony	0.006	mg/L		0	0			0.0053	0	0	0	0			
Beryllium	0.004	mg/L			0			0.0005	0	0	0	0			
Thallium	0.002	mg/L			0			0	0	0	0	0			
Secondary Analysis															
Aluminum	0.2	mg/L			0			0.141	0.105	0					
Chloride	250	mg/L	155	93.3	65	94.5		530	300	218		110			
Copper	1	mg/L	0.00184	0	0			0.0206	0	0	0.00314	0.0026			
Iron	0.3	mg/L	0.09	0.1	0.15	0.09		0.396	0.219	0.209		0.12			
Manganese	0.05	mg/L	0.0076	0.02	0			0.02	0.02	0		0			
Silver	0.1	mg/L	0.00023	0	0			0	0	0	0	0.00022			
Sulfate	250	mg/L	48.5	32	47	32.6		110	71	71.9		160			
Zinc	5	mg/L	0.08	0.01	0	0		0.026	0.023	0.02	0	0.024			
Color	15	PtCo units		50	30			133	30	50		10			
Odor	3	TON			0			2		75		16			
pH (units)	6.5-8.5	std uni	6.84	7.15	7.1			7.03	7.53	6.93			6.1	6.1	6.2
TDS	500	mg/L	448	398	416	394		1260	690	610	634	590			
Foaming Agents	1.5	mg/L	0	26.6	0.2			0.074	0.13			0.15			
Trihalomethane Analysis															
Total THMs	100	mg/L	64							7.18		222			
Radiological Analysis															
Gross Alpha		pCi/L	5.4+/-1.2		1+/-0.5			0		0		0.6+/-0.6			
Miscellaneous Analysis															
Ammonia-N		mg/L	12.56	18.8		2.47							10.5	12.6	11.1
Nitrogen, total		mg/L										17			
Nitrogen, organic		mg/L	2.54	2.94		2.11									
Nitrogen, total Kjeldahl		mg/L	15.1	21.7		4.58						1.8	13.4	12.9	12.3
Ortho-phosphate		mg/L	1.07	4.08		1.99							0.63	0.98	0.68
Phosphorus, total		mg/L	1.4			2.19						0.85	0.76	1.13	0.77
BOD		mg/L						18.1			1.3		3	3	4
Total Coliform		col/100ml			0	180		2100		5*10-4		0			
Water Temperature		° C													

City of Hollywood WTP	City of Hollywood WTP	Palm Beach County	Sunrise (IW1 + IW2)	Sunrise (IW1 + IW2)	Sunrise (IW3)	Broward Co. Secondary Effluent								
5/24/2000	5/31/2000	1999	2/23/1999	2/11/2000	########	12/11/1996	3/18/1997	5/7/1997	6/17/1997	7/9/1997	11/4/1997	4/8/1998	6/24/1998	7/9/1998
		0.00061	0	0	0	0	0	0	0	0	0	0	0	0
		0.00606	0	0	0									
		0	0	0	0.0002	0	0	0	0	0	0	0	0	0
		0.00146	0	0	0	0	0	0	0	0	0	0	0	0
		0	0	0.03	0	0.00472	0	0	0	0	0.024	0.0145	0.00575	0
		0.289	0.74	0.6	0.73									
		0.00027	0	0.004	0	0.00197	0.00289	0.00198	0.00424	0.00427	0.0046	0.0034	0.00322	0
		0	0	0	0	0	0.000405	0	0.000865	0.000552	0.000378	0	0.000271	0.000428
		0.00309	0	0	0	0.0135	0.0173	0.0094	0.0101	0.00819	0.0144	0.0169	0.0205	0.00956
1.7	1.5	2.03	5.69	15.1	7.41									
		0.73	2.12	0.06	0.73									
		0.00326	0.025	0	0.006	0	0	0	0	0	0	0	0	0
		58.4	86.1	74.3	78.1									
		0	0	0	0									
		0	0.0004	0	0	0	0	0	0	0	0	0	0	0
		0.00114	0	0	0	0	0	0	0.0133	0	0	0	0	0
		0.0473	0.1	0	0									0
		89.7	21.9	81.6	125									
		0.00298	0	0	0	0	0.00314	0.00276	0.00273	0.00229	0.0037	0.00609	0.00219	0.00238
		0.386	0.08	0.03	0.05									
		0.0209	0	0	0									
		0	0	0	0	0	0	0	0	0	0	0	0	0
		32	29.3	30.6	23.2									
		0.0126	0	0	0	0	0	0	0	0	0	0	0	0
		35	40	15	60									
		0	1	1	1									
6.2	6.2	6.67	7.26	7.1	7.58									
		514	484	460	450									
		0.166	0.03	0.02	0.02									
		100	4.74		0									
		0												
7.5	6.4		4.62	0	5.15									
			0.2		0.13									
13	10		5.32	2.02	5.28									
0.4	0.8		2.54	0.23	2.34									
0.94	0.94		2.54	2.2	1.81									
3	5		12	0.6	33									
				280	-10									
			25	26	25									

Broward Co. Secondary Effluent							Delray Beach	Mean	Min	Max	Standard Deviation	No of Data	Mean-Reg. Standard
8/6/1998	9/10/1998	10/8/1998	11/5/1998	12/3/1998	9/9/1999	2/9/2000	#######						
0	0	0	0	0	0	0	0.0008	0.00	0.00	0.00	0.00	29	-0.050
							0.0073	0.00	0.00	0.01	0.00	13	-1.998
0	0	0	0	0	0	0	0.0000	0.00	0.00	0.00	0.00	30	-0.005
0	0	0	0	0	0	0	0.0008	0.00	0.00	0.01	0.00	29	-0.100
0	0	0	0	0	0.0152	0	0.0000	0.00	0.00	0.03	0.01	27	-0.197
							2.37	0.73	0.00	2.37	0.58	12	-3.265
0.00247	0	0.00165	0.011	0	0	0.00422	0	0.00	0.00	0.05	0.01	29	-0.011
0	0.000408	0.000296	0.000542	0.000798	0.000061	0	0	0.00	0.00	0.00	0.00	29	-0.002
0.00654	0.0158	0.0021	0.00523	0.0095	0.00841	0.0224	0.00324	0.01	0.00	0.04	0.01	27	-0.090
							0.092	3.82	0.05	15.10	4.84	17	-6.181
							1.43	0.57	0.00	2.12	0.73	10	-0.432
0	0	0	0	0	0	0	0.0032	0.00	0.00	0.03	0.00	28	-0.049
							59.8	114.08	48.10	361.00	90.88	13	-45.923
							0	0.00	0.00	0.01	0.00	11	-0.006
0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	27	-0.004
0	0	0	0	0	0	0	0.00024	0.00	0.00	0.01	0.00	25	-0.001
0	0	0	0	0	0	0.0482	0.226	0.04	0.00	0.23	0.07	17	-0.161
							90	151.85	21.90	530.00	134.03	12	-98.154
0.00134	0.00272	0	0	0.00138	0	0.0072	0.006	0.00	0.00	0.02	0.00	29	-0.997
							0.459	0.18	0.03	0.46	0.14	13	-0.117
							0.0321	0.01	0.00	0.03	0.01	12	-0.040
0	0	0	0	0	0	0	0.0048	0.00	0.00	0.00	0.00	28	-0.100
							48	56.62	23.20	160.00	39.31	13	-193.377
0	0.00517	0.00843	0.00402	0.0181	0	0.00901	0.0247	0.01	0.00	0.08	0.02	29	-4.991
							30	43.91	10.00	133.00	33.06	11	28.909
							0	10.67	0.00	75.00	24.66	9	7.667
							7.81	6.86	6.10	7.81	0.56	16	#VALUE!
							362	550.71	362.00	1260.00	227.16	14	50.714
							0	2.49	0.00	26.60	8.00	11	0.990
											0.00		
							0.0063	56.85	0.00	222.00	82.50	7	-43.153
											0.00		
							1	0.25	0.00	1.00	0.50	7	0.250
											0.00		
								8.34	0.00	18.80	5.39	10	8.336
								17.00	17.00	17.00	one data	1	17.000
								1.58	0.13	2.94	1.33	5	1.584
								9.78	1.80	21.70	6.04	12	9.783
								1.43	0.23	4.08	1.18	11	1.431
	0.46	1.13	1.33	1.49	1.07	1.55		1.33	0.46	2.54	0.58	17	1.327
								8.30	0.60	33.00	10.23	10	8.300
								425.00	-10.00	2100.00	829.11	8	425.000
								25.33	25.00	26.00	0.58	3	25.333

Table B4 - Injection Zone with Non-detects as zero

Parameter Name	Standard mg/L	Units	Boynton Beach	Seacost Pump test 2020-3320	City of WPB IW6	BCNRWW TP IW-5	Injection Zone IW-6	MDWSD N Dist. IN-2	MDWASD S WWTP IW and MW 7946	7947	7948	8101	8102	8103	8105	8106	8107	8108	8109
Inorganic Analysis																			
Arsenic	0.05	mg/L				0	0	0	0	0		0.006	0.006	0.006			0.07		
Barium	2	mg/L	0			0.91	0.27	0											
Cadmium	0.005	mg/L	0.0037			0	0	0	0	0.007		0.005	0	0.014			0		
Chromium	0.1	mg/L	0.002			0.037	0	0											
Cyanide	0.2	mg/L				0	0	0											
Fluoride	4	mg/L		0.62		0.95	0.72	0.95	0.67	0.62	1.31	0.57	0.51	0.57					
Lead	0.015	mg/L	0.04			0	0	0	0.06	0.174		0.336	0.036	0.082			0.052		
Mercury	0.002	mg/L	0			0	0	0	0	0.0002		0.0002	0.0002	0.0002			0		
Nickel	0.1	mg/L	0			0	0.042	0											
Nitrate	10	mg/L			6	0.46	0	0	0.04	0.08	0.04	0.12	0.05	0.12			0.06	0.06	
Nitrite	1	mg/L			0	0	0	0											
Selenium	0.05	mg/L	5			0	0.007	0											
Sodium	160	mg/L	11400		1920	12629	2385	8100	7020	7668	3132	7506	7344	7992			7560	7560	
Antimony	0.006	mg/L				0	0	0											
Beryllium	0.004	mg/L	0.01			0	0	0											
Thallium	0.002	mg/L	1.2			0	0	0											
Secondary Analysis																			
Aluminum	0.2	mg/L				0	0	0	0.55	0.39		0.62	0	0			0.07		
Chloride	250	mg/L		19400	3099	21884	4899	21000	17700	19300	5650	19400	19400	19600	5050	5050	19700	19200	2080
Copper	1	mg/L	0.03			0.065	0.017	5	0.008	0.016		0.16	0.062	0.022			0.018		
Iron	0.3	mg/L	4	0.76	1	1.483	1.16	2.2	0.86	4.08		16.8	4.4	3.32			0.018		
Manganese	0.05	mg/L	0.19			0.032	0.019	0.03	0	0		0.087	0	0			0		
Silver	0.1	mg/L	0.06			0.068	0.015	0											
Sulfate	250	mg/L		2680	120	2884	679	2600	2360	2580	830	2620	2600	2760			2640	2740	
Zinc	5	mg/L	0			0	0.013	0											
Color	15	PtCo units		0	>70	6	95	25		2	0	0	0				0	0	
Odor	3	TON				0	1	2											
pH (units)	6.5-8.5	std units		7.35	8.26	7.63	7.23	9.33	7.75	7.7	7.65	7.4	7.4	7.4			7.5	7.45	
TDS	500	mg/L		38200	5093	30450	9130	31000	31874	37180	10884	36700	37000	36100	10200	9840	36200	36300	4640
Foaming Agents	1.5	mg/L				0.07	0.12	0											
Trihalomethane Analysis																			
Total THMs		mg/L				0	0	0											
Radiological Analysis																			
Gross Alpha		pCi/L				8.7	0	210+/-390											
Miscellaneous Analysis																			
Ammonia-N		mg/L			0	0.19	14.8	0											
Nitrogen, total		mg/L			0		15.37												
Nitrogen, organic		mg/L			0.56	0.63	0.6	2.2											
Nitrogen, total Kjeldahl		mg/L				0.82	15.37	0.39											
Ortho-phosphate		mg/L				0.028	0.65	0.023											
Phosphorus, total		mg/L			0	0.064	0.82	0.099											
BOD		mg/L				2.5	0	0											
Total Coliform		col/100ml				0	54	46											
Water Temperature		° C					23.7	21.9											

8110	MDWASD S WWTP IW and MW 8111	8112	8113	8524	8526	8399	8400	8525	Number of Data	Min	Max	Mean	Standart Deviation	Mean - Reg. Standard
				0		0	0	0	13	0	0.07	0.0068	0.0192	-0.043
						0	0	0	7	0	0.91	0.1686	0.3421	-1.831
				0					11	0	0.014	0.0027	0.0045	-0.002
									4	0	0.037	0.0098	0.0182	-0.090
									3	0	0	0.0000	0.0000	-0.200
				0.61		0.56	0.58	0.59	14	0.51	1.31	0.7021	0.2211	-3.298
				0		0.128	0.034	0	14	0	0.336	0.0673	0.0933	0.052
				0		0.0006	0.0006	0	14	0	0.0006	0.0001	0.0002	-0.002
									4	0	0.042	0.0105	0.0210	-0.090
	0.15	0.02	0.05	0.235		0.05	0.155	0.335	19	0	6	0.4224	1.3558	-9.578
									4	0	0	0.0000	0.0000	-1.000
									4	0	5	1.3	2.5	1.2
	7992	7776	8014	10800	10900	10200	10600	10800	21	1920	12629	8061.8	2854.7	7901.8
									3	0	0	0.0000	0.0000	-0.006
									4	0	0.01	0.0025	0.0050	-0.002
									4	0	1.2	0.3000	0.6000	0.298
				0		0.41	0.16	0.05	13	0	0.62	0.1731	0.2329	-0.027
4950	19500	19500	19500	19700	19400	19400	18800	19400	25	2080	21884	15302.5	7006.6	15052.5
				0		0.019	0.004	0.004	14	0	5	0.4	1.3	-0.6
				0.51		3.2	3.3	3.32	16	0.018	16.8	3.2	3.9	2.9
				0		0	0	0	14	0	0.19	0.0256	0.0532	-0.024
									4	0	0.068	0.0358	0.0334	-0.064
	2760	2760	2620	2760	2840	2660	2670	2800	21	120	2884	2379.2	785.0	2129.2
									4	0	0.013	0.0033	0.0065	-4.997
	0	0	0	1	1	0	1	2		0	95	7.3889	22.6408	-7.611
									3	0	2	1.0000	1.0000	-2.000
	7.7	7.5	7.6	7.55	7.7	8.05	7.65	7.85	21	7.23	9.33	7.7	0.4	
10348	37000	37600	38700	39800	38300	37500	38000	39000	25	4640	39800	28681.6	13049.7	28181.6
									3	0	0.12	0.0633	0.0603	-1.437
									3	0	0	0.0000	0.0000	0.000
									3	0	8.7	4.3500	6.1518	4.350
									4	0	14.8	3.7475	7.3689	3.748
									2	0	15.37	7.6850	10.8682	7.685
									4	0.56	2.2	0.9975	0.8022	0.998
									3	0.39	15.37	5.5267	8.5273	5.527
									3	0.023	0.65	0.2337	0.3606	0.234
									4	0	0.82	0.2458	0.3850	0.246
									3	0	2.5	0.8333	1.4434	0.833
									3	0	54	33.3333	29.1433	33.333
									2	21.9	23.7	22.8000	1.2728	22.800

Table B5 - Lower Monitoring Zone with non-detects as zero

Parameter Name	Standard mg/L	Units	MD-North District 70717-2 FA-2N Lower	Miami Dade North District FA-4 Lower	MDWASD South District FA-10 Lower	MDWASD-Westfield Lower	City of WPB IW 6 F2 Lower	MW-1 Sanders Lab	MW-1 Savannah Lab	MW-2 Sanders Lab	MW-2 Savannah Lab	Boynton Beach 110969 Lower Zone	MDWASD S WWTP IW and MW 7941	7942	7943	7944	7945
Arsenic	0.05	mg/L	0	0	0	0.024						0	0	0	0	0	0
Barium	2	mg/L	0.042	0.076	0	1.33											
Cadmium	0.005	mg/L	0.073	0	0	0							0.023	0.008	0	0.006	0
Chromium	0.1	mg/L	0	0	0	0											
Cyanide	0.2	mg/L	0	0	0	0											
Fluoride	4	mg/L	0.61	0.8	0.8	0.38							1.92	1.72	1.2	0.88	0.95
Lead	0.015	mg/L	0	0.0052	0	0							0.028	0.216	0.076	0.56	0.16
Mercury	0.002	mg/L	0	0	0	0							0.0022	0.0018	0.0008	0.0008	0.0003
Nickel	0.1	mg/L	0	0	0	0.082											
Nitrate	10	mg/L	0.13	0	0	0	0						0.03	0.04	0.06	0.02	0.04
Nitrite	1	mg/L	0	0	0	0	0										
Selenium	0.05	mg/L	0	0	0	0											
Sodium	160	mg/L	7600	7200	7900	2167	8200	1546	NA	2470	NA		972	2430	3726	5238	5076
Antimony	0.006	mg/L	0	0	0	0						0					
Beryllium	0.004	mg/L	0	0	0	0						0					
Thallium	0.002	mg/L	0	0	0	0											
Aluminum	0.2	mg/L	0	0	0	0							3.7	2.2	1.31	0.99	0.53
Chloride	250	mg/L	17000	14000	14000	4649	14346	3949	4300	4949	5000		1080	4160	8260	12300	11500
Copper	1	mg/L	0	0	0	0.02							0.119	0.066	0.03	0.033	0.013
Iron	0.3	mg/L	2.9	1.4	0.78	0.443	10						15.8	6.6	2.95	6.1	1.68
Manganese	0.05	mg/L	0.072	0.015	0	0.013							0.09	0.06	0.06	0.09	<0.040
Silver	0.1	mg/L	0	0	0	0.017											
Sulfate	250	mg/L	1100	830	1700	466	660	481	350	548	500		324	535	1140	1700	1660
Zinc	5	mg/L	0	0.022	0	0.016											
Color	15	PtCo u	10	0	20	12	>70						0	3			
Odor	3	TON	4	4	1	4											
pH (units)	6.5-8.5	std unit	7.83	8.57	6.93	10.61	8.13					7.45	7.7	7.8	8.2	7.6	7.9
TDS	500	mg/L	21000	18000	31000	7220	24243	6000	7100	9320	10000	28300	3224	7528	15212	21900	21544
Foaming Agents	1.5	mg/L	0.52	0.14	0.16	0.27						0.177					
Total THMs		mg/L	0	0	0	1.1											
Gross Alpha		pCi/L		180+/-280	350+/-210	7.3											
Ammonia-N		mg/L	0.22	0.18	1.5	0.42	0.4	0.75	0.61	0.53	0.73	0.27					
Nitrogen, total		mg/L					0	1.43	0.6	1.5	0.56						
Nitrogen, organic		mg/L	0.44	0.92	0	0.34	0.12										
Nitrogen, total Kjeldahl		mg/L	0.22	0.65	0.42	0.76						0.32					
Ortho-phosphate		mg/L	0	0	0	0											
Phosphorus, total		mg/L	0.034	0.03	0.29	0.7	0.5					0.01					
BOD		mg/L	0	0	0	0						0					
Total Coliform		col/100	0	20	0												
Water Temperature		° C	23	21.8	23.1		26										

MDWASD S WWTP IW and MW									
8396	8397	8398	7628	Number of Data	Min	Max	Mean	Standart Deviation	Mean - Reg. Standard
			0.014	10	0	0.024	0.0035	0.0080	-0.047
				4	0	1.33	0.3620	0.6461	-1.638
			0	10	0	0.073	0.0110	0.0230	0.006
				4	0	0			-0.100
				4	0	0			-0.200
0.6	0.59	0.61	0.13	13	0.13	1.92	0.8608	0.5019	-3.139
			0.01	10	0	0.56	0.1055	0.1768	0.091
			0	10	0	0.0022	0.0006	0.0008	-0.001
				4	0	0.082	0.0205	one data	-0.080
0.11	0.233	0.145	0.02	14	0	0.233	0.0591	0.0701	-9.941
				5	0	0			-1.000
				4	0	0			-0.050
11200	11100	11250	153	16	153	11250	5514.3	3786.8	5354.250
				5	0	0			-0.006
				5	0	0			-0.004
				4	0	0			-0.002
			0.036	10	0	3.7	0.8766	1.2394	0.677
19500	19400	19500	251	18	251	19500	9896.9	6580.2	9646.9
			0.004	10	0	0.119	0.0285	0.0380	-0.972
			0.3	11	0.3	15.8	4.4503	4.8512	4.150
			0.012	10	0	0.09	0.0458	0.0358	-0.004
				4	0	0.017	0.0043	one data	-0.096
2720	2710	2650	48	18	48	2720	1117.9	873.0	867.9
				4	0	0.022	0.0095	0.0112	-4.991
2	0	0	13	10	0	20	6.0000	7.1957	-9.000
				4	1	4	3.2500	1.5000	0.250
7.45	7.15	7.55	8	15	6.93	10.61	7.9247	0.8499	
40000	38500	37300	844	19	844	40000	18328.2	12414.1	17828.2
				4	0.14	0.52	0.2534	0.1571	-1.247
				4	0	1.1	0.2750	one data	0.275
				3	7.3	7.3	7.3000	one data	7.300
				10	0.18	1.5	0.5610	0.3860	0.561
				5	0	1.5	0.8180	0.6370	0.818
				5	0	0.92	0.3640	0.3562	0.364
				5	0.22	0.76	0.4740	0.2258	0.474
				4	0	0			0.000
				6	0.01	0.7	0.2607	0.2893	0.261
				5	0	0			0.000
				3	0	20	6.6667	one data	6.667
				4	21.8	26	23.4750	1.7840	23.475

TableB6 - Upper Monitoring Zone with Non-detects as zero

Parameter Name	Standard mg/L	Units	MD-North District	Miami Dade North District	MDWASD South District	MDWASD-Westfield	City of WPB IW 6	Boynton Beach	MDWASD S WWTP IW and MW			Number of Data	Min	Max	Mean	Standard Deviation	Mean - Reg. Standard
			70717-1 FA-1N Upper	FA-4 Upper	FA-10 Upper	Upper	F1 Upper	Upper Zone	7938	7939	7940						
Inorganic Analysis																	
Arsenic	0.05	mg/L	0	0	0	0.0025		0	0	0	0	8	0	0.0025	0.0003	0.0009	-0.050
Barium	2	mg/L	0.021	0.055	0	0.275						4	0	0.275	0.0878	0.1269	-1.912
Cadmium	0.005	mg/L	0	0	0	0			0	0.44	0.009	7	0	0.44	0.0641	0.1658	0.059
Chromium	0.1	mg/L	0	0	0	0						4	0	0	0.0000	0.0000	-0.100
Cyanide	0.2	mg/L	0	0	0	0						4	0	0	0.0000	0.0000	-0.200
Fluoride	4	mg/L	0.76	0.92	0.9	1.7			2	1.98	2	7	0.76	2	1.4657	0.5782	-2.534
Lead	0.015	mg/L	0	0	0	0			0.04	0.03	0.054	7	0	0.054	0.0177	0.0232	0.003
Mercury	0.002	mg/L	0	0	0	0			0	0.0027	0.005	7	0	0.005	0.0011	0.0020	-0.001
Nickel	0.1	mg/L	0	0	0	0.039						4	0	0.039	0.0098	0.0195	-0.090
Nitrate	10	mg/L	0.11	0	0	0	0		0.04	0.06	0.04	8	0	0.11	0.0313	0.0398	-9.969
Nitrite	1	mg/L	0	0	0	0	0					5	0	0	0.0000	0.0000	-1.000
Selenium	0.05	mg/L	0	0	0	0						4	0	0	0.0000	0.0000	-0.050
Sodium	160	mg/L	1200	1200	1800	1150	2500			945	702	7	702	2500	1356.7	604.7	1196.7
Antimony	0.006	mg/L	0	0	0	0		0				5	0	0	0.0000	0.0000	-0.006
Beryllium	0.004	mg/L	0	0	0	0		0				5	0	0	0.0000	0.0000	-0.004
Thallium	0.002	mg/L	0	0	0	0						4	0	0	0.0000	0.0000	-0.002
Secondary Analysis																	
Aluminum	0.2	mg/L	0	0	0	0			0.09	3.76	0.96	7	0	3.76	0.6871	1.4001	0.487
Chloride	250	mg/L	2400	2200	3000	2499	3874		663	1920	1070	8	663	3874	2203.3	1020.5	1953.3
Copper	1	mg/L	0	0	0	0			0.002	0.83	0.052	7	0	0.83	0.1	0.3	-0.9
Iron	0.3	mg/L	0.58	0.7	0.71	0.501	5		0.96	140	5.9	8	0.501	140	19.3	48.8	19.0
Manganese	0.05	mg/L	0.049	0.017	0.011	0.017			0	0	0.055	7	0	0.055	0.0213	0.0222	-0.029
Silver	0.1	mg/L	0	0	0	0						4	0	0	0.0000	0.0000	-0.100
Sulfate	250	mg/L	380	370	260	662	680		280	290	286	8	260	680	401.0	172.1	151.0
Zinc	5	mg/L	0	0.026	0	0.19						4	0	0.19	0.0540	0.0915	-4.946
Color	15	PtCo uni	10	0	20	12	50		2	2	2	8	0	50	12.2500	16.7140	-2.750
Odor	3	TON	2	4	0	2						4	0	4	2.00	1.63	-1.00
pH (units)	6.5-8.5	std units	8.25	8.94	7.72	7.36	5.88	7.8	8.1	7.75	7.8	9	5.88	8.94	7.73	0.82	
TDS	500	mg/L	3500	3500	5900	4300	7388	3800	2616	3752	2396	9	2396	7388	4128.0	1585.9	3628.0
Foaming Agents	1.5	mg/L	0.16	0	0.15	0.2		0.03				5	0	0.2	0.11	0.09	-1.39
Trihalomethane Analysis																	
Total THMs		mg/L	0	0	0	0.5						4	0	0.5	0.1250	0.2500	0.125
Radiological Analysis																	
Gross Alpha		pCi/L		30+/-45	9.7+/-21	4.1						3	4.1	4.1	4.1000	one data	4.100
Miscellaneous Analysis																	
Ammonia-N		mg/L	0.24	0	0.26	0.5	2.28	0.56				6	0	2.28	0.6400	0.8282	0.640
Nitrogen, total		mg/L					0					1	0	0	0.0000	one data	0.000
Nitrogen, organic		mg/L	0.54	0	0.16	1.13	0.28					5	0	1.13	0.4220	0.4422	0.422
Nitrogen, total Kjeldahl		mg/L	0.3	0.35	0.42	1.63		0.69				5	0.3	1.63	0.6780	0.5531	0.678
Ortho-phosphate		mg/L	0	0	0	0						4	0	0	0.0000	0.0000	0.000
Phosphorus, total		mg/L	0	0	0	0.03	0.68	0				6	0	0.68	0.1183	0.2754	0.118
BOD		mg/L	13	16	0	0		4.5				5	0	16	6.7	7.4	6.7
Total Coliform		col/100m	0	0	0							3	0	0	0.0	0.0	0.0
Water Temperature		° C	24.1	22.9	23.1		27					4	22.9	27	24.3	1.9	24.3

Table B7 - ASR with Non-detects as zero

Parameter Name	Standard mg/L	Units	Five Ash ASR	MDWASD - West Wellfield ASR 1	ASR 2	ASR 3	Boynton Beach (Background)	Number of Data	Min	Max	Mean	Standart Deviation	Mean - Reg. Standard
Inorganic Analysis													
Arsenic	0.05	mg/L	0	0	0	0	0	5	0	0	0.000	0.000	-0.050
Barium	2	mg/L	1.506	0	0.376	0	0.012	5	0	1.506	0.379	0.650	-1.621
Cadmium	0.005	mg/L	0	0	0	0	0	5	0	0	0.000	0.000	-0.005
Chromium	0.1	mg/L	0	0.019	0	0	0	5	0	0.019	0.004	0.008	-0.096
Cyanide	0.2	mg/L	0	0	0	0		4	0	0	0.000	0.000	-0.200
Fluoride	4	mg/L	1.44	1.5	1.86	1.8	1.3	5	1.3	1.86	1.580	0.240	-2.420
Lead	0.015	mg/L	0	0.005	0	0	0	5	0	0.005	0.001	0.002	-0.014
Mercury	0.002	mg/L	0	0	0	0	0	5	0	0	0.000	0.000	-0.002
Nickel	0.1	mg/L	0	0	0	0		4	0	0	0.000	0.000	-0.100
Nitrate	10	mg/L	0	NA	0.11	0	0	4	0	0.11	0.028	0.055	-9.973
Nitrite	1	mg/L	0	NA	0	0	0	4	0	0	0.000	0.000	-1.000
Selenium	0.05	mg/L	0	0	0	0	0.013	5	0	0.013	0.003	0.006	-0.047
Sodium	160	mg/L	1827	950	1029	1053		4	950	1827	1214.750	410.532	1054.750
Antimony	0.006	mg/L	0	0	0	0		4	0	0	0.000	0.000	-0.006
Beryllium	0.004	mg/L	0	0	0	0		4	0	0	0.000	0.000	-0.004
Thallium	0.002	mg/L	0	0	0	0		4	0	0	0.000	0.000	-0.002
Secondary Analysis										0			
Aluminum	0.2	mg/L	0	0	0	0		4	0	0			-0.200
Chloride	250	mg/L	3524	2000	2449	2349	1920	5	1920	3524	2448.400	641.690	2198.400
Copper	1	mg/L	0.011	0.005	0.01	0.023	0	5	0	0.023	0.010	0.009	-0.990
Iron	0.3	mg/L	0.156	4.295	0.343	0.575	0.022	5	0.022	4.295	1.078	1.810	0.778
Manganese	0.05	mg/L	0.014	0.165	0.012	0.015	0	5	0	0.165	0.041	0.069	-0.009
Silver	0.1	mg/L	0	0	0	0	0	5	0	0	0.000	0.000	-0.100
Sulfate	250	mg/L	725	238	615	595	436	5	238	725	521.800	189.235	271.800
Zinc	5	mg/L	0	0.018	0.065	0.324	0	5	0	0.324	0.081	0.138	-4.919
Color	15	PtCo units	17	10	2	31	0	5	0	31	12.000	12.590	-3.000
Odor	3	TON	50	1	2	1		4	1	50	13.500	24.338	10.500
pH (units)	6.5-8.5	std units	7.61	6.91	7.12	8.39	7.6	5	6.91	8.39	7.526	0.571	
TDS	500	mg/L	7880	5980	4390	4040	3910	5	3910	7880	5240.000	1691.789	4740.000
Foaming Agents	1.5	mg/L	0.04	0	0.13	0.18	0	5	0	0.18	0.070	0.081	-1.430
Trihalomethane Analysis										0			
Total THMs		mg/L	0.0017	9.93	0	0		4	0	9.93	2.483	4.965	2.483
Radiological Analysis										0			
Gross Alpha		pCi/L	30.7	7.8	47	19.3	18.5	5	7.8	47	24.660	14.887	24.660
Miscellaneous Analysis										0			
Ammonia-N		mg/L		0.68	0.4	0.49	0.73	4	0.4	0.73	0.575	0.156	0.575
Nitrogen, total		mg/L							0	0			
Nitrogen, organic		mg/L		0.19	0.31	0.42		3	0.19	0.42	0.307	0.115	0.307
Nitrogen, total Kjeldahl		mg/L		0.87	0.71	0.91		3	0.71	0.91	0.830	0.106	0.830
Ortho-phosphate		mg/L		0	0.19	0.2		3	0	0.2	0.130	0.113	0.130
Phosphorus, total		mg/L		NA	0.22	0.29		2	0.22	0.29	0.255	0.049	0.255
BOD		mg/L		0	1.8	1.9		3	0	1.9	1.233	1.069	1.233
Total Coliform		col/100ml	6					1	6	6	6.000	one data	6.000
Water Temperature		° C											0.000

Table B8 - Biscayne Monitoring Zone with Non-detects as zero

Parameter Name	Standard mg/L	Units	Five Ash Broward Co.	City of Hollywood	MDWASD S WWTP Biscayne Wells										W Palm B.
					MW No 1 7622	MW No 2 7623	MW No 3 7624	MW No 4 7625	MW No 5 7626	MW No 6 7627	Water supply well 7628	Water supply well 7692	Water supply well 7693	Water supply well 7694	Raw Comp 14629
Inorganic Analysis															
Arsenic	0.05	mg/L	0		0.031	0.029	0	0.016	0.012	0.024	0.014	0.051	0	0.009	0
Barium	2	mg/L	1.12												0.0237
Cadmium	0.005	mg/L	0		0	0	0	0	0.003	0	0				0.0001
Chromium	0.1	mg/L	0												0.0027
Cyanide	0.2	mg/L	0												0
Fluoride	4	mg/L	0.36	0.21	0.16	0.12	0.15	0.17	0.14	0.13	0.13				0.206
Lead	0.015	mg/L	0.004		0.022	0	0.008	0.026	0.018	0.012	0.01				0.0012
Mercury	0.002	mg/L	0		0	0	0	0	0	0	0				0
Nickel	0.1	mg/L	0												0.0011
Nitrate	10	mg/L	0		0.06	0.07	1.45	0.05	0.13	0.06	0.02	0.5	0.1	0.18	0.0536
Nitrite	1	mg/L	0												0
Selenium	0.05	mg/L	0												0
Sodium	160	mg/L	15.9		65	149	77.5	77	102	151	153				23.1
Antimony	0.006	mg/L	0												0
Beryllium	0.004	mg/L	0												0
Thallium	0.002	mg/L	0												0
Secondary Analysis															
Aluminum	0.2	mg/L	3.44	0.15	0.24	0.2	1.36	0.288	2.9	1.24	0.036				0.185
Chloride	250	mg/L	24	32	97	250	135	112	165	233	251	187	279	417	47.3
Copper	1	mg/L	0.008	0	0.006	0.005	0.007	0.005	0.011	0.006	0.004				0.0011
Iron	0.3	mg/L	0.642	0.35	0.23	0.224	0.77	0.27	2.12	0.384	0.3				0.0808
Manganese	0.05	mg/L	0.049	0	0.01	0.016	0.011	0.016	0.037	0.005	0.012				0.0044
Silver	0.1	mg/L	0	0											0.0064
Sulfate	250	mg/L	21	38	37	42	99	71	32	34	48	52	46	61	0
Zinc	5	mg/L	0.011	0.11											0.0046
Color	15	PtCo un	3	25	15	20	25	10	30	3	13				45
Odor	3	TON	1	1											0
pH (units)	6.5-8.5	std units	7.74	7.2	7.9	7.6	7.84	7.95	7.8	11.7	8		7.9	7.85	6.76
TDS	500	mg/L	279	340	598	814	696	532	630	640	844				354
Foaming Agents	1.5	mg/L	0	0											0
Trihalomethane Analysis															
Total THMs		mg/L													0
Radiological Analysis															
Gross Alpha		pCi/L	10.7												
Miscellaneous Analysis															
Ammonia-N		mg/L													
Nitrogen, total		mg/L													
Nitrogen, organic		mg/L													
Nitrogen, total Kjeldahl		mg/L													
Ortho-phosphate		mg/L													
Phosphorus, total		mg/L													
BOD		mg/L													
Total Coliform		col/100ml													
Water Temperature		° C			24	24	24	24	24	24	24	25	25.5	25	

West Palm Beach				MDWASD S WWTP IW and MW									
13025elclairch 14575	Raw Comp 15015	Raw 19151	Raw 15660	7692	7693	7694	7627	Number of Data	Min	Max	Mean	Standart Deviation	Mean - Reg. Standard
0		0	0	0.051	0	0.009	0.024	19	0	0.051	0.0142	0.0168	-0.036
0.025		0.0256	0.0266					5	0.0237	1.12	0.2442	0.4896	-1.756
0		0.000402	0.0005				0	13	0	0.003	0.0003	0.0008	-0.005
0.002		0.00265	0.0022					5	0	0.0027	0.0019	0.0011	-0.098
0		0	0.0133					5	0	0.0133	0.0027	0.0059	-0.197
0.22		0.214	0.259				0.13	14	0.12	0.36	0.1856	0.0660	-3.814
0		0.00261	0				0.012	13	0	0.026	0.0089	0.0088	-0.006
0.00217	0	0	0				0	14	0	0.00217	0.0002	0.0006	-0.002
0.000849		0.00169	0.0041					5	0	0.0041	0.0015	0.0016	-0.098
0.159		0	0	0.5	0.1	0.18	0.06	19	0	1.45	0.1933	0.3367	-9.807
0		0	0					5	0	0	0.0000	0.0000	-1.000
0		0	0					5	0	0	0.0000	0.0000	-0.050
25.3		24.4	27				152	13	15.9	153	80.1692	55.7358	-79.831
0		0	0					5	0	0	0.0000	0.0000	-0.006
0		0	0					5	0	0	0.0000	0.0000	-0.004
0		0	0					5	0	0	0.0000	0.0000	-0.002
0.057		0.17	0				1.24	14	0	3.44	0.8219	1.1088	0.622
75.4		45.7	58.1	187	279	417	233	20	24	417	176.2250	118.9342	-73.775
0.00437		0.000536	0.0007				0.006	14	0	0.011	0.0046	0.0032	-0.995
0.001		0.0628	0.0666				0.384	14	0.001	2.12	0.4204	0.5352	0.120
0.00258		0.00505	0.0054				0.005	14	0	0.049	0.0127	0.0139	-0.037
0		0	0					6	0	0.0064	0.0011	0.0026	-0.099
0		0	0	52	46	61	34	16	0	99	38.7000	25.7807	-211.300
0.001		0.0121	0.0096					6	0.001	0.11	0.0247	0.0420	-4.975
40		25	50				3	14	3	50	21.9286	15.4146	6.929
0		0	0					6	0	1	0.3333	0.5164	-2.667
7.13		7.22	7.48		7.9	7.85	11.7	18	6.76	11.7	8.0844	1.3598	
396		348	352				640	14	279	844	533.0714	187.7693	33.071
0		0	0					6	0	0	0.0000	0.0000	-1.500
0.0397	0.0381							3	0	0.0397	0.0259	0.0225	0.026
		0.4						2	0.4	10.7	5.5500	7.2832	5.550
									0	0			0.000
									0	0			0.000
									0	0			0.000
									0	0			0.000
									0	0			0.000
									0	0			0.000
									0	0			0.000
									0	0			0.000
								10	24	25.5	24.3500	0.5798	24.350

APPENDIX C. TABLES OF DATA TOTALS AND STATISTICS, ASSUMING NON-DETECTED VALUES EQUAL TO REPORTED DETECTION LIMITS

Table C1 - AWT with Non-detects at detection limit

Parameter	units	Detection limit	Southgate Bioassay Composite								
			12/1/99	12/6/99	12/7/99	12/8/99	12/10/99	12/13/99	12/15/99	12/17/99	12/20/99
Inorganic Analysis											
Arsenic	ug/L	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6
Cadmium	ug/L	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18
Calcium	mg/L	0.009	38.5	40.4	38.3	39.8	34.7	34.3	38.9	39.1	38.8
Chromium	ug/L	1	1	1	2.73	1	1	1	1	1	1
Copper	ug/L	1	16.2	6.9	4.1	2.66	3.46	1.78	1.46	1	1
Iron	ug/L	16	40	80	0.12	0.16	0.085	0.09	0.09	0.11	0.12
Lead	ug/L	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Magnesium	mg/L	0.001	31	23.6	23.7	18.7	20.9	20.6	23.9	24.4	25
Mercury	ug/L	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Molybdenum	ug/L	1	1	1	1	1	1	1	1.02	1.36	1.01
Nickel	ug/L	3.3	3.3	3.45	4.7	3.3	3.3	3.3	3.3	3.3	3.3
Potassium	ug/L	0.2	15.7	15.9	15.3	15.6	15.2	15	14.9	15.7	15.3
Selenium	ug/L	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
Sodium	mg/L	0.5	63.7	57.9	58.3	57	54.4	55.6	60.5	57.8	58.2
Zinc	mg/L	0.003	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Bromide	mg/L	0.1	0.1	0.2	0.1	0.2	0.2	0.1	0.1	0.2	0.2
Fluoride	mg/L	0.1	0.82	0.85	0.93	0.92	0.95	0.9	0.84	0.96	0.86
Sulfate	mg/L	1	172	204	200	180	200	190	164	171	167
Strontium	mg/L	0.03	2.93	3.61	3.32	2.94	3.76	3.64	3.79	4.05	4.08
Secondary Analysis											
Bicarbonate A	mg/L	0.6	60.4	57.6	55.2	65.6	57.2	58.9	67.2	57.8	70.4
Chloride	mg/L	0.25	80.6	75	72.7	78.1	75.8	69	81	79.2	78

Gulf Gate WWTP Composite			Number of Data	Min	Max	Mean	Standard Deviation
12/8/1999	12/10/1999	12/13/1999					
2.6	2.6	2.6	12	2.6	2.6	2.6000	0.0000
0.29			10	0.18	0.29	0.1910	0.0348
30.8	28.4	28.3	12	28.3	40.4	35.8583	4.4684
1	1	1	12	1	2.73	1.1442	0.4994
1	1	1	12	1	6.9	3.4633	4.3929
0.15	0.16	0.12	12	0.085	80	10.1004	24.8192
0.5	0.5	0.5	12	0.5	0.5	0.5000	0.0000
25.5	23.3	23.4	12	18.7	25.5	23.6667	3.0368
0.2	0.2	0.2	12	0.2	0.2	0.2000	0.0000
1	1	1	12	1	1.36	1.0325	0.1033
3.3	3.3	3.3	12	3.3	4.7	3.4292	0.4025
13.4	13.6	13	12	13	15.9	14.8833	0.9880
1.7	1.7	1.7	12	1.7	1.7	1.7000	0.0000
82.6	77.6	81.1	12	54.4	82.6	63.7250	10.3935
0.03	0.03	0.02	12	0.02	0.03	0.0217	0.0039
0.1	0.1	0.1	12	0.1	0.2	0.1417	0.0515
1.12	1.08	1.09	12	0.82	1.12	0.9433	0.1026
170	168	168	12	164	204	179.5000	14.8661
2.59	2.55	2.62	12	2.55	4.08	3.3233	0.5740
92.9	84.2	79.3	12	55.2	92.9	67.2250	12.2413
103	95.2	99.1	12	69	103	82.2250	10.8376

Tabel C2 - Reclaimed Water Analysis with Non-detects at detection limit

Parameter Name	Standard mg/L	Units	Boca Raton	City of Hollywood WWTP	Hollywood, reuse filter	Boca Raton	Boca Raton	Boca Raton	Boca Raton	Hollywood Re-use filter	Hollywood Re-use filter	Hollywood Re-use filter	Boca Raton	No of Data	Mean	Min
Inorganic Analysis																
Arsenic	0.05	mg/L	0.0012	0.01	0.01	0.0004	0.004	0.005	0.005	0.01	0.01	0.01	0.004	11	0.0063	0.0004
Barium	2	mg/L	0.7	0.05	0.01	0.5	0.5	0.1	0.1	0.01	0.01	0.01	0.07	11	0.1873	0.0100
Cadmium	0.005	mg/L	0.0001	0.005	0.004	0.0003	0.0003	0.0005	0.0005	0.004	0.004	0.004	0.003	11	0.0023	0.0001
Chromium	0.1	mg/L	0.0017	0.005	0.01	0.003	0.003	0.001	0.002	0.01	0.01	0.01	0.005	11	0.0055	0.0010
Cyanide	0.2	mg/L		0.004	0.004					0.002	0.004	0.004		5	0.0036	0.0020
Fluoride	4	mg/L	0.3	0.72	0.67	0.34	0.289	0.27	0.292	0.69	0.67	0.61	0.25	11	0.4637	0.2500
Lead	0.015	mg/L	0.0005	0.005	0.005	0.0033	0.001	0.002	0.002	0.0005	0.0005	0.0005	0.005	11	0.0023	0.0005
Mercury	0.002	mg/L	0.0001	0.001	0.001	0.0002	0.0002	0.0002	0.0002	0.0001	0.001	0.0001	0.0002	11	0.0004	0.0001
Nickel	0.1	mg/L		0.005	0.01					0.01	0.01	0.01		5	0.0090	0.0050
Nitrate	10	mg/L	1.03	0.21	9.1	1.34	6.03	0.304	3.3	2.3	9.1	6.5	1.37	11	3.6895	0.2100
Nitrite	1	mg/L		0.05	0.02					0.02	0.02	0.02		5	0.0260	0.0200
Selenium	0.05	mg/L	0.0015	0.01	0.01	0.005	0.005	0.005	0.005	0.01	0.01	0.01	0.005	11	0.0070	0.0015
Sodium	160	mg/L		107	69	79.6	77.6	64.6	73.1	85	69	66	58.2	10	74.9100	58.2
Antimony	0.006	mg/L	0.81	0.005	0.05					0.0079	0.005	0.005		6	0.1472	0.0050
Beryllium	0.004	mg/L		0.002	0.03					0.003	0.003	0.003		5	0.0082	0.0020
Thallium	0.002	mg/L		0.002	0.001					0.002	0.002	0.002		5	0.0018	0.0010
Secondary Analysis																
Aluminum	0.2	mg/L		0.1	0.1						0.1	0.1		4	0.1000	0.1000
Chloride	250	mg/L	126	75	130	120	148	96	101	140	130	120	99.4	11	116.8545	75.0
Copper	1	mg/L	0.1	0.01	0.0002	0.03	0.02	0.021	0.01	0.025	0.0002	0.0035	0.07	11	0.0264	0.0002
Iron	0.3	mg/L	0.4	0.29	0.28	0.054	0.01	0.18	0.1	0.16	0.28	0.16	0.09	11	0.1822	0.0100
Manganese	0.05	mg/L	0.0976	0.05	0.022	0.014	0.01	0.0086	0.0146	0.014	0.022	0.019	0.014	11	0.0260	0.0086
Silver	0.1	mg/L	0.003	0.002	0.0005	0.001	0.001	0.004	0.001	0.0005	0.0005	0.0005	0.005	11	0.0017	0.0005
Sulfate	250	mg/L	36.1	150	120	27	39.4	28.7	35	64	120	190	28.4	11	76.2364	27.0
Zinc	5	mg/L	0.02	0.01	0.032	0.036	0.032	0.01	0.011	0.063	0.032	0.016	0.02	11	0.0256	0.0100
Color	15	PtCo units		40	30					25	30	40		5	33.0000	25.0
Odor	3	TON		1	1					2	1	8		5	2.6000	1.0000
pH (units)	6.5-8.5	std units	6.87	6.8	7	7.5	7.2	7.6	7		7	6.2	7.32	10	7.0490	6.2000
TDS	500	mg/L	385	1119	550	354	438	400	400	540	550	690	382	11	528.0000	354.0
Foaming Agents	1.5	mg/L	0.23	0.13	0.01	0.04	0.246	0.5	0.2	0.29	0.01	0.026	0.14	11	0.1656	0.0100
Trihalomethane Analysis																
Total THMs	100	mg/L	11		34.8	13.3	35	17.4	21	61.3	34.8	26.9	13	10	26.8500	11.0
Radiological Analysis																
Gross Alpha		pCi/L	1.2+/-1.4	6.7	4.0+/-5.0	0.5	1		n/a	0.0+/-0.7	4+/-5	3+/-5	0+/-0.6	9	2.7333	0.5
Miscellenous Analysis																
Ammonia-N		mg/L												0		
Nitrogen, total		mg/L			13.6					16	13.6	10		4	13.3000	10.0
Nitrogen, organic		mg/L												0		
Nitrogen, total Kjeldahl		mg/L			4.5					3.3	4.5	4		4	4.0750	3.3
Ortho-phosphate		mg/L												0		
Phosphorus, total		mg/L			1.1					2	1.1	1.3		4	1.3750	1.1
BOD		mg/L												0		
Water Temperature		° C												0		

Max	Standard Deviation	Mean-Reg. Standard
0.0100	0.0038	-0.0437
0.7000	0.2514	-1.8127
0.0050	0.0020	-0.0027
0.0100	0.0038	-0.0945
0.0040	0.0009	-0.1964
0.7200	0.2022	-3.5363
0.0050	0.0019	-0.0127
0.0010	0.0004	-0.0016
0.0100	0.0022	-0.0910
9.1000	3.3992	-6.3105
0.0500	0.0134	-0.9740
0.0100	0.0031	-0.0430
107.0	13.7	-85.1
0.8100	0.3252	0.1412
0.0300	0.0122	0.0042
0.0020	0.0004	-0.0002
0.1000	0.0000	-0.1000
148.0	21.7	-133.1
0.1000	0.0314	-0.9736
0.4000	0.1185	-0.1178
0.0976	0.0263	-0.0240
0.0050	0.0016	-0.0983
190.0	58.3	-173.8
0.0630	0.0158	-4.9744
40.0	6.7	18.0
8.0000	3.0496	-0.4000
7.6000	0.3980	
1119.0	221.3	28.0
0.5000	0.1499	-1.3344
61.3	15.3833	-73.1500
6.7	3.4443	2.7333
16.0	2.4739	13.3000
4.5	0.5679	4.0750
2.0	0.4272	1.3750

Table C3 - Secondary effluent with Non-detects at detection limit

Parameter Name	Standard mg/L	Units	Golden Gate WWTP (Naples)	Seacoast unchlorinated effluent	City of Hollywood	Sunrise (IW3) Sawgrass	North District WWTP	City of Ft. Lauderdale	Broward County	Miami Dade Water/sewer N Dist IW3	Broward Co. (North Regional special)	City of Hollywood WTP (reuse filter)	City of Hollywood WTP	City of Hollywood WTP	City of Hollywood WTP	City of Hollywood WTP
Inorganic Analysis																
Arsenic	0.05	mg/L	0.0026	0.005	0.01			0.003	0.00101	0.01	0.0102	0.01				
Barium	2	mg/L	0.00526	0.2	0.05	0.04		0.07	0.008	0.05		0.01				
Cadmium	0.005	mg/L	0.00018	0.0009	0.005	0.0001		0.004	0.00009	0.005	0.00247	0.004				
Chromium	0.1	mg/L	0.001	0.05	0.005			0.006	0.005	0.005	0.00527	0.01				
Cyanide	0.2	mg/L			0.004			0.022	0.2	0.004	0.00443	0.02				
Fluoride	4	mg/L	1.24	0.29	0.72			0.898	0.76	0.75		0.67				
Lead	0.015	mg/L	0.001	0.002	0.005			0.0492	0.0008	0.005	0.00289	0.0005				
Mercury	0.002	mg/L	0.0002	0.0003	0.001			0.0002	0.00012	0.001	0.000405	0.0002				
Nickel	0.1	mg/L			0.005			0.038	0.00549	0.005	0.0173	0.01				
Nitrate	10	mg/L	4.34		0.24			0.507	0.05	0.64		15	2.5	2.2	2.1	1.7
Nitrite	1	mg/L			0.05			0.607	0.015	0.05		0.02				
Selenium	0.05	mg/L	0.0017	0.001	0.01			0.001	0.00042	0.01	0.0176	0.01				
Sodium	160	mg/L	109	82	48.1	66.2		361	226	181		53				
Antimony	0.006	mg/L		0.2	0.005			0.0053	0.0009	0.005	0.00722	0.005				
Beryllium	0.004	mg/L			0.002			0.0005	0.001	0.002	0.000551	0.003				
Thallium	0.002	mg/L			0.002			0.002	0.00032	0.002	0.001	0.002				
Secondary Analysis																
Aluminum	0.2	mg/L			0.1			0.141	0.105	0.1						
Chloride	250	mg/L	155	93.3	65	94.5		530	300	218		110				
Copper	1	mg/L	0.00184	0.02	0.01			0.0206	0.003	0.01	0.00314	0.0026				
Iron	0.3	mg/L	0.09	0.1	0.15	0.09		0.396	0.219	0.209		0.12				
Manganese	0.05	mg/L	0.0076	0.02	0.05			0.02	0.02	0.05		0.01				
Silver	0.1	mg/L	0.00023	0.02	0.001			0.002	0.00007	0.001	0.00202	0.00022				
Sulfate	250	mg/L	48.5	32	47	32.6		110	71	71.9		160				
Zinc	5	mg/L	0.08	0.01	0.01	0.02		0.026	0.023	0.02	0.016	0.024				
Color	15	PtCo units		50	30			133	30	50		10				
Odor	3	TON			1			2		75		16				
pH (units)	6.5-8.5	std units	6.84	7.15	7.1			7.03	7.53	6.93			6.1	6.1	6.2	6.2
TDS	500	mg/L	448	398	416	394		1260	690	610	634	590				
Foaming Agents	1.5	mg/L	0.1	26.6	0.2			0.074	0.13			0.15				
Trihalomethane Analysis																
Total THMs	100	mg/L	64							7.18		222				
Radiological Analysis																
Gross Alpha		pCi/L	5.4+/-1.2		1+/-0.5			1+/-0.5		1+/-0.5		0.6+/-0.6				
Miscellaneous Analysis																
Ammonia-N		mg/L	12.56	18.8		2.47							10.5	12.6	11.1	7.5
Nitrogen, total		mg/L										17				
Nitrogen, organic		mg/L	2.54	2.94		2.11										
Nitrogen, total Kjeldahl		mg/L	15.1	21.7		4.58						1.8	13.4	12.9	12.3	13
Ortho-phosphate		mg/L	1.07	4.08		1.99							0.63	0.98	0.68	0.4
Phosphorus, total		mg/L	1.4			2.19						0.85	0.76	1.13	0.77	0.94
BOD		mg/L						18.1			1.3		3	3	4	3
Total Coliform		col/100ml			1	180		2100		5*10-4		1				
Water Temperature		° C														

City of Hollywood WTP	Palm Beach County	Sunrise (IW1 + IW2)	Sunrise (IW1 + IW2)	Sunrise (IW3)	Broward Co. Secondary Effluent															
	0.000611	bdl	bdl	bdl	bdl	bdl	bdl	bdl	bdl	bdl	bdl	bdl	bdl	bdl	bdl	bdl	bdl	bdl	bdl	bdl
	0.00606	bdl	bdl	bdl																
	0.00005	bdl	bdl	0.0002	bdl	bdl	bdl	bdl	bdl	bdl	bdl	bdl	bdl	bdl	bdl	bdl	bdl	bdl	bdl	bdl
	0.00146	bdl	bdl	bdl	bdl	bdl	bdl	bdl	bdl	bdl	bdl	bdl	bdl	bdl	bdl	bdl	bdl	bdl	bdl	bdl
	0.005	bdl	0.03	bdl	0.00472	bdl	bdl	bdl	bdl	0.024	0.0145	0.00575	bdl	bdl	bdl	bdl	bdl	bdl	0.0152	bdl
	0.289	0.74	0.6	0.73																
	0.000274	bdl	0.004	bdl	0.00197	0.00289	0.00198	0.00424	0.00427	0.0046	0.0034	0.00322	bdl	0.00247	bdl	0.00165	0.011	bdl	bdl	0.00422
	0.0002	bdl	bdl	bdl	bdl	0.00041	bdl	0.00087	0.00055	0.000378	bdl	0.000271	0.00043	bdl	0.000408	0.000296	0.0005	0.0008	6E-05	bdl
	0.00309	bdl	bdl	bdl	0.0135	0.0173	0.0094	0.0101	0.00819	0.0144	0.0169	0.0205	0.00956	0.00654	0.0158	0.0021	0.0052	0.0095	0.0084	0.0224
1.5	2.03	5.69	15.1	7.41																
	0.73	2.12	0.06	0.73																
	0.00326	0.025	bdl	0.006	bdl	bdl	bdl	bdl	bdl	bdl	bdl	bdl	bdl	bdl	bdl	bdl	bdl	bdl	bdl	bdl
	58.4	86.1	74.3	78.1																
	0.0002	bdl	bdl	bdl																
	0.0001	0.0004	bdl	bdl	bdl	bdl	bdl	bdl	bdl	bdl	bdl	bdl	bdl	bdl	bdl	bdl	bdl	bdl	bdl	bdl
	0.00114	bdl	bdl	bdl	bdl	bdl	bdl	0.0133	bdl	bdl	bdl	bdl	bdl	bdl	bdl	bdl	bdl	bdl	bdl	bdl
	0.0473	0.1	bdl	bdl									bdl	bdl	bdl	bdl	bdl	bdl	bdl	0.0482
	89.7	21.9	81.6	125																
	0.00298	bdl	bdl	bdl	bdl	0.00314	0.00276	0.00273	0.00229	0.0037	0.00609	0.00219	0.00238	0.00134	0.00272	bdl	bdl	0.00138	bdl	0.0072
	0.386	0.08	0.03	0.05																
	0.0209	bdl	bdl	bdl																
	0.00005	bdl	bdl	bdl	bdl	bdl	bdl	bdl	bdl	bdl	bdl	bdl	bdl	bdl	bdl	bdl	bdl	bdl	bdl	bdl
	32	29.3	30.6	23.2																
	0.0126	bdl	bdl	bdl	bdl	bdl	bdl	bdl	bdl	bdl	bdl	bdl	bdl	bdl	0.00517	0.00843	0.004	0.0181	bdl	0.00901
	35	40	15	60																
	1	1	1	1																
6.2	6.67	7.26	7.1	7.58																
	514	484	460	450																
	0.166	0.03	0.02	0.02																
	100	4.74		bdl																
	0.1																			
6.4		4.62	bdl	5.15																
		0.2		0.13																
10		5.32	2.02	5.28																
0.8		2.54	0.23	2.34																
0.94		2.54	2.2	1.81											0.46	1.13	1.33	1.49	1.07	1.55
5		12	0.6	33																
		-10	280	-10																
		25	26	25																

Delray Beach	No of Data	Min	Max	Mean	Standard Deviation	Mean-Reg. Standard
0.0008	29	0.0006	0.0102	0.0053	0.0043	-0.0447
0.0073	13	0.0053	0.2000	0.0447	0.0595	-1.9553
bdl	30	0.0001	0.0050	0.0020	0.0021	-0.0030
0.0008	29	0.0008	0.0500	0.0090	0.0147	-0.0910
bdl	27	0.0040	0.2000	0.0272	0.0527	-0.1728
2.37	12	0.2890	2.3700	0.8381	0.5434	-3.1619
0.0003	29	0.0003	0.0492	0.0051	0.0099	-0.0099
0.0006	29	0.0001	0.0010	0.0004	0.0003	-0.0016
0.00324	27	0.0021	0.0380	0.0115	0.0080	-0.0885
0.092	17	0.0500	15.1000	3.8187	4.8395	-6.1813
1.43	10	0.0150	2.1200	0.5812	0.7153	-0.4188
0.0032	28	0.0004	0.0250	0.0074	0.0076	-0.0426
59.8	13	48.1000	361.0000	114.0769	90.8808	-45.9231
0.0007	11	0.0002	0.2000	0.0255	one data	0.0195
0.0009	27	0.0001	0.0030	0.0012	0.0010	-0.0028
0.00024	25	0.0002	0.0133	0.0027	0.0041	0.0007
0.226	17	0.0473	0.2260	0.1084	0.0567	-0.0916
90	12	21.9000	530.0000	151.8462	134.0317	-98.1538
0.006	29	0.0013	0.0206	0.0054	0.0054	-0.9946
0.459	13	0.0300	0.4590	0.1830	0.1431	-0.1170
0.0321	12	0.0076	0.0500	0.0256	0.0155	-0.0244
0.0048	28	0.0001	0.0200	0.0031	0.0061	-0.0969
48	13	23.2000	160.0000	56.6231	39.3059	-193.3769
0.0247	29	0.0040	0.0800	0.0194	0.0177	-4.9806
30	11	10.0000	133.0000	43.9091	33.0619	28.9091
3.16	9	1.0000	75.0000	11.2400	24.4002	8.2400
7.81	16	6.1000	7.8100	6.8625	0.5634	#VALUE!
362	14	362.0000	1260.0000	550.7143	227.1639	50.7143
0.506	11	0.0200	26.6000	2.5451	7.9793	1.0451
0.0063	7	0.0063	222.0000	66.3211	86.0966	-33.6790
1	7	0.1000	1.0000	0.5500	one data	0.5500
	10	2.4700	18.8000	9.1700	4.8729	9.1700
	1	17.0000	17.0000	17.0000	one data	17.0000
	5	0.1300	2.9400	1.5840	1.3284	1.5840
	12	1.8000	21.7000	9.7833	6.0383	9.7833
	11	0.2300	4.0800	1.4309	1.1760	1.4309
	17	0.4600	2.5400	1.3271	0.5781	1.3271
	10	0.6000	33	8.3	10.2	8.3000
	8	-10	2100	363.1	774.4	363.1429
	3	25	26	25.3	0.6	25.3333

Table C4 - Injection Wells with Non-detects at detection limit

Parameter Name	Standard mg/L	Units	Boynton Beach, (background	Seacost Pump test 2020-3320	City of WPB IW6	BCNRWW TP IW-5	Injection Zone IW-6	Miami Dade North District IN-2	58419 Annular Monitor	58420 Deep Monitor	7946	7947	7948	8101	8102	8103	8105	8106	8107
Inorganic Analysis																			
Arsenic	0.05	mg/L				0.0022	0.0022	0.01			0.006	0.006		0.006	0.006	0.006			0.07
Barium	2	mg/L	0.2			0.91	0.27	0.01											
Cadmium	0.005	mg/L	0.0037			0.003	0.003	0.005			0.004	0.007		0.005	0.004	0.014			0.006
Chromium	0.1	mg/L	0.002			0.037	0.02	0.01											
Cyanide	0.2	mg/L				0.02	0.006	0.01											
Fluoride	4	mg/L		0.62		0.95	0.72	0.95			0.67	0.62	1.31	0.57	0.51	0.57			
Lead	0.015	mg/L	0.04			0.001	0.001	0.005			0.06	0.174		0.336	0.036	0.082			0.052
Mercury	0.002	mg/L	0.0002			0.001	0.001	0.0002			0.0002	0.0002		2E-04	0.0002	0.0002			2E-04
Nickel	0.1	mg/L	0.05			0.01	0.042	0.04											
Nitrate	10	mg/L			6	0.46	0.01	0.05			0.04	0.08	0.04	0.12	0.05	0.12			0.06
Nitrite	1	mg/L			0.004	0.01	0.01	0.05											
Selenium	0.05	mg/L	0.025			0.05	0.007	0.01											
Sodium	160	mg/L	11400		1920	12629	2385	8100			7020	7668	3132	7506	7344	7992			7560
Antimony	0.006	mg/L				0.01	0.002	0.006											
Beryllium	0.004	mg/L	0.01			0.0002	0.0001	0.04											
Thallium	0.002	mg/L	1.2			0.01	0.009	0.02											
Secondary Analysis																			
Aluminum	0.2	mg/L				0.2	0.2	0.2			0.55	0.39		0.62	0.03	0.03			0.07
Chloride	250	mg/L		19400	3099	21884	4899	21000			17700	19300	5650	19400	19400	19600	5050	5050	19700
Copper	1	mg/L	0.03			0.065	0.017	0.025			0.008	0.016		0.16	0.062	0.022			0.018
Iron	0.3	mg/L	4	0.76	1	1.483	1.16	2.2			0.86	4.08		16.8	4.4	3.32			0.018
Manganese	0.05	mg/L	0.19			0.032	0.019	0.03			0.04	0.04		0.087	0.04	0.04			0.04
Silver	0.1	mg/L	0.06			0.068	0.015	0.01											
Sulfate	250	mg/L		2680	120	2884	679	2600			2360	2580	830	2620	2600	2760			2640
Zinc	5	mg/L	0.01			0.005	0.013	0.02											
Color	15	PtCo units		0	>70	6	95	25				2	0	0	0				0
Odor	3	TON				1	1	2											
pH (units)	6.5-8.5	std units		7.35	8.26	7.63	7.23	9.33			7.75	7.7	7.65	7.4	7.4	7.4			7.5
TDS	500	mg/L		38200	5093	30450	9130	31000			31874	37180	10884	36700	37000	36100	10200	9840	36200
Foaming Agents	1.5	mg/L				0.07	0.12	0.1											
Trihalomethane Analysis																			
Total THMs		mg/L				0.00036	0.00036	0.001											
Radiological Analysis																			
Gross Alpha		pCi/L				8.7	21.3	210+/-390											
Miscellaneous Analysis																			
Ammonia-N		mg/L			0.1	0.19	14.8	0.05											
Nitrogen, total		mg/L			6.66		15.37												
Nitrogen, organic		mg/L			0.56	0.63	0.6	2.2											
Nitrogen, total Kjeldahl		mg/L				0.82	15.37	0.39											
Ortho-phosphate		mg/L				0.028	0.65	0.023											
Phosphorus, total		mg/L			0.2	0.064	0.82	0.099											
BOD		mg/L				2.5	1	20											
Total Coliform		col/100ml				1	54	46											
Water Temperature		° C					23.7	21.9											

8108	8109	8110	8111	8112	8113	8524	8526	8399	8400	8525	Number of Data	Min	Max	Mean	Standart Deviation	Mean - Reg. Standard
						0.03		0.006	0.006	0.006	13	0.0022	0.0700	0.0125	0.0186	-0.0375
								0.004	0.004	0.004	7	0.0040	0.9100	0.2003	0.3317	-1.7997
						0.006					11	0.0030	0.0140	0.0055	0.0031	0.0005
											4	0.0020	0.0370	0.0173	0.0151	-0.0828
											3	0.0060	0.0200	0.0120	0.0072	-0.1880
						0.61		0.56	0.58	0.59	14	0.5100	1.3100	0.7021	0.2211	-3.2979
						0.02		0.128	0.034	0.02	14	0.0010	0.3360	0.0706	0.0910	0.0556
						0.0002		0.0006	0.0006	0.0002	14	0.0002	0.0010	0.0004	0.0003	-0.0016
											4	0.0100	0.0500	0.0355	0.0175	-0.0645
0.06			0.15	0.02	0.05	0.235		0.05	0.155	0.335	19	0.0100	6.0000	0.4255	1.3549	-9.5745
											4	0.0040	0.0500	0.0185	0.0212	-0.9815
											4	0.0070	0.0500	0.0230	0.0196	-0.0270
7560			7992	7776	8014	10800	10900	10200	10600	10800	21	1920.0	12629.0	8061.8	2854.7	7901.8
											3	0.0020	0.0100	0.0060	0.0040	0.0000
											4	0.0001	0.0400	0.0126	0.0189	0.0086
											4	0.0090	1.2000	0.3098	0.5935	0.3078
						0.03		0.41	0.16	0.05	13	0.0300	0.6200	0.2262	0.2037	0.0262
19200	2080	4950	19500	19500	19500	19700	19400	19400	18800	19400	25	2080.0	21884.0	15302.5	7006.6	15052.5
						0.002		0.019	0.004	0.004	14	0.0020	0.1600	0.0323	0.0415	-0.9677
						0.51		3.2	3.3	3.32	16	0.0180	16.8000	3.1507	3.9120	2.8507
						0.04		0.04	0.04	0.04	14	0.0190	0.1900	0.0513	0.0425	0.0013
											4	0.0100	0.0680	0.0383	0.0300	-0.0618
2740			2760	2760	2620	2760	2840	2660	2670	2800	21	120.0000	2884.0	2379.2	785.0	2129.2
											4	0.0050	0.0200	0.0120	0.0063	-4.9880
0			0	0	0	1	1	0	1	2		0.0000	95.0000	7.3889	22.6408	-7.6111
											3	1.0000	2.0000	1.3333	0.5774	-1.6667
7.45			7.7	7.5	7.6	7.55	7.7	8.05	7.65	7.85	21	7.2300	9.3300	7.6976	0.4425	
36300	4640	10348	37000	37600	38700	39800	38300	37500	38000	39000	25	4640.0	39800.0	28681.6	13049.7	28181.6
											3	0.0700	0.1200	0.0967	0.0252	-1.4033
											3	0.0004	0.0010	0.0006	0.0004	0.0006
											3	8.7000	21.3000	15.0000	8.9095	15.0000
											4	0.0500	14.8000	3.7850	7.3436	3.7850
											2	6.6600	15.3700	11.0150	6.1589	11.0150
											4	0.5600	2.2000	0.9975	0.8022	0.9975
											3	0.3900	15.3700	5.5267	8.5273	5.5267
											3	0.0230	0.6500	0.2337	0.3606	0.2337
											4	0.0640	0.8200	0.2958	0.3542	0.2958
											3	1.0000	20.0000	7.8333	10.5633	7.8333
											3	1.0000	54.0000	33.6667	28.5715	33.6667
											2	21.9000	23.7000	22.8000	1.2728	22.8000

Table C5 - Lower Monitoring zone with Non-detects at detection limit

			MD-North District	Miami Dade North District	MDWASD South	MDWASD-Westfield	City of WPB IW 6	Lower Monitoring Zone of MW-1 and 2 Broward MW-1		MW-2		Boynton Beach	MDWASD S WWTP IW and MW		
Parameter Name	**Standard mg/L**	**Units**	**70717-2 FA-2N Lower**	**FA-4 Lower**	**FA-10 Lower**	**Lower**	**F2 Lower**	**Sanders Lab**	**Savannah Lab**	**Sanders Lab**	**Savannah Lab**	**110969 Lower Zone**	**7941**	**7942**	**7943**
Inorganic Analysis															
Arsenic	0.05	mg/L	0.01	0.01	0.01	0.024						0.025	0.006	0.006	0.006
Barium	2	mg/L	0.042	0.076	0.01	1.33									
Cadmium	0.005	mg/L	0.073	0.005	0.005	0.003							0.023	0.008	0.004
Chromium	0.1	mg/L	0.05	0.01	0.01	0.02									
Cyanide	0.2	mg/L	0.01	0.01	0.01	0.004									
Fluoride	4	mg/L	0.61	0.8	0.8	0.38							1.92	1.72	1.2
Lead	0.015	mg/L	0.005	0.0052	0.005	0.04							0.028	0.216	0.076
Mercury	0.002	mg/L	0.0002	0.0002	0.0002	0.001							0.0022	0.0018	0.0008
Nickel	0.1	mg/L	0.04	0.04	0.04	0.082									
Nitrate	10	mg/L	0.13	0.05	0.01	0.01	0.1						0.03	0.04	0.06
Nitrite	1	mg/L	0.05	0.05	0.01	0.01	0.004								
Selenium	0.05	mg/L	0.005	0.01	0.01	0.004									
Sodium	160	mg/L	7600	7200	7900	2167	8200	1546	NA	2470	NA		972	2430	3726
Antimony	0.006	mg/L	0.003	0.006	0.05	0.005						0.03			
Beryllium	0.004	mg/L	0.002	0.04	0.005	0.002						0.0006			
Thallium	0.002	mg/L	0.02	0.02	0.01	0.002									
Secondary Analysis															
Aluminum	0.2	mg/L	0.2	0.2	0.2	0.2							3.7	2.2	1.31
Chloride	250	mg/L	17000	14000	14000	4649	14346	3949	4300	4949	5000		1080	4160	8260
Copper	1	mg/L	0.025	0.025	0.025	0.02							0.119	0.066	0.03
Iron	0.3	mg/L	2.9	1.4	0.78	0.443	10						15.8	6.6	2.95
Manganese	0.05	mg/L	0.072	0.015	0.01	0.013							0.09	0.06	0.06
Silver	0.1	mg/L	0.01	0.01	0.01	0.017									
Sulfate	250	mg/L	1100	830	1700	466	660	481	350	548	500		324	535	1140
Zinc	5	mg/L	0.02	0.022	0.02	0.016									
Color	15	PtCo ur	10	5	20	12	>70						0	3	
Odor	3	TON	4	4	1	4									
pH (units)	6.5-8.5	std units	7.83	8.57	6.93	10.61	8.13					7.45	7.7	7.8	8.2
TDS	500	mg/L	21000	18000	31000	7220	24243	6000	7100	9320	10000	28300	3224	7528	15212
Foaming Agents	1.5	mg/L	0.52	0.14	0.16	0.27						0.177			
Trihalomethane Analysis															
Total THMs		mg/L	1	1	1	1.1									
Radiological Analysis															
Gross Alpha		pCi/L		180+/-280	350+/-210	7.3									
Miscellaneous Analysis															
Ammonia-N		mg/L	0.22	0.18	1.5	0.42	0.4	0.75	0.61	0.53	0.73	0.27			
Nitrogen, total		mg/L					0.63	1.43	0.6	1.5	0.56				
Nitrogen, organic		mg/L	0.44	0.92	0.1	0.34	0.12								
Nitrogen, total Kjeldahl		mg/L	0.22	0.65	0.42	0.76						0.32			
Ortho-phosphate		mg/L	0.05	0.1	0.01	0.02									
Phosphorus, total		mg/L	0.034	0.03	0.29	0.7	0.5					0.01			
BOD		mg/L	2	20	2	1						2			
Total Coliform		col/100r	1	20	1										
Water Temperature		° C	23	21.8	23.1		26								

MDWASD S WWTP IW and MW											
7944	**7945**	**8396**	**8397**	**8398**	**7628**	**Number of Data**	**Min**	**Max**	**Mean**	**Standart Deviation**	**Mean - Reg. Standard**
0.006	0.006				0.014	10	0.006	0.025	0.0112	0.0071	-0.039
						4	0.01	1.33	0.3645	0.6442	-1.636
0.006	0.004				0.002	10	0.002	0.073	0.0133	0.0218	0.008
						4	0.01	0.05	0.0225	0.0189	-0.078
						4	0.004	0.01	0.0085	0.0030	-0.192
0.88	0.95	0.6	0.59	0.61	0.13	13	0.13	1.92	0.8608	0.5019	-3.139
0.56	0.16				0.01	10	0.005	0.56	0.1105	0.1739	0.096
0.0008	0.0003				0.0002	10	0.0002	0.0022	0.0008	0.0007	-0.001
						4	0.04	0.082	0.0505	0.0210	-0.050
0.02	0.04	0.11	0.233	0.145	0.02	14	0.01	0.233	0.0713	0.0647	-9.929
						5	0.004	0.05	0.0248	0.0231	-0.975
						4	0.004	0.01	0.0073	0.0032	-0.043
5238	5076	11200	11100	11250	153	16	153	11250	5514.3	3786.8	5354.3
						5	0.003	0.05	0.0188	0.0206	0.013
						5	0.0006	0.04	0.0099	0.0169	0.006
						4	0.002	0.02	0.0130	0.0087	0.011
0.99	0.53				0.036	10	0.036	3.7	0.9566	1.1793	0.757
12300	11500	19500	19400	19500	251	18	251	19500	9896.9	6580.2	9646.9
0.033	0.013				0.004	10	0.004	0.119	0.0360	0.0333	-0.964
6.1	1.68				0.3	11	0.3	15.8	4.4503	4.8512	4.150
0.09	0.04				0.012	10	0.01	0.09	0.0462	0.0325	-0.004
						4	0.01	0.017	0.0118	0.0035	-0.088
1700	1660	2720	2710	2650	48	18	48	2720	1117.9	873.0	867.9
						4	0.016	0.022	0.0195	0.0025	-4.981
		2	0	0	13	10	0	20	6.5000	6.9001	-8.500
						4	1	4	3.2500	1.5000	0.250
7.6	7.9	7.45	7.15	7.55	8	15	6.93	10.61	7.9247	0.8499	
21900	21544	40000	38500	37300	844	19	844	40000	18328.2	12414.1	17828.2
						4	0.14	0.52	0.2534	0.1571	-1.247
						4	1	1.1	1.0250	0.0500	1.025
						3	7.3	7.3	7.3000	one data	7.300
						10	0.18	1.5	0.5610	0.3860	0.561
						5	0.56	1.5	0.9440	0.4769	0.944
						5	0.1	0.92	0.3840	0.3327	0.384
						5	0.22	0.76	0.4740	0.2258	0.474
						4	0.01	0.1	0.0450	0.0404	0.045
						6	0.01	0.7	0.2607	0.2893	0.261
						5	1	20	5.4000	8.1731	5.400
						3	1	20	7.3333	10.9697	7.333
						4	21.8	26	23.4750	1.7840	23.475

Table C6 - Upper Monitoring Zone with Non-detects at detection limit

Parameter Name	Standard mg/L	Units	MD-North District 70717-1 FA-1N Upper	Miami Dade North District FA-4 Upper	MDWASD South District FA-10 Upper	MDWASD-Westfield Upper	City of WPB IW 6 F1 Upper	Boynton Beach Upper Zone	MDWASD S WWTP IW an 7938	7939	7940	Number of Data	Min	Max	Mean	Standart Deviation	Mean - Reg. Standard
Inorganic Analysis																	
Arsenic	0.05	mg/L	0.01	0.01	0.01	0.0025		0.025	0.006	0.006	0.006	8	0.0025	0.0250	0.0094	0.0068	-0.0406
Barium	2	mg/L	0.021	0.055	0.01	0.275						4	0.0100	0.2750	0.0903	0.1246	-1.9098
Cadmium	0.005	mg/L	0.005	0.0005	0.005	0.003			0.004	0.44	0.009	7	0.0005	0.4400	0.0666	0.1647	0.0616
Chromium	0.1	mg/L	0.01	0.01	0.01	0.02						4	0.0100	0.0200	0.0125	0.0050	-0.0875
Cyanide	0.2	mg/L	0.01	0.01	0.01	0.004						4	0.0040	0.0100	0.0085	0.0030	-0.1915
Fluoride	4	mg/L	0.76	0.92	0.9	1.7			2	1.98	2	7	0.7600	2.0000	1.4657	0.5782	-2.5343
Lead	0.015	mg/L	0.005	0.005	0.005	0.04			0.04	0.03	0.054	7	0.0050	0.0540	0.0256	0.0205	0.0106
Mercury	0.002	mg/L	0.0002	0.0002	0.0002	0.001			0.0002	0.0027	0.005	7	0.0002	0.0050	0.0014	0.0019	-0.0006
Nickel	0.1	mg/L	0.04	0.04	0.04	0.039						4	0.0390	0.0400	0.0398	0.0005	-0.0603
Nitrate	10	mg/L	0.11	0.05	0.01	0.01	0.1		0.04	0.06	0.04	8	0.0100	0.1100	0.0525	0.0369	-9.9475
Nitrite	1	mg/L	0.05	0.05	0.01	0.01	0.004					5	0.0040	0.0500	0.0248	0.0231	-0.9752
Selenium	0.05	mg/L	0.005	0.01	0.01	0.004						4	0.0040	0.0100	0.0073	0.0032	-0.0428
Sodium	160	mg/L	1200	1200	1800	1150	2500			945	702	7	702.0	2500.0	1356.7	604.7	1196.7
Antimony	0.006	mg/L	0.006	0.006	0.05	0.005		0.03				5	0.0050	0.0500	0.0194	0.0201	0.0134
Beryllium	0.004	mg/L	0.002	0.04	0.005	0.002		0.0006				5	0.0006	0.0400	0.0099	0.0169	0.0059
Thallium	0.002	mg/L	0.02	0.02	0.01	0.002						4	0.0020	0.0200	0.0130	0.0087	0.0110
Secondary Analysis																	
Aluminum	0.2	mg/L	0.2	0.2	0.2	0.2			0.09	3.76	0.96	7	0.0900	3.7600	0.8014	1.3374	0.6014
Chloride	250	mg/L	2400	2200	3000	2499	3874		663	1920	1070	8	663.0	3874.0	2203.3	1020.5	1953.3
Copper	1	mg/L	0.025	0.025	0.025	0.01			0.002	0.83	0.052	7	0.0020	0.8300	0.1384	0.3054	-0.8616
Iron	0.3	mg/L	0.58	0.7	0.71	0.501	5		0.96	140	5.9	8	0.5010	140.0000	19.2939	48.8208	18.9939
Manganese	0.05	mg/L	0.049	0.017	0.011	0.017			0.04	0.04	0.055	7	0.0110	0.0550	0.0327	0.0175	-0.0173
Silver	0.1	mg/L	0.01	0.01	0.01	0.01						4	0.0100	0.0100	0.0100	0.0000	-0.0900
Sulfate	250	mg/L	380	370	260	662	680		280	290	286	8	260.0	680.0	401.0	172.1	151.0
Zinc	5	mg/L	0.02	0.026	0.02	0.19						4	0.0200	0.1900	0.0640	0.0840	-4.9360
Color	15	PtCo units	10	5	20	12	50		2	2	2	8	2.0000	50.0000	12.8750	16.2783	-2.1250
Odor	3	TON	2	4	1	2						4	1.0000	4.0000	2.2500	1.2583	-0.7500
pH (units)	6.5-8.5	std units	8.25	8.94	7.72	7.36	5.88	7.8	8.1	7.75	7.8	9	5.8800	8.9400	7.7333	0.8247	
TDS	500	mg/L	3500	3500	5900	4300	7388	3800	2616	3752	2396	9	2396.0	7388.0	4128.0	1585.9	3628.0
Foaming Agents	1.5	mg/L	0.16	0.1	0.15	0.2		0.03				5	0.0300	0.2000	0.1280	0.0653	-1.3720
Trihalomethane Analysis																	
Total THMs		mg/L	1	1	1	0.5						4	0.5000	1.0000	0.8750	0.2500	0.8750
Radiological Analysis																	
Gross Alpha		pCi/L		30+/-45	9.7+/-21	4.1						3	4.1000	4.1000	4.1000	one data	4.1000
Miscellaneous Analysis																	
Ammonia-N		mg/L	0.24	0.05	0.26	0.5	2.28	0.56				6	0.0500	2.2800	0.6483	0.8207	0.6483
Nitrogen, total		mg/L					2.66					1	2.6600	2.6600	2.6600	one data	2.6600
Nitrogen, organic		mg/L	0.54	0.1	0.16	1.13	0.28					5	0.1000	1.1300	0.4420	0.4200	0.4420
Nitrogen, total Kjeldahl		mg/L	0.3	0.35	0.42	1.63		0.69				5	0.3000	1.6300	0.6780	0.5531	0.6780
Ortho-phosphate		mg/L	0.05	0.1	0.01	0.02						4	0.0100	0.1000	0.0450	0.0404	0.0450
Phosphorus, total		mg/L	0.01	0.01	0.1	0.03	0.68	0.01				6	0.0100	0.6800	0.1400	0.2668	0.1400
BOD		mg/L	13	16	2	1		4.5				5	1.0000	16.0000	7.3000	6.7786	7.3000
Total Coliform		col/100ml	1	1	1							3	1.0000	1.0000	1.0000	0.0000	1.0000
Water Temperature		° C	24.1	22.9	23.1		27					4	22.9000	27.0000	24.2750	1.8910	24.2750

Table C7 - ASR with Non-detects at detection limit

Parameter Name	Standard mg/L	Units	Five Ash ASR	MDWASD - West Wellfield ASR 1	ASR 2	ASR 3	Boynton Beach (Background)	Number of Data	Min	Max	Mean	Standart Deviation	Mean - Reg. Standard
Inorganic Analysis													
Arsenic	0.05	mg/L	0.0022	0.01	0.0025	0.0022	0.005	5	0.0022	0.01	0.0044	0.0034	-0.0456
Barium	2	mg/L	1.506	0.05	0.376	0.2	0.012	5	0.012	1.506	0.4288	0.6190	-1.5712
Cadmium	0.005	mg/L	0.003	0.005	0.003	0.003	0.005	5	0.003	0.005	0.0038	0.0011	-0.0012
Chromium	0.1	mg/L	0.02	0.019	0.02	0.02	0.006	5	0.006	0.02	0.0170	0.0062	-0.0830
Cyanide	0.2	mg/L	0.006	0.004	0.004	0.004		4	0.004	0.006	0.0045	0.0010	-0.1955
Fluoride	4	mg/L	1.44	1.5	1.86	1.8	1.3	5	1.3	1.86	1.5800	0.2404	-2.4200
Lead	0.015	mg/L	0.001	0.005	0.0001	0.001	0.01	5	0.0001	0.01	0.0034	0.0041	-0.0116
Mercury	0.002	mg/L	0.001	0.001	0.001	0.001	0.0002	5	0.0002	0.001	0.0008	0.0004	-0.0012
Nickel	0.1	mg/L	0.01	0.005	0.01	0.01		4	0.005	0.01	0.0088	0.0025	-0.0913
Nitrate	10	mg/L	0.01	NA	0.11	0.01	0.02	4	0.01	0.11	0.0375	0.0486	-9.9625
Nitrite	1	mg/L	0.01	NA	0.01	0.01	0.02	4	0.01	0.02	0.0125	0.0050	-0.9875
Selenium	0.05	mg/L	0.004	0.01	0.002	0.004	0.013	5	0.002	0.013	0.0066	0.0047	-0.0434
Sodium	160	mg/L	1827	950	1029	1053		4	950	1827	1214.8	410.5	1054.8
Antimony	0.006	mg/L	0.017	0.005	0.005	0.005		4	0.005	0.017	0.0080	0.0060	0.0020
Beryllium	0.004	mg/L	0.0003	0.002	0.002	0.002		4	0.0003	0.002	0.0016	0.0009	-0.0024
Thallium	0.002	mg/L	0.0006	0.002	0.002	0.002		4	0.0006	0.002	0.0017	0.0007	-0.0004
Secondary Analysis													
Aluminum	0.2	mg/L	0.2	0.05	0.2	0.2		4	0.05	0.2	0.1625	0.0750	-0.0375
Chloride	250	mg/L	3524	2000	2449	2349	1920	5	1920	3524	2448.4	641.7	2198.4
Copper	1	mg/L	0.011	0.005	0.01	0.023	0.006	5	0.005	0.023	0.0110	0.0072	-0.9890
Iron	0.3	mg/L	0.156	4.295	0.343	0.575	0.022	5	0.022	4.295	1.0782	1.8102	0.7782
Manganese	0.05	mg/L	0.014	0.165	0.012	0.015	0.02	5	0.012	0.165	0.0452	0.0670	-0.0048
Silver	0.1	mg/L	0.01	0.004	0.01	0.01	0.005	5	0.004	0.01	0.0078	0.0030	-0.0922
Sulfate	250	mg/L	725	238	615	595	436	5	238	725	521.8	189.2	271.8
Zinc	5	mg/L	0.005	0.018	0.065	0.324	0.003	5	0.003	0.324	0.0830	0.1370	-4.9170
Color	15	PtCo un	17	10	2	31	0	5	0	31	12.0000	12.5897	-3.0000
Odor	3	TON	50	1	2	1		4	1	50	13.5000	24.3379	10.5000
pH (units)	6.5-8.5	std units	7.61	6.91	7.12	8.39	7.6	5	6.91	8.39	7.5260	0.5708	
TDS	500	mg/L	7880	5980	4390	4040	3910	5	3910	7880	5240.0	1691.8	4740.0
Foaming Agents	1.5	mg/L	0.04	0.01	0.13	0.18	0.025	5	0.01	0.18	0.0770	0.0741	-1.4230
Trihalomethane Analysis													
Total THMs		mg/L	0.0017	9.93	0.5	0.5		4	0.0017	9.93	2.7329	4.8038	2.7329
Radiological Analysis													
Gross Alpha		pCi/L	30.7	7.8	47	19.3	18.5	5	7.8	47	24.6600	14.8870	24.6600
Miscellaneous Analysis													
Ammonia-N		mg/L		0.68	0.4	0.49	0.73	4	0.4	0.73	0.5750	0.1559	0.5750
Nitrogen, total		mg/L							0	0			0.0000
Nitrogen, organic		mg/L		0.19	0.31	0.42		3	0.19	0.42	0.3067	0.1150	0.3067
Nitrogen, total Kjeldahl		mg/L		0.87	0.71	0.91		3	0.71	0.91	0.8300	0.1058	0.8300
Ortho-phosphate		mg/L		0.02	0.19	0.2		3	0.02	0.2	0.1367	0.1012	0.1367
Phosphorus, total		mg/L		NA	0.22	0.29		2	0.22	0.29	0.2550	0.0495	0.2550
BOD		mg/L		1	1.8	1.9		3	1	1.9	1.5667	0.4933	1.5667
Total Coliform		col/100r	6					1	6	6	6.0000	one data	6.0000
Water Temperature		° C							0	0			0.0000

Table C8 - Biscayne Monitoring Zone with Non-detects at detection limit

Parameter Name	Standard mg/L	Units	Five Ash Broward Co.	City of Hollywood	MW No 1 7622	MW No 2 7623	MW No 3 7624	MW No 4 7625	MW No 5 7626	MW No 6 7627	Water supply well 7628	Water supply well 7692	Water supply well 7693	Water supply well 7694	Raw Comp 14629	13025elclairch 14575
					MDWASD S WWTP Biscayne Wells										West Palm Beac	
Inorganic Analysis																
Arsenic	0.05	mg/L	0.0022		0.031	0.029	0.006	0.016	0.012	0.024	0.014	0.051	0.006	0.009	0.0005	0.0005
Barium	2	mg/L	1.12												0.0237	0.025
Cadmium	0.005	mg/L	0.003		0.002	0.002	0.002	0.002	0.003	0.002	0.002				0.0001	0.0001
Chromium	0.1	mg/L	0.02												0.0027	0.002
Cyanide	0.2	mg/L	0.006												0.005	0.0005
Fluoride	4	mg/L	0.36	0.21	0.16	0.12	0.15	0.17	0.14	0.13	0.13				0.206	0.22
Lead	0.015	mg/L	0.004		0.022	0.008	0.008	0.026	0.018	0.012	0.01				0.0012	0.001
Mercury	0.002	mg/L	0.001		0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002				0.0002	0.00217
Nickel	0.1	mg/L	0.01												0.0011	0.000849
Nitrate	10	mg/L	0.01		0.06	0.07	1.45	0.05	0.13	0.06	0.02	0.5	0.1	0.18	0.0536	0.159
Nitrite	1	mg/L	0.01												0.01	0.01
Selenium	0.05	mg/L	0.004												0.0005	0.0005
Sodium	160	mg/L	15.9		65	149	77.5	77	102	151	153				23.1	25.3
Antimony	0.006	mg/L	0.0017												0.003	0.003
Beryllium	0.004	mg/L	0.0003												0.0002	0.0002
Thallium	0.002	mg/L	0.0006												0.001	0.001
Secondary Analysis																
Aluminum	0.2	mg/L	3.44	0.15	0.24	0.2	1.36	0.288	2.9	1.24	0.036				0.185	0.057
Chloride	250	mg/L	24	32	97	250	135	112	165	233	251	187	279	417	47.3	75.4
Copper	1	mg/L	0.008	0.01	0.006	0.005	0.007	0.005	0.011	0.006	0.004				0.0011	0.00437
Iron	0.3	mg/L	0.642	0.35	0.23	0.224	0.77	0.27	2.12	0.384	0.3				0.0808	0.001
Manganese	0.05	mg/L	0.049	0.01	0.01	0.016	0.011	0.016	0.037	0.005	0.012				0.0044	0.00258
Silver	0.1	mg/L	0.01	0.01											0.0064	0.0002
Sulfate	250	mg/L	21	38	37	42	99	71	32	34	48	52	46	61	1	1
Zinc	5	mg/L	0.011	0.11											0.0046	0.001
Color	15	PtCo ur	3	25	15	20	25	10	30	3	13				45	40
Odor	3	TON	1	1											1	1
pH (units)	6.5-8.5	std unit	7.74	7.2	7.9	7.6	7.84	7.95	7.8	11.7	8		7.9	7.85	6.76	7.13
TDS	500	mg/L	279	340	598	814	696	532	630	640	844				354	396
Foaming Agents	1.5	mg/L	0.02	0.1											0.1	0.1
Trihalomethane Analysis																
Total THMs		mg/L													0.001	0.0397
Radiological Analysis																
Gross Alpha		pCi/L	10.7													
Miscellaneous Analysis																
Ammonia-N		mg/L														
Nitrogen, total		mg/L														
Nitrogen, organic		mg/L														
Nitrogen, total Kjeldahl		mg/L														
Ortho-phosphate		mg/L														
Phosphorus, total		mg/L														
BOD		mg/L														
Total Coliform		col/100ml														
Water Temperature		° C			24	24	24	24	24	24	24	25	25.5	25		

:h	W Palm Beach							
Raw Comp 15015	Raw 19151	Raw 15660	Number of Data	Min	Max	Mean	Standard Deviation	Mean - Reg. Standard
	0.0005	0.0005		0.0005	0.0510	0.0135	0.0147	-0.0365
	0.0256	0.0266		0.0237	1.1200	0.2442	0.4896	-1.7558
	0.0004	0.0005		0.0001	0.0030	0.0016	0.0010	-0.0034
	0.00265	0.0022		0.0020	0.0200	0.0059	0.0079	-0.0941
	0.0005	0.0133		0.0005	0.0133	0.0051	0.0053	-0.1949
	0.214	0.259		0.1200	0.3600	0.1899	0.0666	-3.8101
	0.00261	0.001		0.0010	0.0260	0.0095	0.0085	-0.0055
0.0002	0.0002	0.0002		0.0002	0.0022	0.0004	0.0006	-0.0016
	0.00169	0.0041		0.0008	0.0100	0.0035	0.0038	-0.0965
	0.01	0.01		0.0100	1.4500	0.1908	0.3693	-9.8092
	0.01	0.01		0.0100	0.0100	0.0100	0.0000	-0.9900
	0.0005	0.0005		0.0005	0.0040	0.0012	0.0016	-0.0488
	24.4	27		15.9	153.0	74.2	53.7	-85.8
	0.003	0.003		0.0017	0.0030	0.0027	0.0006	-0.0033
	0.0002	0.0002		0.0002	0.0003	0.0002	0.0000	-0.0038
	0.001	0.001		0.0006	0.0010	0.0009	0.0002	-0.0011
	0.17	0.02		0.0200	3.4400	0.7912	1.1461	0.5912
	45.7	58.1		24.0000	417.0000	150.5313	111.4522	-99.4688
	0.00054	0.0007		0.0005	0.0110	0.0053	0.0033	-0.9947
	0.0628	0.0666		0.0010	2.1200	0.4232	0.5570	0.1232
	0.00505	0.0054		0.0026	0.0490	0.0141	0.0137	-0.0359
	0.0002	0.0002		0.0002	0.0100	0.0045	0.0049	-0.0955
	1	1		1.0000	99.0000	36.5625	27.6887	-213.4375
	0.0121	0.0096		0.0010	0.1100	0.0247	0.0420	-4.9753
	25	50		3.0000	50.0000	23.3846	15.0085	8.3846
	1	1		1.0000	1.0000	1.0000	0.0000	-2.0000
	7.22	7.48		6.7600	11.7000	7.8713	1.1210	
	348	352		279.0	844.0	524.8	192.8	24.8
	1	1		0.0200	1.0000	0.3867	0.4761	-1.1133
0.0381				0.0010	0.0397	0.0263	0.0219	0.0263
	0.4			0.4000	10.7000	5.5500	7.2832	5.5500
				0.0000	0.0000			0.0000
				0.0000	0.0000			0.0000
				0.0000	0.0000			0.0000
				0.0000	0.0000			0.0000
				0.0000	0.0000			0.0000
				0.0000	0.0000			0.0000
				0.0000	0.0000			0.0000
				0.0000	0.0000			0.0000
				24.0000	25.5000	24.3500	0.5798	24.3500

APPENDIX D. DATA AND ANALYSIS OF VOLATILE ORGANIC COMPOUNDS AND SYNTHETIC ORGANIC COMPOUNDS

Table D1 Comparison of MCL Values with Secondary Effluent Data with Non-detects at half the detection value

Color Code ***red:*** *half the detection limit values* ***blue:*** *non-detect values that are higher than MCL values* *measured values that are higher than MCL values*		***green:***	**Seacoast**	**MD- North D.**	**Sunrise, Sawgrass**	**Naples, GoldenGate Annual eff.**	**City of Hollywood WTP**	**City of Hollywood WTP**	**City of Hollywood WTP**	**City of Hollywood WTP**	**City of Hollywood WTP**	**Broward Co. Secondary Effluent**																**Broward County**	**City of Hollywood**	**City of Hollywood**
		Date	9/29/1988	9/12/1995	Date has not	1/13/2000	5/3/2000	5/10/2000	5/17/2000	5/24/2000	5/31/2000	12/11/1996	3/18/1997	5/7/1997	6/17/1997	7/9/1997	11/4/1997	4/8/1998	6/24/1998	7/9/1998	8/6/1998	9/10/1998	10/8/1998	11/5/1998	12/3/1998	9/9/1999	2/9/2000	4/11/2000	7/9/1999	11/9/1999
Inorganic Analysis - 62-550.310 (1) PWS030																														
Parameter Name	**MCL - Drinking Water Standard**	**Units**																												
Arsenic	0.05	mg/L	0.0025			0.0013						0.004005	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.00101	0.005	0.005
Barium	2	mg/L	0.1		0.02	0.00526																						0.008	0.005	0.005
Cadmium	0.005	mg/L	0.0009		0.00005	0.00009						0.001235	0.001235	0.001235	0.001235	0.001235	0.001235	0.001235	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.000045	0.002	0.002
Chromium	0.1	mg/L	0.025			0.0005						0.002635	0.002635	0.00584	0.002635	0.002635	0.002635	0.002635	0.000685	0.000685	0.000685	0.000685	0.000685	0.000685	0.000685	0.000685	0.000685	0.005	0.005	0.005
Cyanide	0.2	mg/L										0.00472	0.002215	0.002215	0.002215	0.002215	0.024	0.0145	0.00575	0.002215	0.002215	0.002215	0.002215	0.002215	0.002215	0.0152	0.002215	0.0025	0.001	0.001
Fluoride	4	mg/L	0.29			1.24																						0.76	0.67	0.69
Lead	0.015	mg/L	0.002			0.001						0.00197	0.00289	0.00198	0.00424	0.00427	0.0046	0.0034	0.00322	0.000565	0.00247	0.000565	0.00165	0.011	0.000565	0.000565	0.00422	0.0008	0.00025	0.00025
Mercury	0.002	mg/L	0.0003			0.0001						0.000113	0.000405	0.000113	0.000865	0.000552	0.000378	0.000113	0.000271	0.000428	0.000113	0.000408	0.000296	0.000542	0.000798	0.000061	0.000005	0.00012	0.0001	0.0001
Nickel	0.1	mg/L										0.0135	0.0173	0.0094	0.0101	0.00819	0.0144	0.0169	0.0205	0.00956	0.00654	0.0158	0.0021	0.00523	0.0095	0.00841	0.0224	0.00549	0.005	0.005
Nitrate	10	mg/L				4.34	2.5	2.2	2.1	1.7	1.5																	0.05	15	13
Nitrite	1	mg/L																										0.0075	0.01	0.01
Selenium	0.05	mg/L	0.0005			0.00085						0.0088	0.0088	0.0088	0.0088	0.0088	0.0088	0.0088	0.0088	0.0088	0.0088	0.0088	0.0088	0.0088	0.0088	0.0088	0.0088	0.00021	0.005	0.005
Sodium	160	mg/L	82		66.2	109																						226	53	85
Antimony	0.006	mg/L	0.1																									0.00045	0.0025	0.0079
Beryllium	0.004	mg/L										0.000276	0.000276	0.000276	0.000276	0.000276	0.000276	0.000276	0.000276	0.000276	0.000276	0.000276	0.000276	0.000276	0.000276	0.000276	0.000276	0.0005	0.0015	0.0015
Thallium	0.002	mg/L										0.0005	0.0005	0.000256	0.0133	0.000256	0.000256	0.000256	0.000256	0.000256	0.000256	0.000256	0.000256	0.000256	0.000256	0.000256	0.000256	0.00016	0.001	0.001
Secondary Chemical Analysis - 62-550.320 PWS031																														
Parameter Name	Standart	Units																												
Aluminum	0.2	mg/L																										0.105		
Chloride	250	mg/L	93.3		94.5	155																						300	110	140
Copper	1	mg/L	0.01			0.00184						0.000113	0.00314	0.00276	0.00273	0.00229	0.0037	0.00609	0.00219	0.00238	0.00134	0.00272	0.000482	0.000482	0.00138	0.000482	0.0072	0.0015	0.0026	0.025
Fluoride	2	mg/L	0.29																									0.76	0.67	0.69
Iron	0.3	mg/L	0.1		0.09	0.09																						0.219	0.12	0.16
Manganese	0.05	mg/L	0.02																									0.02	0.005	0.014
Silver	0.1	mg/L	0.01									0.00101	0.00101	0.00101	0.00101	0.00101	0.00101	0.00101	0.00101	0.00101	0.00101	0.00101	0.00101	0.00101	0.00101	0.00101	0.00025	0.000035	0.00022	0.00025
Sulfate	250	mg/L	32		32.6	48.5																						71	160	64
Zinc	5	mg/L	0.01		0.01	0.08						0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.001825	0.001825	0.001825	0.00517	0.00843	0.00402	0.0181		0.00901	0.023	0.024	0.063
Color	15	PtCo units	50																									30	1	25
Odor	3	TON	No odor observed																										16	2
pH (units)	6.5-8.5	std units	7.15				6.1	6.1	6.2	6.2	6.2																	7.53		
TDS	500	mg/L			394	448																						690	590	540
Foaming Agents	1.5	mg/L	26.6			0.00005																						0.13	0.15	0.29
TOC - Liquid																													17	12
Volatile Organic Analysis - 62-550.310 (2)(b) PWS028																														
Parameter Name	Standard mg/L	Units																												
1,2,4-Trichlorobenzene	70	ug/L		0.5																								0.05	0.5	0.5
cis-1,2-Dichloroethene	70	ug/L		0.5																								0.045	0.5	0.5
Xylenes (total)	10000	ug/L		0.5																								0.18	0.5	0.5
Dichloromethane	5	ug/L																										0.5	0.5	0.5
o-dichlorobenzene	600	ug/L																										0.06		
para-Dichlorobenzene	75	ug/L																										0.06		
Vinyl Chloride	1	ug/L		0.5		0.25																						0.14	0.5	0.5
1,1-dichloroethane	7	ug/L		0.5		0.25																						0.04	0.5	0.5
Trans-1,2-Dichloroethylene	100	ug/L		0.5																								0.04	0.5	0.5
1,2 Dichloroethane	3	ug/L		0.5		0.25																						0.04	0.5	0.5
1,1,1-Trichloroethane	200	ug/L		0.5		0.25																						0.02	0.5	0.5
Carbon Tetrachloride	3	ug/L		0.5		0.25																						0.02	0.5	0.5
1,2 Dichloropropane	5	ug/L		0.5																								0.025	0.5	0.5
Trichloroethylene	3	ug/L		0.5		0.25																						0.06	0.5	0.5
1,1,2-trichloroethane	5	ug/L		0.5																								0.045	0.5	0.5
Tetrachloroethene	3	ug/L		2.6		0.25																						0.025	0.5	0.5
Monochlorobenzene	100	ug/L																										0.09	0.5	0.5
Benzene	1	ug/L		0.5		0.25																						0.05	0.5	0.5
Toluene	1000	ug/L		1																								0.025	0.5	0.5
Ethylbenzene	700	ug/L		0.5																								0.03	0.5	0.5
Styrene	100	ug/L		0.5																								13	0.5	0.5
1,2-Dichlorobenzene																														
1,4-Dichlorobenzene																														
Pesticide/PCB Chemical Analysis - 62-550.310(2)(c) PWS029																														
Parameter Name	Standard mg/L	Units																												
Endrin	2	ug/L	0.01			0.5																						0.005	0.05	0.05
Lindane	0.2	ug/L	0.015			0.5																						0.005	0.05	0.05
Methoxychlor	40	ug/L	0.02			0.01																						0.01	0.1	0.1
Toxaphene	3	ug/L	0.25			0.1																						0.1	1.5	1.5
Dalapon	200	ug/L																										0.5	0.25	0.25
Diquat	20	ug/L																										0.5	0.5	0.5
Endothall	100	ug/L																										10	10	10
Glyphosate	700	ug/L																										5	5	5
Di(2-ethylhexyl)adipate	400	ug/L																										0.5	0.5	0.5
Oxyamyl (Vydate)	200	ug/L																										0.25	0.25	0.25
Simazine	4	ug/L																										0.05	1.5	1.5
Di(2-ethylhexyl)phthlate	6	ug/L																										0.5	0.5	0.5
Pincloram	500	ug/L																										0.1	0.25	0.25
Dinoseb	7	ug/L																										0.1	0.25	0.25
Hexachlorocyclopentadiene	50	ug/L																										0.05	0.05	0.05
Carbofuran	40	ug/L																										0.25	0.25	0.25
Atrazine	3	ug/L																										0.28	1.5	1.5
Alachlor	2	ug/L																										0.15	0.05	0.05
Heptachlor	0.4	ug/L																										0.005	0.05	0.05

Color Code red: half the detection limit values blue: non-detect values that are higher than MCL values measured values that are higher than MCL values		green:	Seacoast	MD- North D.	Sunrise, Sawgrass	Naples, GoldenGate Annual eff.	City of Hollywood WTP	City of Hollywood WTP	City of Hollywood WTP	City of Hollywood WTP	City of Hollywood WTP	Broward Co. Secondary Effluent																Broward County	City of Hollywood	City of Hollywood
		Date	9/29/1988	9/12/1995	Date has not	1/13/2000	5/3/2000	5/10/2000	5/17/2000	5/24/2000	5/31/2000	12/11/1996	3/18/1997	5/7/1997	6/17/1997	7/9/1997	11/4/1997	4/8/1998	6/24/1998	7/9/1998	8/6/1998	9/10/1998	10/8/1998	11/5/1998	12/3/1998	9/9/1999	2/9/2000	4/11/2000	7/9/1999	11/9/1999
Heptachlor epoxide	0.2	ug/L																										0.005	0.05	0.05
2,4-D	70	ug/L	18.5			0.25																						0.25	0.25	0.25
2,4, 5-TP (Silvex)	50	ug/L	28.5			0.025																						0.025	0.05	0.05
Hexachlorobenzene	1	ug/L																										0.005	0.05	0.05
Benzo (a) pyrene	0.2	ug/L																										0.005	0.1	0.1
Pentachlorophenol	1	ug/L																										0.025	0.025	0.025
PCB	0.5	ug/L																										0.25		
Dibromochloropropane	0.2	ug/L																										0.005	0.01	0.01
Ethylene Dibromide	0.02	ug/L																										0.01	0.01	0.01
Chlordane	2	ug/L																										0.025	0.25	0.25
Trihalomethane Analysis - 62-550.310(2)(a) PWS027																														
Parameter Name	Standard mg/L	Units																												
Chloroform		mg/L																											0.16	0.032
Bromodichloromethane		mg/L																											0.035	0.02
Dibromochloromethane		mg/L																											0.0089	0.007
Bromoform		mg/L																											0.00025	0.0023
Total THMs		mg/L				0.064																							0.222	0.0613
Radiochemical Analysis - 62-550.310(5) PWS033																														
Parameter Name	Standart	Units																												
Gross Alpha		pCi/L				13.7+/-0.7																								
Radium 226		pCi/L				0.3+0.09																							0.3+/-0.1	0.2+/-0.05
Radium 228		pCi/L				1.3+0.8																							0.5+/-0.7	0.0+/-0.5
Unregulated Group I Analysis - 62-550.405 PWS035																														
Parameter Name	Standart	Units																												
Carbaryl		ug/L																												
Methomyl		ug/L																												
Aldicarb Sulfoxide		ug/L																												
Aldicarb Sulfone		ug/L																												
Metolachlor		ug/L																												
Aldicarb		ug/L																												
3-Hydroxycarbofuran		ug/L																												
Propachlor		ug/L																												
Aldrin		ug/L																												
Dieldrin		ug/L																												
Dicamba		ug/L																												
Metribuzin		ug/L																												
Butachlor		ug/L																												
Unregulated Group II Analysis - 62-550.410 PWS034																														
Parameter Name	Standart	Units																												
Chloromethane		ug/L		0.5																										
Dichlorodiflouromethane		ug/L		0.5																										
Bromomethane		ug/L		0.5																										
Chloroethane		ug/L		0.5																										
Trichloroflouromethane		ug/L		0.5																										
Methyl-Tert-Butyl-Ether		ug/L		0.5																										
Dibromomethane		ug/L		0.5																										
1,1-Dichloropropylene		ug/L		0.5																										
1,3 Dichloropropane		ug/L		0.5																										
1,3-Dichloropropene		ug/L		0.5																										
1,2,3 Trichloropropane		ug/L		0.5																										
2,2 Dichloropropane		ug/L																												
Chloroform		ug/L		5																										
Bromoform		ug/L		0.5																										
Bromodichloromethane		ug/L		0.5																										
Dibromochloromethane		ug/L		0.5																										
o-chlorotoluene		ug/L		0.5																										
p-chlorotoluene		ug/L		0.5																										
m-dichlorobenzene		ug/L																												
1,1-dichloroethane		ug/L																												
1,1,1,2 Tetrachloroethane		ug/L		0.5																										
1,1,2,2-tetrachloroethane		ug/L		0.5																										
Bromobenzene		ug/L		0.5																										
Unregulated Group III Analysis - 62-550.415 PWS036&0347																														
Parameter Name	Standart	Units																												
Isophrone		ug/L																												
2,4-Dinitrotoluene		ug/L																												
Dimethylphthalate		ug/L																												
Diethylphthalate		ug/L																												
Di-n-Butylphthalate		ug/L																												
Butyl benzyl phthalate		ug/L																												
Di-n-octylphthalate		ug/L																												
2-Chlorophenol		ug/L																												
2-Methyl-4,6-dinitrophenol		ug/L																												
Phenol		ug/L																												
2,4,6-Trichlorophenol		ug/L																												
EPA 608																														
Parameter Name	Standart	Unit																												
A-BHC		ug/L																												
B-BHC		ug/L																												
D-BHC		ug/L																												
G-BHC (Lindane)		ug/L																												
Heptachlor		ug/L																												

Aldrin		ug/L																												
Heptachlor Epoxide		ug/L																												
Color Code *red: half the detection limit values* *blue: non-detect values that are higher than MCL values* *measured values that are higher than MCL values*		***green:***	**Seacoast**	**MD- North D.**	**Sunrise, Sawgrass**	**Naples, GoldenGate Annual eff.**	**City of Hollywood WTP**	**City of Hollywood WTP**	**City of Hollywood WTP**	**City of Hollywood WTP**	**City of Hollywood WTP**	**Broward Co. Secondary Effluent**																**Broward County**	**City of Hollywood**	**City of Hollywood**
		Date	9/29/1988	9/12/1995	Date has not	1/13/2000	5/3/2000	5/10/2000	5/17/2000	5/24/2000	5/31/2000	12/11/1996	3/18/1997	5/7/1997	6/17/1997	7/9/1997	11/4/1997	4/8/1998	6/24/1998	7/9/1998	8/6/1998	9/10/1998	10/8/1998	11/5/1998	12/3/1998	9/9/1999	2/9/2000	4/11/2000	7/9/1999	11/9/1999
Endosulfan I		ug/L																												
4,4-DDE		ug/L																												
Dieldrin		ug/L																												
Endrin		ug/L																												
4,4-DDD		ug/L																												
Endosulfan II		ug/L																												
4,4-DDT		ug/L																												
Endrin Aldehyde		ug/L																												
Endosulfan Sulfate		ug/L																												
Chlordane		ug/L																												
Toxaphene		ug/L																												
PCB-1016		ug/L																											0.25	0.25
PCB-1221		ug/L																											0.25	0.25
PCB-1232		ug/L																											0.25	0.25
PCB_1242		ug/L																											0.25	0.25
PCB-1248		ug/L																											0.25	0.25
PCB-1254		ug/L																											0.25	0.25
PCB-1260		ug/L																											0.25	0.25
Methoxychlor		ug/L																												
EPA 624 - Purgeable Organics																														
Parameter Name	Standart	Unit																												
Chloromethane		ug/L																												
Vinyl Chloride		ug/L																												
Bromomethane		ug/L																												
Chloroethane		ug/L																												
Trichlorofluoromethane		ug/L																												
1,1-Dichloroethene		ug/L																												
Methylene Chloride		ug/L																												
Trans-1,2-Dichloroethene		ug/L																												
1,1-Dichloroethane		ug/L																												
Chloroform		ug/L																												
1,1,1-Trichloroethane		ug/L																												
Carbon Tetrachloride		ug/L																												
1,2-Dichloroethane		ug/L																												
Benzene		ug/L																												
Trichloroethene		ug/L																												
1,2-Dichloropropane		ug/L																												
Bromodichloromethane		ug/L																												
2-Chloroethylvinyl Ether		ug/L																												
Cis-1,3-dichloropropene		ug/L																												
Toluene		ug/L																												
Trans-1,3-Dichloropropene		ug/L																												
1,1,2-Trichloroethane		ug/L																												
Tetrachloroethene		ug/L																												
Dibromochloromethane		ug/L																												
Chlorobenzene		ug/L																												
Ethylbenzene		ug/L																												
Bromoform		ug/L																												
1,1,2,2-Tetrachloroethane		ug/L																												
1,3-Dichlorobenzene		ug/L																												
1,4-Dichlorobenzene		ug/L																												
1,2-Dichlorobenzene		ug/L																												
Semivolatile Organics (EPA 625)																														
Parameter Name	Standart	Units																												
N-Nitrosodimethylamine		ug/L	5																											
Phenol		ug/L	5																											
Bis(2-Chloroethyl)Ether		ug/L	5																											
2-Chlorophenol		ug/L	5																											
1,3-Dichlorobenzene		ug/L																												
1,4-Dichlorobenzene		ug/L																												
1,2-Dichlorobenzene		ug/L																												
Bis(2-Chloroisopropyl)ether		ug/L																												
N-Nitroso-di-n-propylamine		ug/L																												
Hexachloroethane		ug/L																												
Nitrobenzene		ug/L																												
2-Nitrophenol		ug/L																												
2,4-Dimethylphenol		ug/L	5																											
Bis(2-Chloroethoxy)Methane		ug/L																												
2,4-Dichlorophenol		ug/L	5																											
1,2,4-Trichlorobenzene		ug/L	5																											
Naphthalane		ug/L	5																											
Hexachlorobutadiene		ug/L	5																											
4-Chloro-3-Methylphenol		ug/L	5																											
2-Methylnaphthalene		ug/L	5																											
1-Methylnaphthalene		ug/L																												
Hexachlrorcyclopentadiene		ug/L	5																											
2,4,6-Trichlorophenol		ug/L	5																											
2-Chloronaphthalene		ug/L																												
Dimethylphthalene		ug/L	5																											
Acenaphthane		ug/L	5																											
Acenaphthylene		ug/L	5																											
2,4-Dinitrophenol		ug/L	25																											

4-Nitrophenol		ug/L	25																											
2,4-Dinitrotoluene		ug/L	5																											
Color Code ***red:*** *half the detection limit values* ***blue:*** *non-detect values that are higher than MCL values* *measured values that are higher than MCL values*		***green:***	**Seacoast**	**MD- North D.**	**Sunrise, Sawgrass**	**Naples, GoldenGate Annual eff.**	**City of Hollywood WTP**	**City of Hollywood WTP**	**City of Hollywood WTP**	**City of Hollywood WTP**	**City of Hollywood WTP**	**Broward Co. Secondary Effluent**																**Broward County**	**City of Hollywood**	**City of Hollywood**
		Date	9/29/1988	9/12/1995	Date has not	1/13/2000	5/3/2000	5/10/2000	5/17/2000	5/24/2000	5/31/2000	12/11/1996	3/18/1997	5/7/1997	6/17/1997	7/9/1997	11/4/1997	4/8/1998	6/24/1998	7/9/1998	8/6/1998	9/10/1998	10/8/1998	11/5/1998	12/3/1998	9/9/1999	2/9/2000	4/11/2000	7/9/1999	11/9/1999
2,6-Dinitrotoluene		ug/L	5																											
Diethylphthalate		ug/L																												
4-Chlorophenyl-phenyl ether		ug/L																												
Fluorene		ug/L	5																											
4,6-Dinitro-2-Methylphenol		ug/L																												
N-Nitrosodiphenylamine		ug/L	5																											
4-Bromophenyl-phenyl ehter		ug/L	5																											
Hexachlorobenzene		ug/L	5																											
B-BHC		ug/L																												
Pentachlorophenol		ug/L	5																											
Phenanthrene		ug/L	5																											
Anthracene		ug/L	5																											
D-BHC		ug/L																												
Heptachlor		ug/L																												
Di-n-Butylphthalate		ug/L	5																											
Aldrin		ug/L	5																											
Heptachlor Epoxide		ug/L																												
Fluoranthene		ug/L	5																											
Benzidine		ug/L	5																											
Pyrene		ug/L	5																											
Endosulfan I		ug/L																												
4,4-DDE		ug/L																												
Dieldrin		ug/L																												
Endrin		ug/L																												
4,4-DDD		ug/L																												
Endosulfan II		ug/L																												
Butylbenzylphthalate		ug/L	5																											
4,4-DDT		ug/L																												
Endosulfan Sulfate		ug/L																												
3,3-Dichlorobenzidine		ug/L	10																											
Benzo(a)Anthracene		ug/L	5																											
Bis(2-Ethylhexyl)Phthalate		ug/L																												
Chrysene		ug/L	5																											
Di-n-octylophthalate		ug/L	5																											
Benzo(d)Fluoranthene		ug/L																												
Benzo(k)Fluoranthene		ug/L	5																											
Benzo(a)pyrene		ug/L	5																											
Indeno(1,2,3-cd)Pyrene		ug/L	5																											
Dibenzo(a,h)Anthracene		ug/L	5																											
Benzo(g,h,I)Perylene		ug/L	5																											
Chlordane		ug/L																												
Endrin Aldehyde		ug/L																												
Isophorone		ug/L																												
Toxaphene		ug/L																												
PCB 1016		ug/L																												
PBC 1221		ug/L																												
PCB 1232		ug/L																												
PCB 1242		ug/L																												
PCB 1248		ug/L																												
PCB 1254		ug/L																												
PCB 1260		ug/L																												
Ammonia-N		mg/L	18.8		2.47		10.5	12.6	11.1	7.5	6.4																			
Nitrogen, total		mg/L																											17	16
Nitrogen, organic		mg/L	2.94		2.11																									
Nitrogen, total Kjeldahl		mg/L	21.7		4.58		13.4	12.9	12.3	13	10																		1.8	3.3
Ortho-phosphate		mg/L	4.08		1.99		0.63	0.98	0.68	0.4	0.8																			
Phosphorus, total		mg/L			2.19		0.76	1.13	0.77	0.94	0.94																		0.85	2
Alkalinity, total (as CaCO3)		mg/L	166																											
Carbonate Alkalinity		mg/L																												
Bicarbonate Alkalinity		mg/L																												
Calcium		mg/L	38.4																											
Carbon Dioxide		mg/L																												
Hardness, total		mg/L																												
Non-Carb. Hardness		mg/L																												
Hydrogen Sulfide, total																														
Hydroxide, CaCO3		mg/L																												
Magnesium		mg/L																												
Potassium		mg/L																												
BOD		mg/L					3	3	4	3	5																			
Dioxin - 2,3,7,8-TCDD		pg/L																												
Asbestos		mg/L																												
pH, field		std unit																												
Field Conductivity		umhos/cm																												
Total Coliform		col/100ml			180																									0.5	0.5
Fecal Coliform		col/100ml																												
Fecal Strep		col/100ml																												
Water Temperature		° C																												
Weather Condition																														
COD		mg/L																												
Corosivity																														
Turbidity		NTU																												

Table D1 Comparison of MCL Values with Secondary Effluent Data with Non-detects at half the detection value

Color Code ***red:*** *half the detection limit values* ***blue:*** *non-detect values that are higher than MCL values* *measured values that are higher than MCL values*		***green:***	**City of Hollywood**	**City of Hollywood**	**MD-South D.**	**Broward County**		
		Date	4/17/2000	7/10/2000	3/19/1999	3/18/1997		
Inorganic Analysis - 62-550.310 (1) PWS030								
Parameter Name	**MCL - Drinking Water Standard**	**Units**						
Arsenic	0.05	mg/L	0.005	0.005	0.005	0.005		
Barium	2	mg/L	0.005	0.005	0.025			
Cadmium	0.005	mg/L	0.002	0.002	0.0025	0.001235		
Chromium	0.1	mg/L	0.005	0.005	0.0025	0.002635		
Cyanide	0.2	mg/L	0.001	0.001	0.002			
Fluoride	4	mg/L	0.67	0.61	0.75			
Lead	0.015	mg/L	0.00025	0.00025	0.0025	0.00289		
Mercury	0.002	mg/L	0.001	0.0001	0.0005	0.00405		
Nickel	0.1	mg/L	0.005	0.005	0.0025	0.0173		
Nitrate	10	mg/L	9.1	6.5	0.64			
Nitrite	1	mg/L	0.01	0.01	0.025			
Selenium	0.05	mg/L	0.005	0.005	0.005	0.0088		
Sodium	160	mg/L	69	66	181			
Antimony	0.006	mg/L	0.0025	0.0025	0.0025	0.00361		
Beryllium	0.004	mg/L	0.0015	0.0015	0.001	0.000551		
Thallium	0.002	mg/L	0.001	0.001	0.001	0.0005		
Secondary Chemical Analysis - 62-550.320 PWS031								
Parameter Name	Standart	Units						
Aluminum	0.2	mg/L			0.05			
Chloride	250	mg/L	130		218			
Copper	1	mg/L	0.0001	0.0035	0.005	0.00314		
Fluoride	2	mg/L	0.67	0.61	0.75			
Iron	0.3	mg/L	0.28	0.16	0.209			
Manganese	0.05	mg/L	0.022	0.019	0.025			
Silver	0.1	mg/L	0.00025	0.00025	0.0005			
Sulfate	250	mg/L	120	190	71.9			
Zinc	5	mg/L	0.032	0.016	0.02	0.008		
Color	15	PtCo units	30	40	50			
Odor	3	TON	1	8	75			
pH (units)	6.5-8.5	std units	7	6.2	6.93			
TDS	500	mg/L	550	690	610			
Foaming Agents	1.5	mg/L	0.01	0.025	0.063			
TOC - Liquid			17	16				
Volatile Organic Analysis - 62-550.310 (2)(b) PWS028								
Parameter Name	Standard mg/L	Units						
1,2,4-Trichlorobenzene	70	ug/L	0.5	0.5	0.25	0.53		
cis-1,2-Dichloroethene	70	ug/L	0.5	0.5	0.25			
Xylenes (total)	10000	ug/L	0.5	0.5	0.25			
Dichloromethane	5	ug/L	0.5	0.5	0.25			
o-dichlorobenzene	600	ug/L						
para-Dichlorobenzene	75	ug/L						
Vinyl Chloride	1	ug/L	0.5	0.5	0.25	0.0545		
1,1-dichloroethane	7	ug/L	0.5	0.5	0.25	0.0102		
Trans-1,2-Dichloroethylene	100	ug/L	0.5	0.5	0.25	0.0085		
1,2 Dichloroethane	3	ug/L	0.5	0.5	0.25	0.0175		
1,1,1-Trichloroethane	200	ug/L	0.5	0.5	0.25	0.027		
Carbon Tetrachloride	3	ug/L	0.5	0.5	0.25	6.42		
1,2 Dichloropropane	5	ug/L	0.5	0.5	0.25	0.012		
Trichloroethylene	3	ug/L	0.5	0.5	0.25	0.0075		
1,1,2-trichloroethane	5	ug/L	0.5	0.5	0.25	0.0175		
Tetrachloroethene	3	ug/L	0.5	0.5	0.25	0.165		
Monochlorobenzene	100	ug/L	0.5	0.5	0.25	0.012		
Benzene	1	ug/L	0.5	0.5	0.25	0.005		
Toluene	1000	ug/L	0.5	0.5	0.25	0.095		
Ethylbenzene	700	ug/L	0.5	0.5	0.25	0.0125		
Styrene	100	ug/L	0.5	0.5	0.25			
1,2-Dichlorobenzene						0.02		
1,4-Dichlorobenzene						0.88		
Pesticide/PCB Chemical Analysis - 62-550.310(2)(c) PWS029								
Parameter Name	Standard mg/L	Units						
Endrin	2	ug/L	0.05	0.05	0.005	0.995		
Lindane	0.2	ug/L	0.05	0.05	0.005			
Methoxychlor	40	ug/L	0.1	0.1	0.005			
Toxaphene	3	ug/L	1.5	1.5	0.005			
Dalapon	200	ug/L	0.25	0.25	0.65			
Diquat	20	ug/L	0.5	0.5	0.25			
Endothall	100	ug/L	10	10	5			
Glyphosate	700	ug/L	5	5	5			
Di(2-ethylhexyl)adipate	400	ug/L	0.5	0.5	2.5			
Oxyamyl (Vydate)	200	ug/L	0.25	0.25	25			
Simazine	4	ug/L	1.5	1.5	0.25			
Di(2-ethylhexyl)phthlate	6	ug/L	0.5	0.5	2.5	0.407		
Pincloram	500	ug/L	0.25	0.25	0.1			
Dinoseb	7	ug/L	0.25	0.25	0.1			
Hexachlorocyclopentadiene	50	ug/L	0.05	0.05	0.005	0.298		
Carbofuran	40	ug/L	0.25	0.25	5			
Atrazine	3	ug/L	1.5	1.5	0.1			
Alachlor	2	ug/L	0.05	0.05	0.005			
Heptachlor	0.4	ug/L	0.05	0.05	0.005	0.84		

Color Code **red:** *half the detection limit values* **blue:** *non-detect values that are higher than MCL values* *measured values that are higher than MCL values*		***green:***	**City of Hollywood**	**City of Hollywood**	**MD-South D.**	**Broward County**
		Date	4/17/2000	7/10/2000	3/19/1999	3/18/1997
Heptachlor epoxide	0.2	ug/L	0.05	0.05	0.005	0.48
2,4-D	70	ug/L	0.25	0.25	0.1	
2,4, 5-TP (Silvex)	50	ug/L	0.05	0.05	0.1	
Hexachlorobenzene	1	ug/L	0.05	0.05	0.005	0.825
Benzo (a) pyrene	0.2	ug/L	0.1	0.1	0.1	0.515
Pentachlorophenol	1	ug/L	0.025	0.025	0.5	0.293
PCB	0.5	ug/L				
Dibromochloropropane	0.2	ug/L	0.01	0.01	0.01	
Ethylene Dibromide	0.02	ug/L	0.01	0.01	0.01	
Chlordane	2	ug/L	0.25	0.25	0.005	0.0555
Trihalomethane Analysis - 62-550.310(2)(a) PWS027						
Parameter Name	Standard mg/L	Units				
Chloroform		mg/L	0.02	0.019	0.00718	0.0017
Bromodichloromethane		mg/L	0.012	0.0063	0.00025	0.000455
Dibromochloromethane		mg/L	0.0028	0.0016	0.00025	
Bromoform		mg/L	0.00025	0.00025	0.00025	0.000021
Total THMs		mg/L	0.0348	0.0269	0.00718	
Radiochemical Analysis - 62-550.310(5) PWS033						
Parameter Name	Standart	Units				
Gross Alpha		pCi/L				
Radium 226		pCi/L	0.1+/-0.0	0.4+/-0.1	0.5+/-0.25	
Radium 228		pCi/L	0.5+/-0.4	0.5+/-0.5		
Unregulated Group I Analysis - 62-550.405 PWS035						
Parameter Name	Standart	Units				
Carbaryl		ug/L				
Methomyl		ug/L				
Aldicarb Sulfoxide		ug/L				
Aldicarb Sulfone		ug/L				
Metolachlor		ug/L				
Aldicarb		ug/L				
3-Hydroxycarbofuran		ug/L				
Propachlor		ug/L				
Aldrin		ug/L				1.045
Dieldrin		ug/L				0.3545
Dicamba		ug/L				
Metribuzin		ug/L				
Butachlor		ug/L				
Unregulated Group II Analysis - 62-550.410 PWS034						
Parameter Name	Standart	Units				
Chloromethane		ug/L				0.0505
Dichlorodiflouromethane		ug/L				
Bromomethane		ug/L				0.036
Chloroethane		ug/L				0.0265
Trichloroflouromethane		ug/L				0.006
Methyl-Tert-Butyl-Ether		ug/L				
Dibromomethane		ug/L				
1,1-Dichloropropylene		ug/L				
1,3 Dichloropropane		ug/L				
1,3-Dichloropropene		ug/L				
1,2,3 Trichloropropane		ug/L				
2,2 Dichloropropane		ug/L				
Chloroform		ug/L				
Bromoform		ug/L				
Bromodichloromethane		ug/L				
Dibromochloromethane		ug/L				
o-chlorotoluene		ug/L				
p-chlorotoluene		ug/L				
m-dichlorobenzene		ug/L				
1,1-dichloroethane		ug/L				
1,1,1,2 Tetrachloroethane		ug/L				
1,1,2,2-tetrachloroethane		ug/L				0.0175
Bromobenzene		ug/L				
Unregulated Group III Analysis - 62-550.415 PWS036&0347						
Parameter Name	Standart	Units				
Isophrone		ug/L				0.278
2,4-Dinitrotoluene		ug/L				0.305
Dimethylphthalate		ug/L				0.382
Diethylphthalate		ug/L				0.407
Di-n-Butylphthalate		ug/L				1.215
Butyl benzyl phthalate		ug/L				
Di-n-octylphthalate		ug/L				2.29
2-Chlorophenol		ug/L				0.3305
2-Methyl-4,6-dinitrophenol		ug/L				rejected
Phenol		ug/L				1.07
2,4,6-Trichlorophenol		ug/L				0.2855
EPA 608						
Parameter Name	Standart	Unit				
A-BHC		ug/L				0.04055
B-BHC		ug/L				0.04
D-BHC		ug/L				0.04165
G-BHC (Lindane)		ug/L				
Heptachlor		ug/L				

Aldrin		ug/L				0.0915		
Heptachlor Epoxide		ug/L						
Color Code ***red:*** *half the detection limit values* ***blue:*** *non-detect values that are higher than MCL values* *measured values that are higher than MCL values*		***green:***	**City of Hollywood**	**City of Hollywood**	**MD-South D.**	**Broward County**		
		Date	4/17/2000	7/10/2000	3/19/1999	3/18/1997		
Endosulfan I		ug/L				0.061		
4,4-DDE		ug/L				0.0389		
Dieldrin		ug/L				0.065		
Endrin		ug/L				0.995		
4,4-DDD		ug/L				0.066		
Endosulfan II		ug/L				1.495		
4,4-DDT		ug/L				0.064		
Endrin Aldehyde		ug/L				rejected		
Endosulfan Sulfate		ug/L				0.98		
Chlordane		ug/L				0.0555		
Toxaphene		ug/L						
PCB-1016		ug/L	0.25	0.25				
PCB-1221		ug/L	0.25	0.25				
PCB-1232		ug/L	0.25	0.25				
PCB_1242		ug/L	0.25	0.25				
PCB-1248		ug/L	0.25	0.25				
PCB-1254		ug/L	0.25	0.25				
PCB-1260		ug/L	0.25	0.25				
Methoxychlor		ug/L						
EPA 624 - Purgeable Organics								
Parameter Name	Standart	Unit						
Chloromethane		ug/L						
Vinyl Chloride		ug/L						
Bromomethane		ug/L						
Chloroethane		ug/L						
Trichlorofluoromethane		ug/L						
1,1-Dichloroethene		ug/L						
Methylene Chloride		ug/L						
Trans-1,2-Dichloroethene		ug/L						
1,1-Dichloroethane		ug/L						
Chloroform		ug/L						
1,1,1-Trichloroethane		ug/L						
Carbon Tetrachloride		ug/L						
1,2-Dichloroethane		ug/L						
Benzene		ug/L						
Trichloroethene		ug/L						
1,2-Dichloropropane		ug/L						
Bromodichloromethane		ug/L						
2-Chloroethylvinyl Ether		ug/L						
Cis-1,3-dichloropropene		ug/L						
Toluene		ug/L						
Trans-1,3-Dichloropropene		ug/L						
1,1,2-Trichloroethane		ug/L						
Tetrachloroethene		ug/L						
Dibromochloromethane		ug/L						
Chlorobenzene		ug/L						
Ethylbenzene		ug/L						
Bromoform		ug/L						
1,1,2,2-Tetrachloroethane		ug/L						
1,3-Dichlorobenzene		ug/L						
1,4-Dichlorobenzene		ug/L						
1,2-Dichlorobenzene		ug/L						
Semivolatile Organics (EPA 625)								
Parameter Name	Standart	Units						
N-Nitrosodimethylamine		ug/L						
Phenol		ug/L						
Bis(2-Chloroethyl)Ether		ug/L						
2-Chlorophenol		ug/L						
1,3-Dichlorobenzene		ug/L						
1,4-Dichlorobenzene		ug/L						
1,2-Dichlorobenzene		ug/L						
Bis(2-Chloroisopropyl)ether		ug/L						
N-Nitroso-di-n-propylamine		ug/L						
Hexachloroethane		ug/L						
Nitrobenzene		ug/L						
2-Nitrophenol		ug/L						
2,4-Dimethylphenol		ug/L						
Bis(2-Chloroethoxy)Methane		ug/L						
2,4-Dichlorophenol		ug/L						
1,2,4-Trichlorobenzene		ug/L						
Naphthalane		ug/L						
Hexachlorobutadiene		ug/L						
4-Chloro-3-Methylphenol		ug/L						
2-Methylnaphthalene		ug/L						
1-Methylnaphthalene		ug/L						
Hexachlrorcyclopentadiene		ug/L						
2,4,6-Trichlorophenol		ug/L						
2-Chloronaphthalene		ug/L						
Dimethylphthalene		ug/L						
Acenaphthane		ug/L						
Acenaphthylene		ug/L						
2,4-Dinitrophenol		ug/L						

4-Nitrophenol		ug/L						
2,4-Dinitrotoluene		ug/L						
Color Code ***red:*** *half the detection limit values* ***blue:*** *non-detect values that are higher than MCL values* *measured values that are higher than MCL values*		***green:***	**City of Hollywood**	**City of Hollywood**	**MD-South D.**	**Broward County**		
		Date	4/17/2000	7/10/2000	3/19/1999	3/18/1997		
2,6-Dinitrotoluene		ug/L						
Diethylphthalate		ug/L						
4-Chlorophenyl-phenyl ether		ug/L						
Fluorene		ug/L						
4,6-Dinitro-2-Methylphenol		ug/L						
N-Nitrosodiphenylamine		ug/L						
4-Bromophenyl-phenyl ehter		ug/L						
Hexachlorobenzene		ug/L						
B-BHC		ug/L						
Pentachlorophenol		ug/L						
Phenanthrene		ug/L						
Anthracene		ug/L						
D-BHC		ug/L						
Heptachlor		ug/L						
Di-n-Butylphthalate		ug/L						
Aldrin		ug/L						
Heptachlor Epoxide		ug/L						
Fluoranthene		ug/L						
Benzidine		ug/L						
Pyrene		ug/L						
Endosulfan I		ug/L						
4,4-DDE		ug/L						
Dieldrin		ug/L						
Endrin		ug/L						
4,4-DDD		ug/L						
Endosulfan II		ug/L						
Butylbenzylphthalate		ug/L						
4,4-DDT		ug/L						
Endosulfan Sulfate		ug/L						
3,3-Dichlorobenzidine		ug/L						
Benzo(a)Anthracene		ug/L						
Bis(2-Ethylhexyl)Phthalate		ug/L						
Chrysene		ug/L						
Di-n-octylophthalate		ug/L						
Benzo(d)Fluoranthene		ug/L						
Benzo(k)Fluoranthene		ug/L						
Benzo(a)pyrene		ug/L						
Indeno(1,2,3-cd)Pyrene		ug/L						
Dibenzo(a,h)Anthracene		ug/L						
Benzo(g,h,I)Perylene		ug/L						
Chlordane		ug/L						
Endrin Aldehyde		ug/L						
Isophorone		ug/L						
Toxaphene		ug/L						
PCB 1016		ug/L						
PBC 1221		ug/L						
PCB 1232		ug/L						
PCB 1242		ug/L						
PCB 1248		ug/L						
PCB 1254		ug/L						
PCB 1260		ug/L						
Ammonia-N		mg/L						
Nitrogen, total		mg/L	13.6	10				
Nitrogen, organic		mg/L						
Nitrogen, total Kjeldahl		mg/L	4.5	4				
Ortho-phosphate		mg/L						
Phosphorus, total		mg/L	1.1	1.3				
Alkalinity, total (as CaCO3)		mg/L						
Carbonate Alkalinity		mg/L						
Bicarbonate Alkalinity		mg/L						
Calcium		mg/L						
Carbon Dioxide		mg/L						
Hardness, total		mg/L						
Non-Carb. Hardness		mg/L						
Hydrogen Sulfide, total								
Hydroxide, CaCO3		mg/L						
Magnesium		mg/L						
Potassium		mg/L						
BOD		mg/L						
Dioxin - 2,3,7,8-TCDD		pg/L	absent	absent				
Asbestos		mg/L						
pH, field		std unit						
Field Conductivity		umhos/cm						
Total Coliform		col/100ml	0.5	0.5	0.0005			
Fecal Coliform		col/100ml	0.5					
Fecal Strep		col/100ml						
Water Temperature		° C						
Weather Condition								
COD		mg/L						
Corosivity								
Turbidity		NTU						

APPENDIX E. GRAPHICAL COMPARISON OF MEANS FOR WATER QUALITY CONSTITUENTS

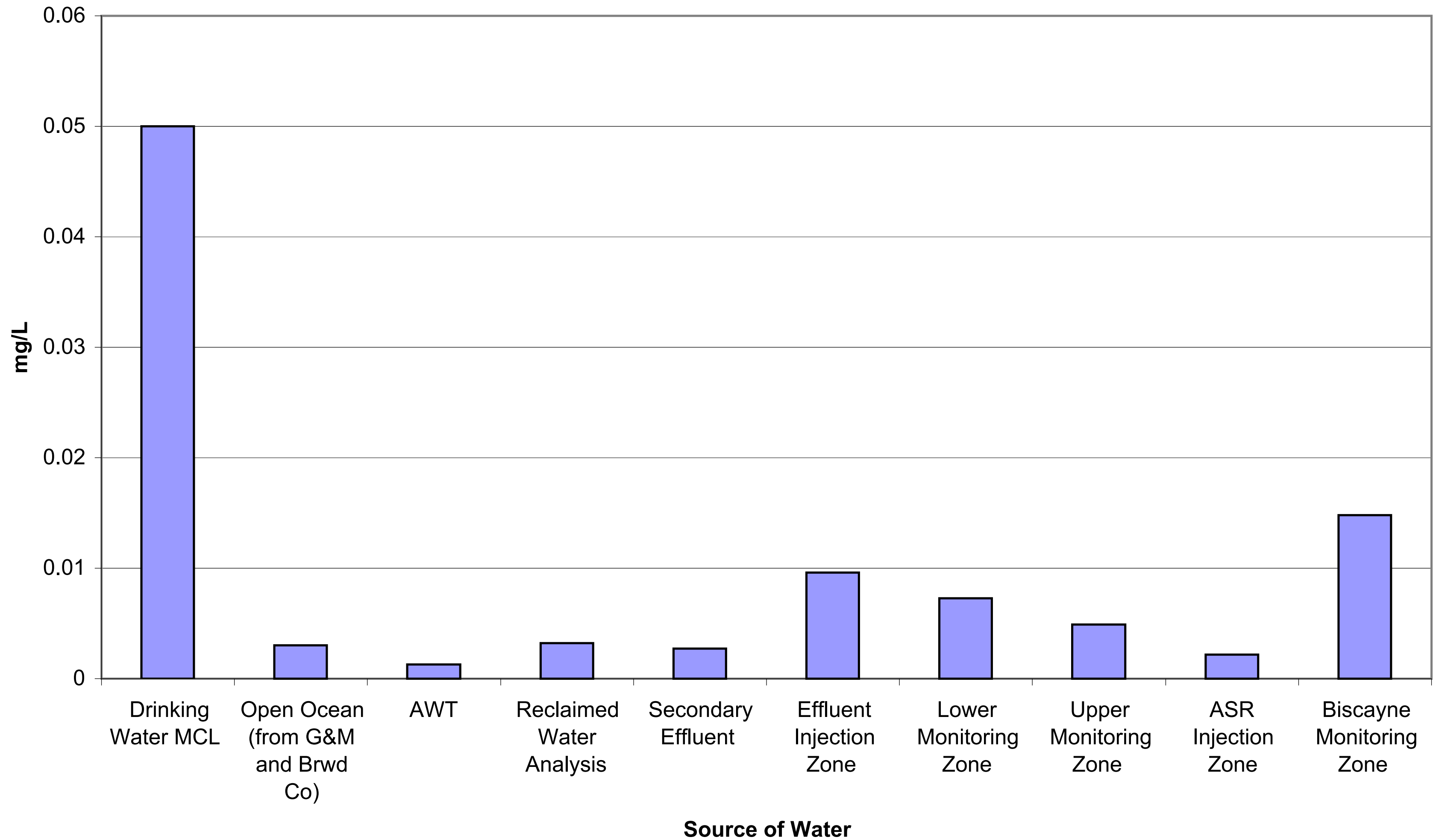


Figure E-1. COMPARISON OF AVERAGE ARSENIC VALUES IN TREATED WASTEWATER VERSUS THE BACKGOUND GROUNDWATER QUALITY

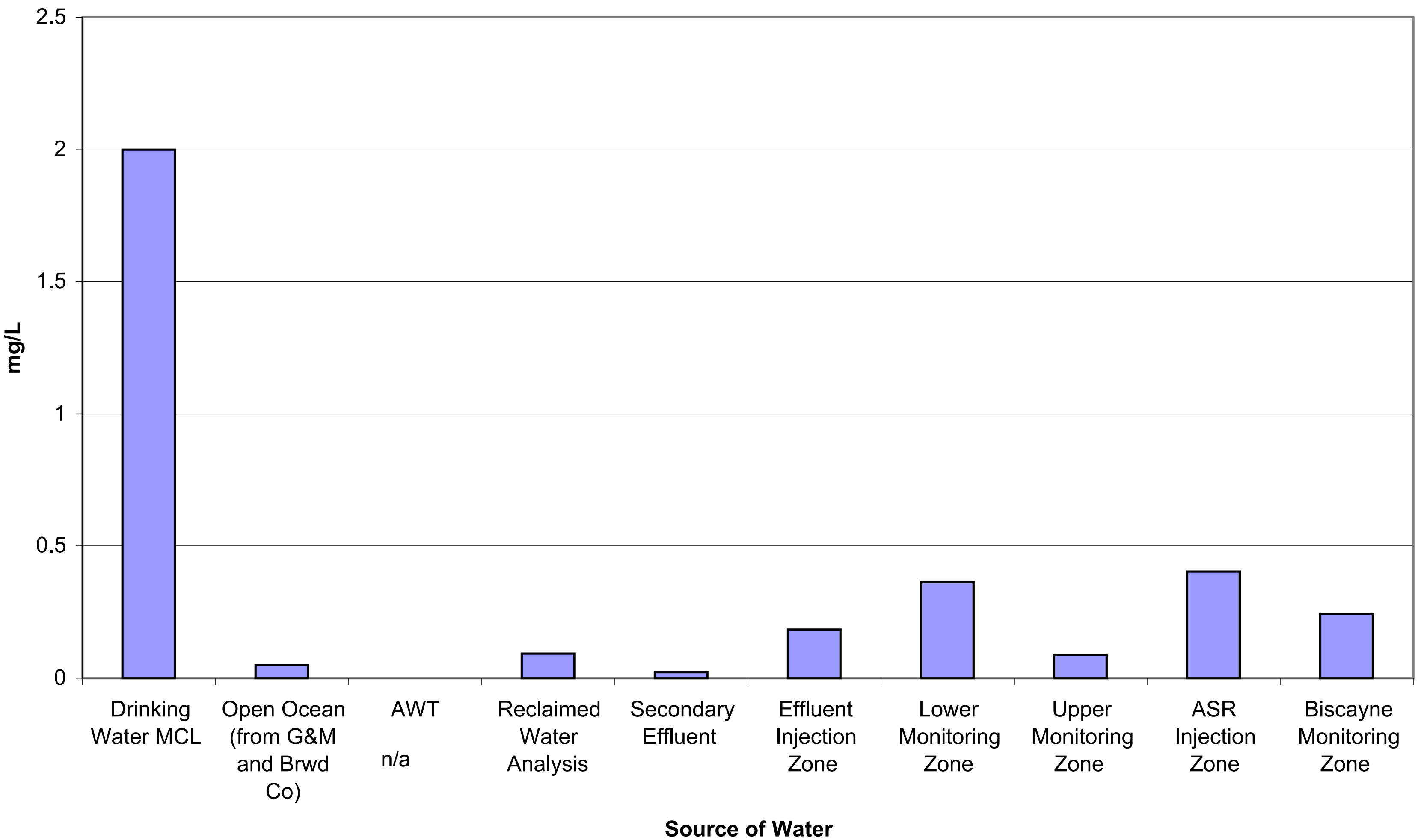


Figure E-2. COMPARISON OF AVERAGE BARIUM VALUES IN TREATED WASTEWATER VERSUS THE BACKGOUND GROUNDWATER QUALITY

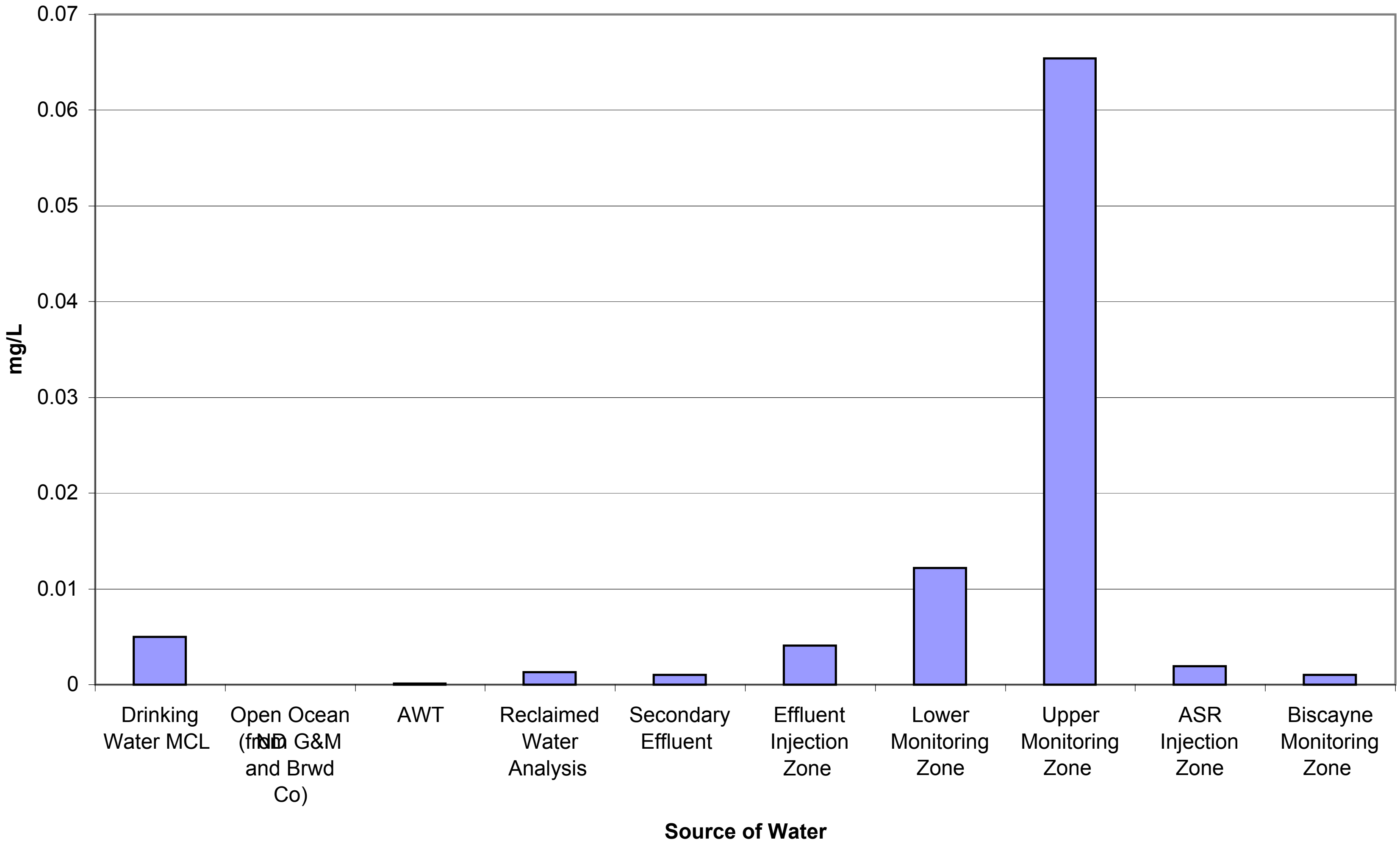


Figure E-3. COMPARISON OF AVERAGE CADMIUM VALUES IN TREATED WASTEWATER VERSUS THE BACKGOUND GROUNDWATER QUALITY

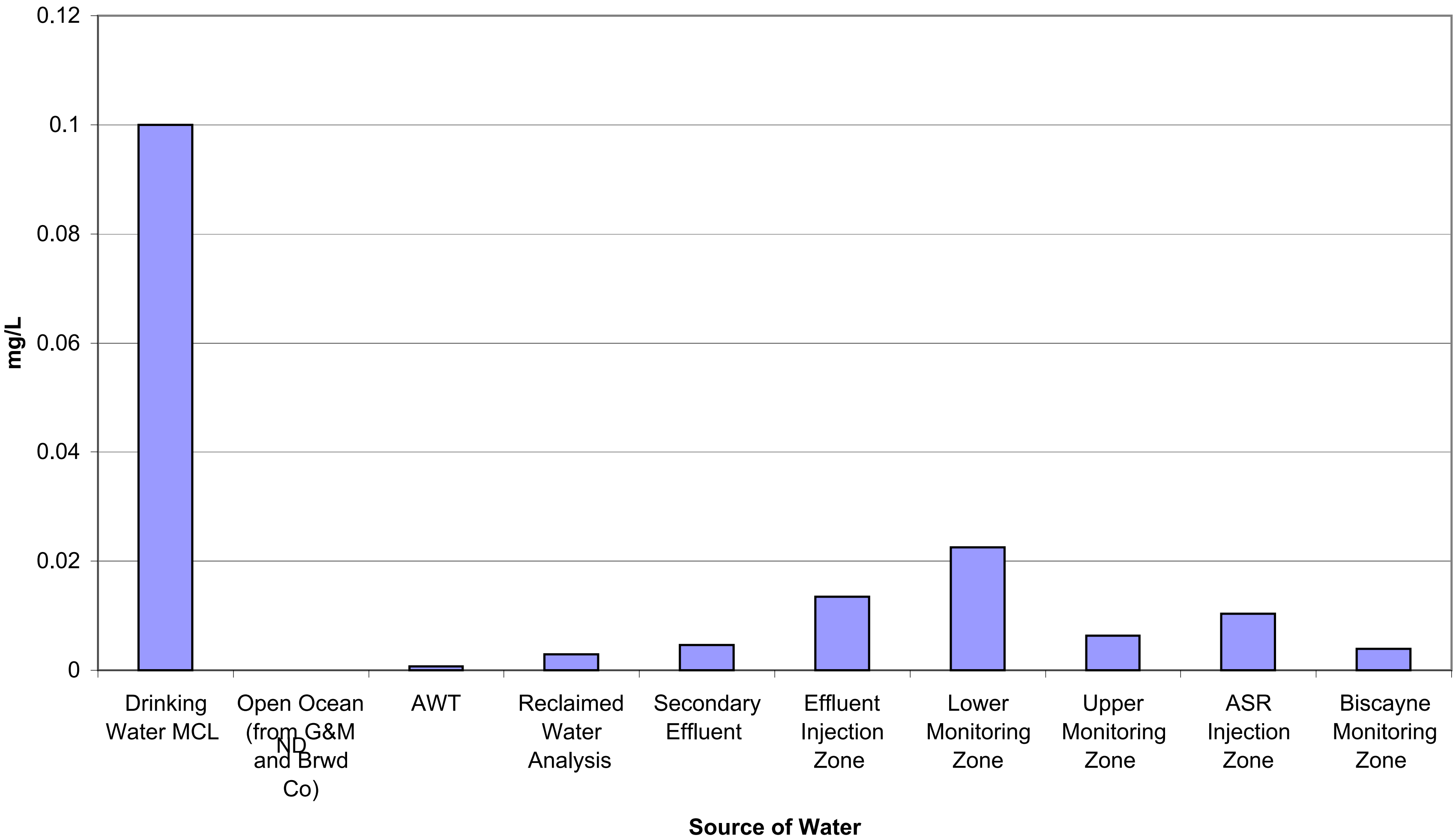


Figure E-4. COMPARISON OF AVERAGE CHROMIUMVALUES IN TREATED WASTEWATER VERSUS THE BACKGOUND GROUNDWATER QUALITY

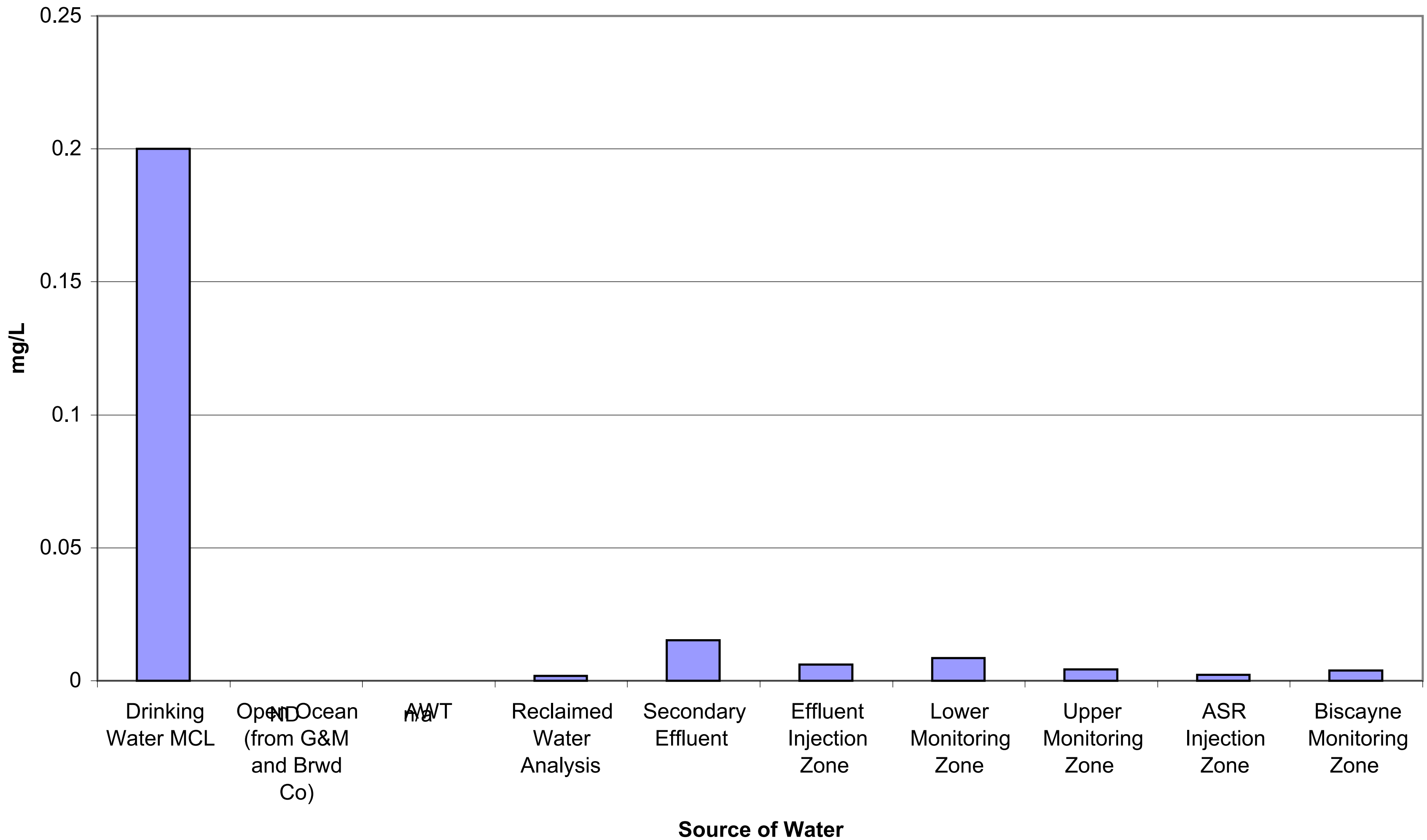


Figure E-5. COMPARISON OF AVERAGE CYANIDEVALUES IN TREATED WASTEWATER VERSUS THE BACKGOUND GROUNDWATER QUALITY

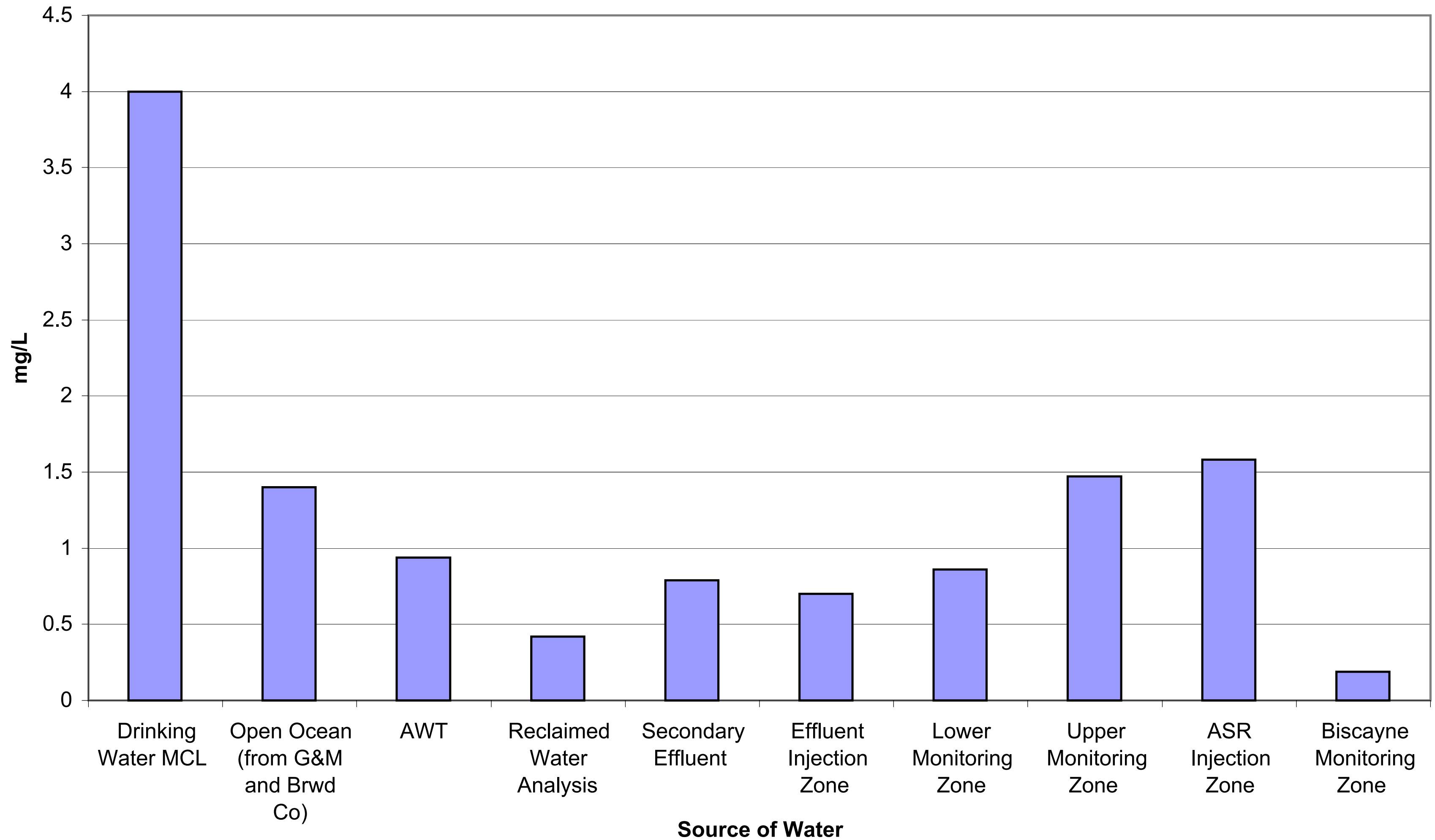


Figure E-6. COMPARISON OF AVERAGE FLUORIDE VALUES IN TREATED WASTEWATER VERSUS THE BACKGOUND GROUNDWATER QUALITY

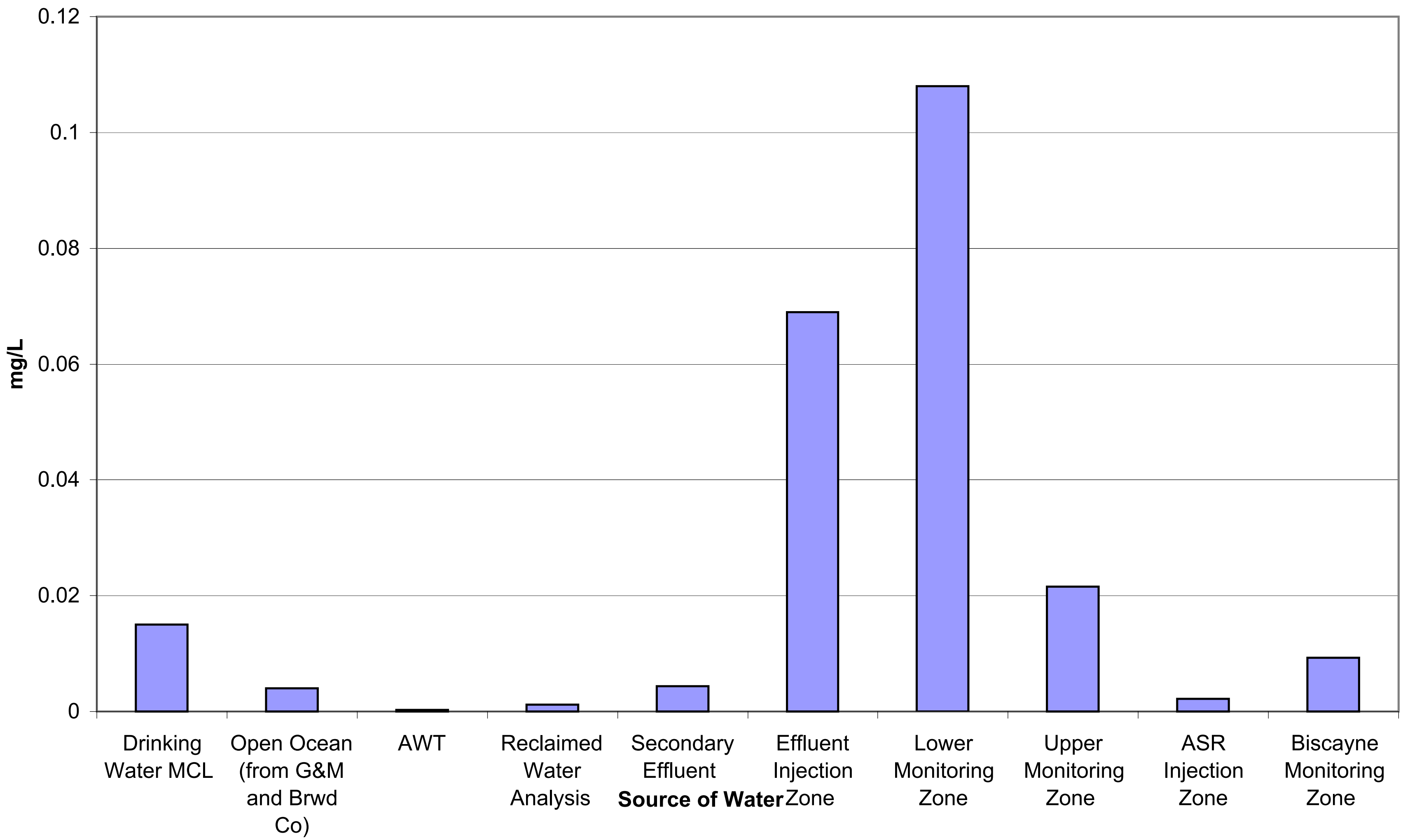


Figure E-7. COMPARISON OF AVERAGE LEAD VALUES IN TREATED WASTEWATER VERSUS THE BACKGOUND GROUNDWATER QUALITY

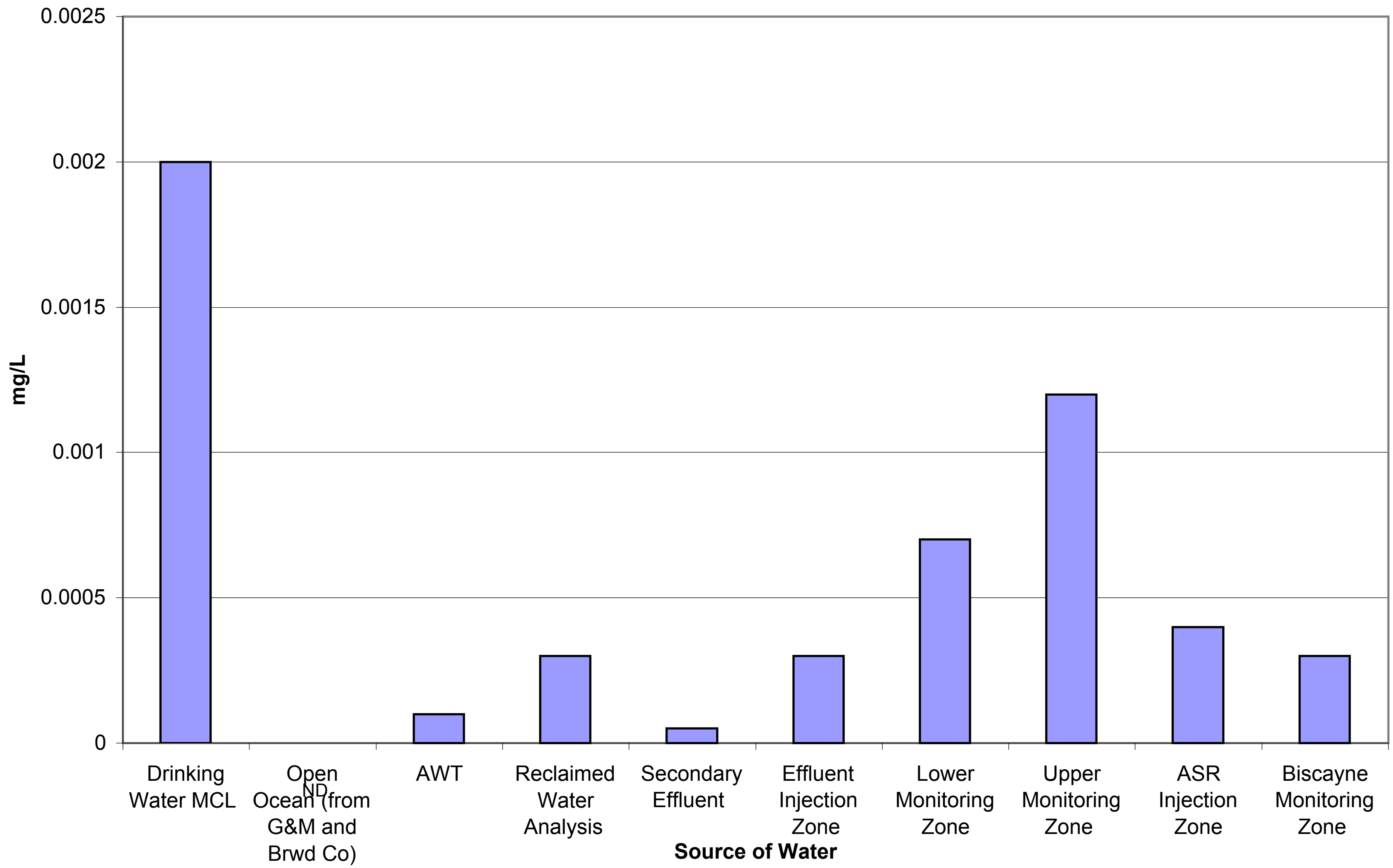


Figure E-8. COMPARISON OF AVERAGE MERCURY VALUES IN TREATED WASTEWATER VERSUS THE BACKGOUND GROUNDWATER QUALITY

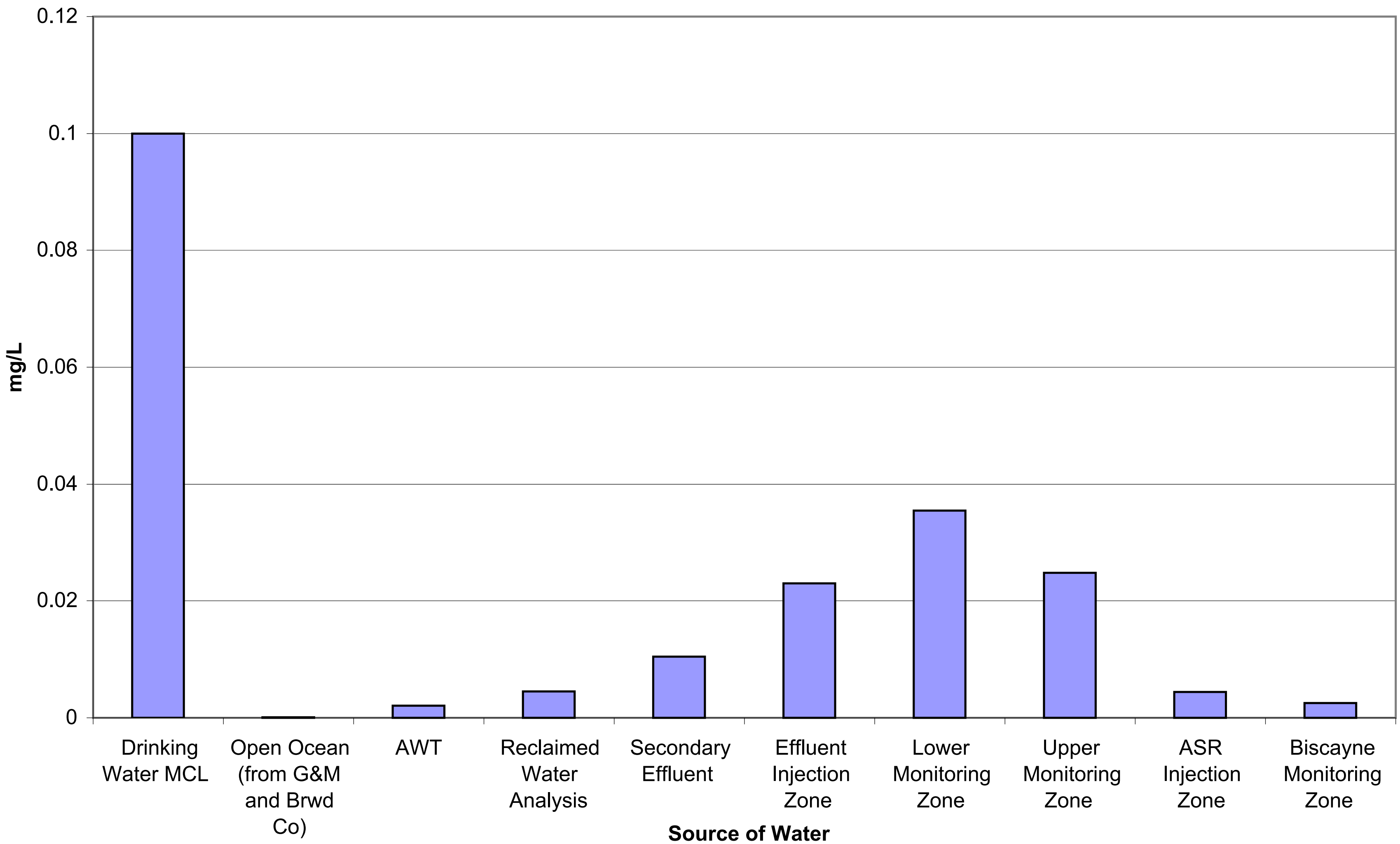


Figure E-9. COMPARISON OF AVERAGE NICKEL VALUES IN TREATED WASTEWATER VERSUS THE BACKGOUND GROUNDWATER QUALITY

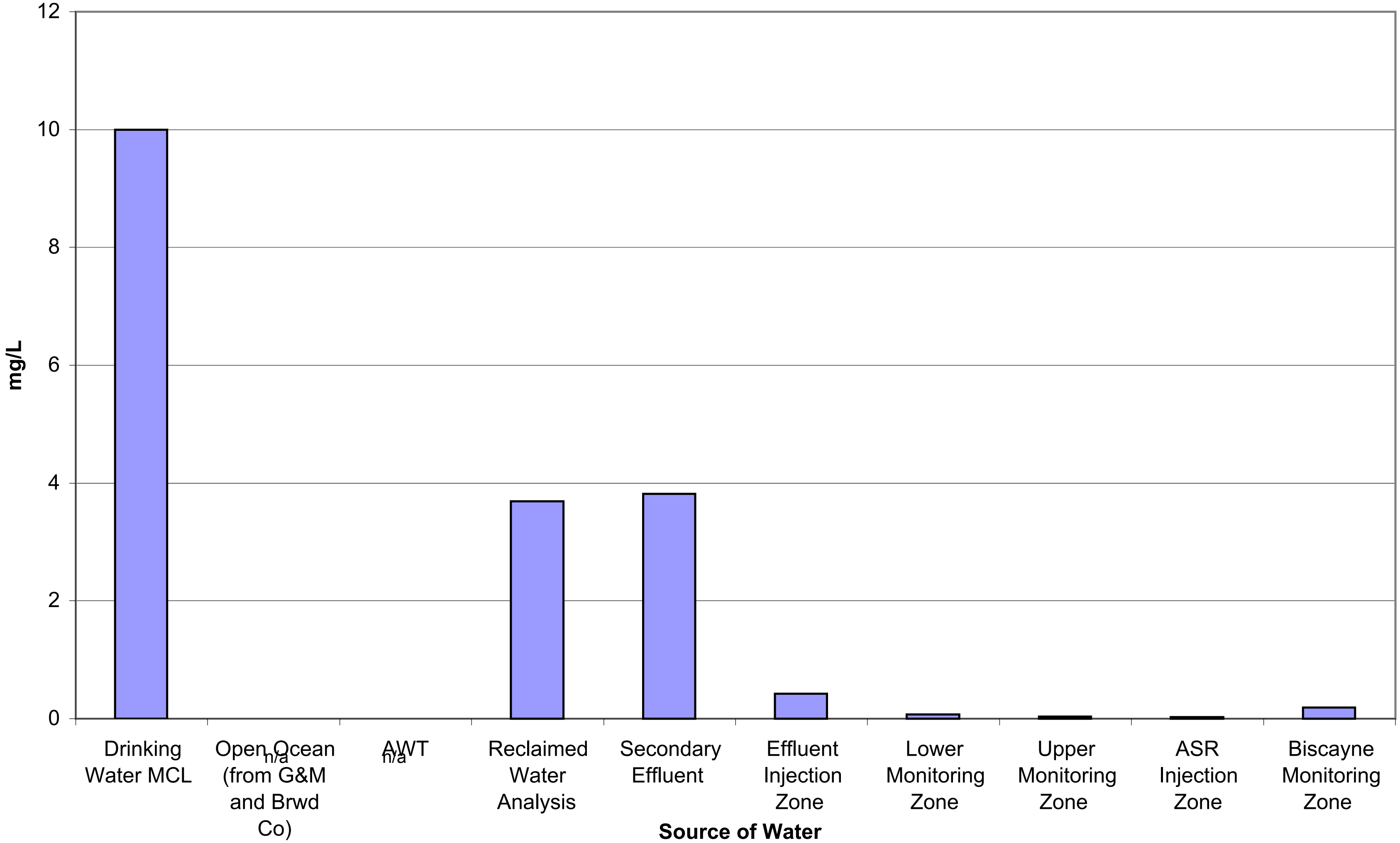


Figure E-10. COMPARISON OF AVERAGE NITRATE VALUES IN TREATED WASTEWATER VERSUS THE BACKGOUND GROUNDWATER QUALITY

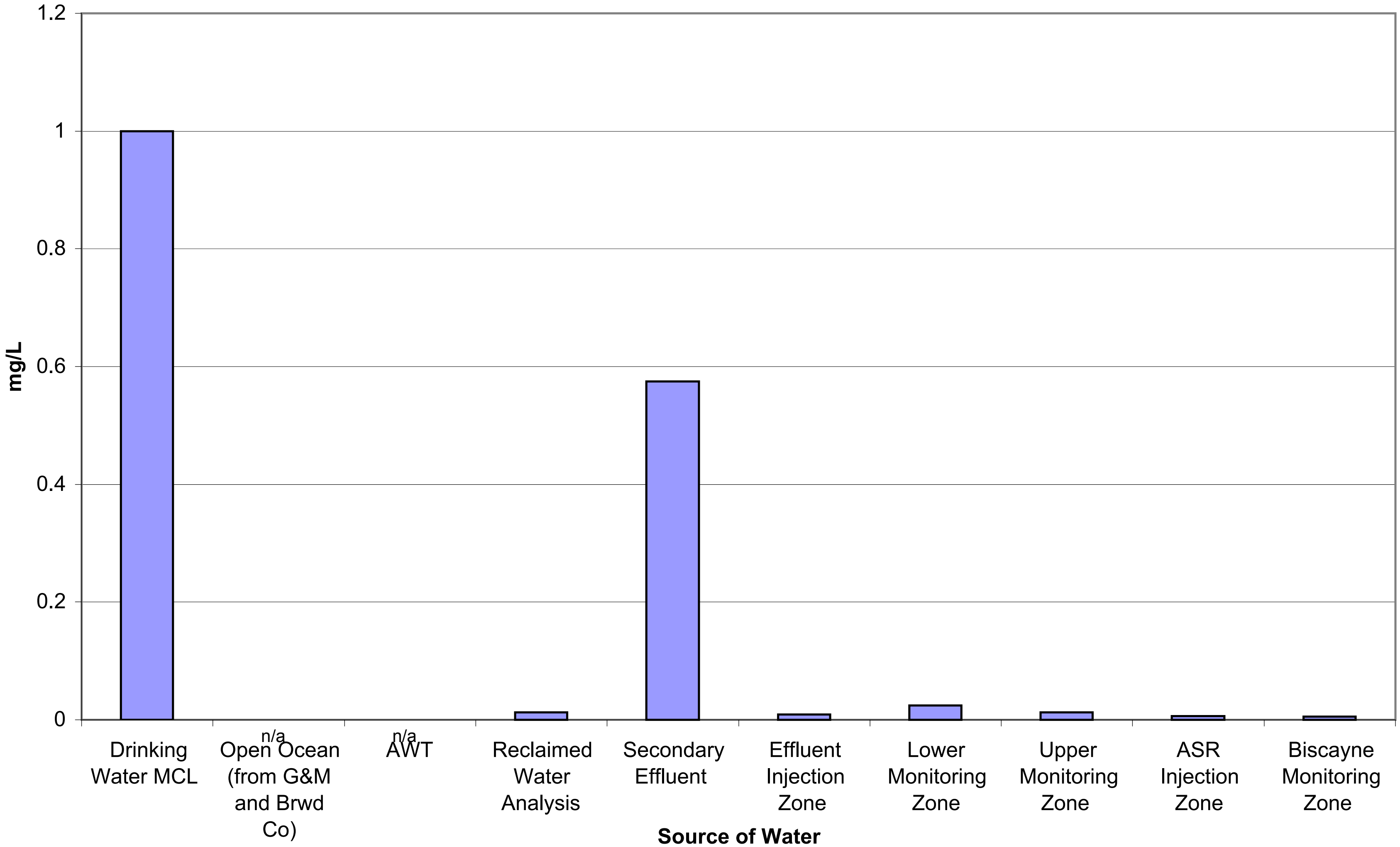


Figure E-11. COMPARISON OF AVERAGE NITRITE VALUES IN TREATED WASTEWATER VERSUS THE BACKGOUND GROUNDWATER QUALITY

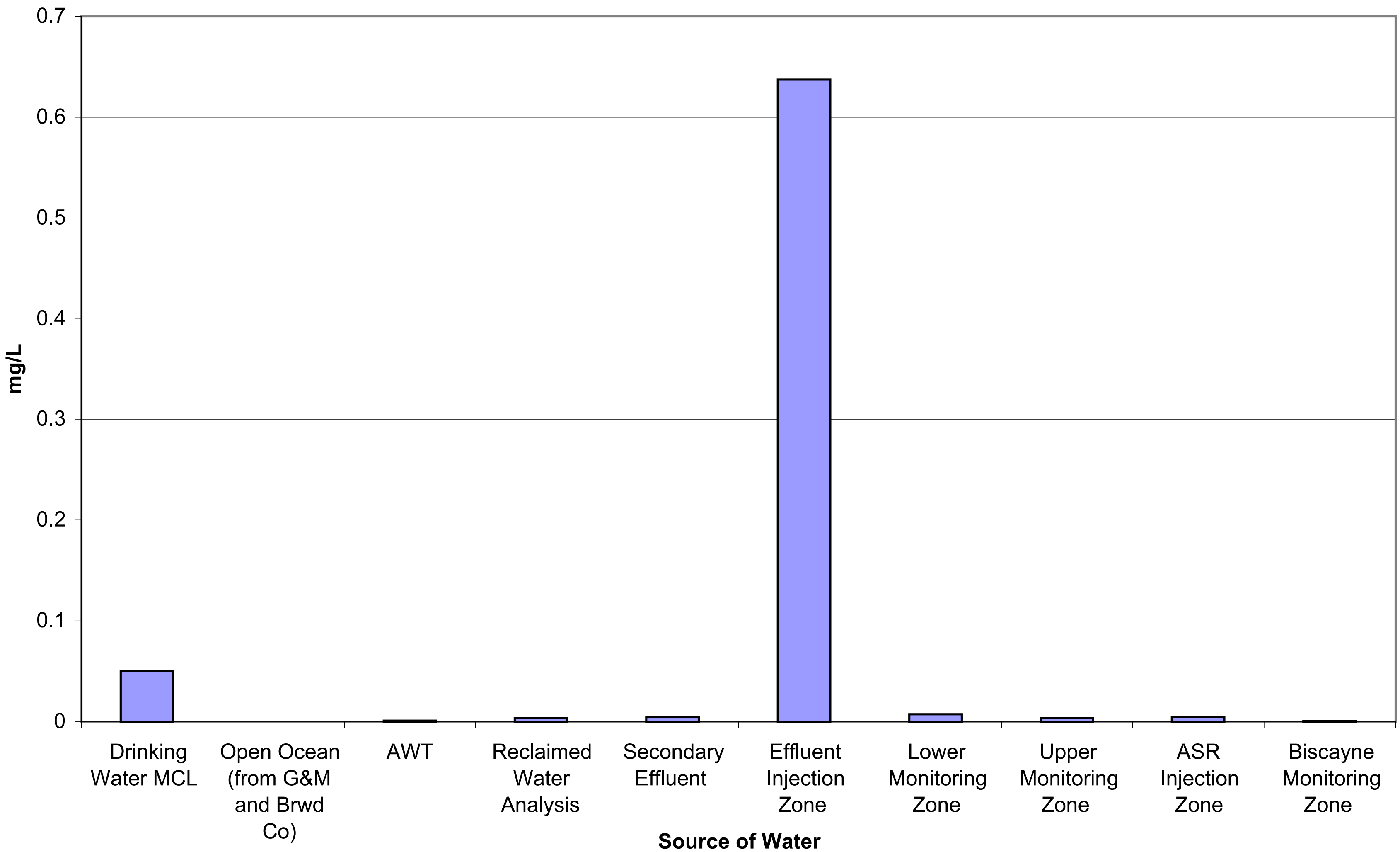


Figure E-12. COMPARISON OF AVERAGE SELENIUM VALUES IN TREATED WASTEWATER VERSUS THE BACKGOUND GROUNDWATER QUALITY

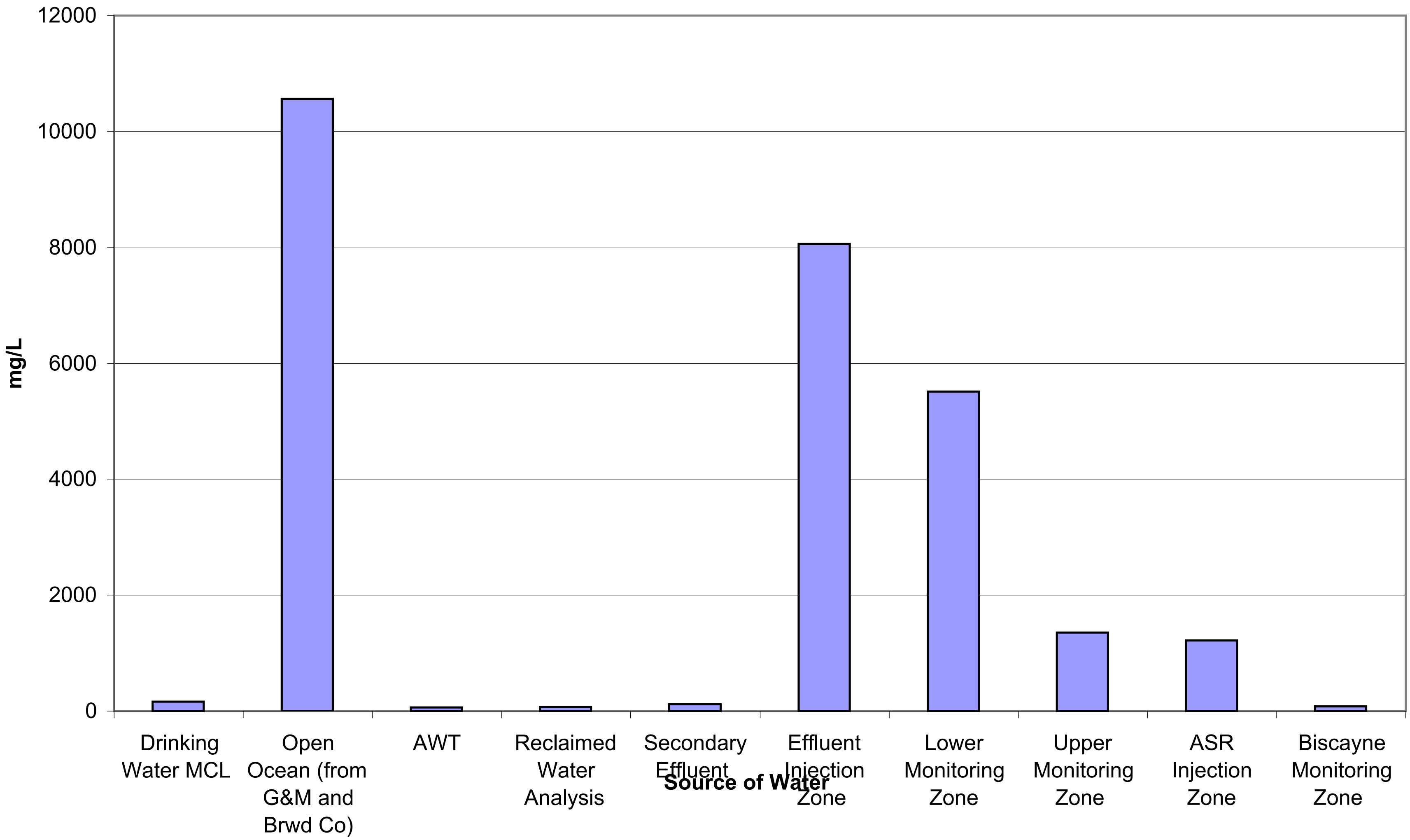


Figure E-13. COMPARISON OF AVERAGE SODIUM VALUES IN TREATED WASTEWATER VERSUS THE BACKGOUND GROUNDWATER QUALITY

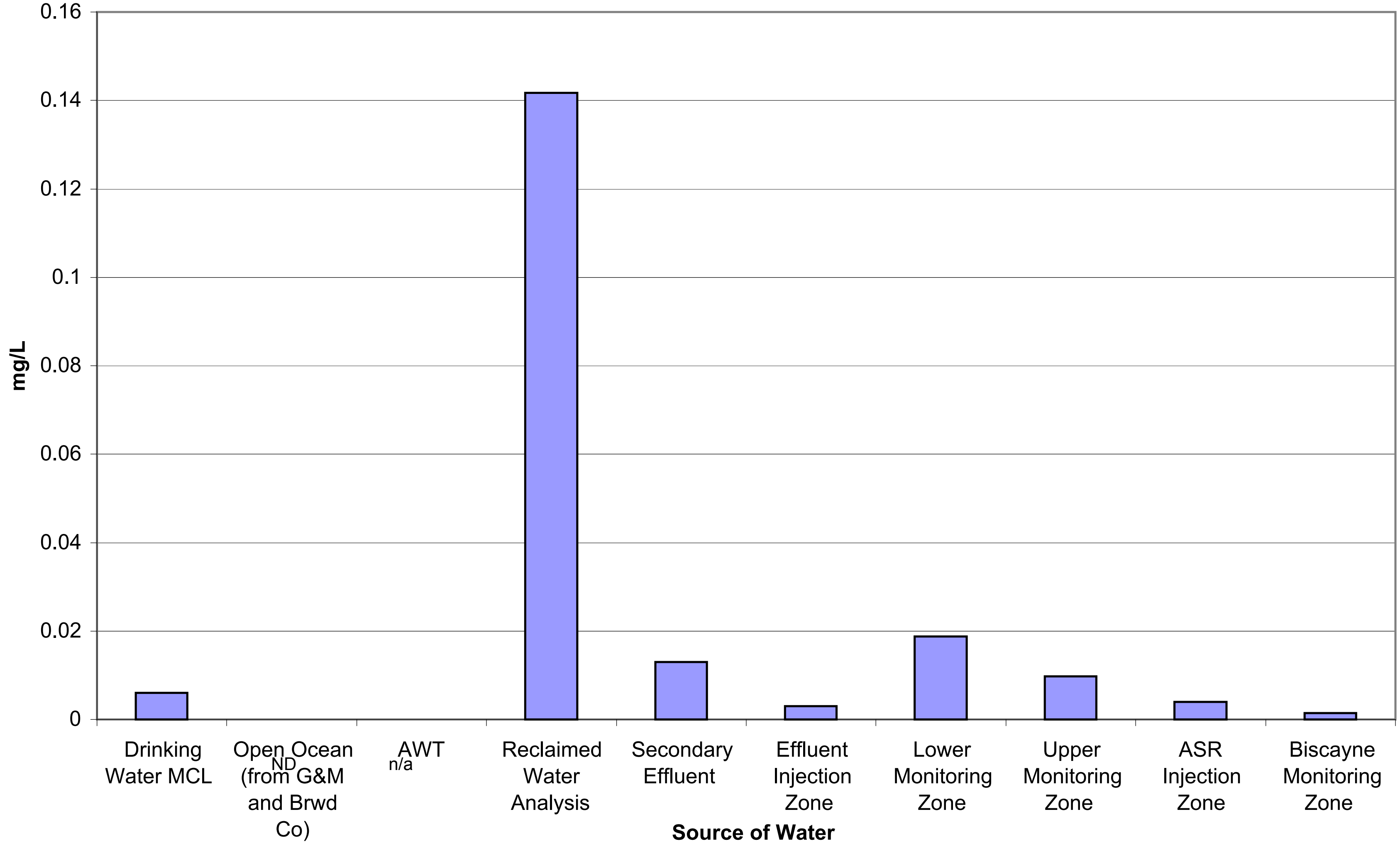


Figure E-14. COMPARISON OF AVERAGE ANTIMONY VALUES IN TREATED WASTEWATER VERSUS THE BACKGOUND GROUNDWATER QUALITY

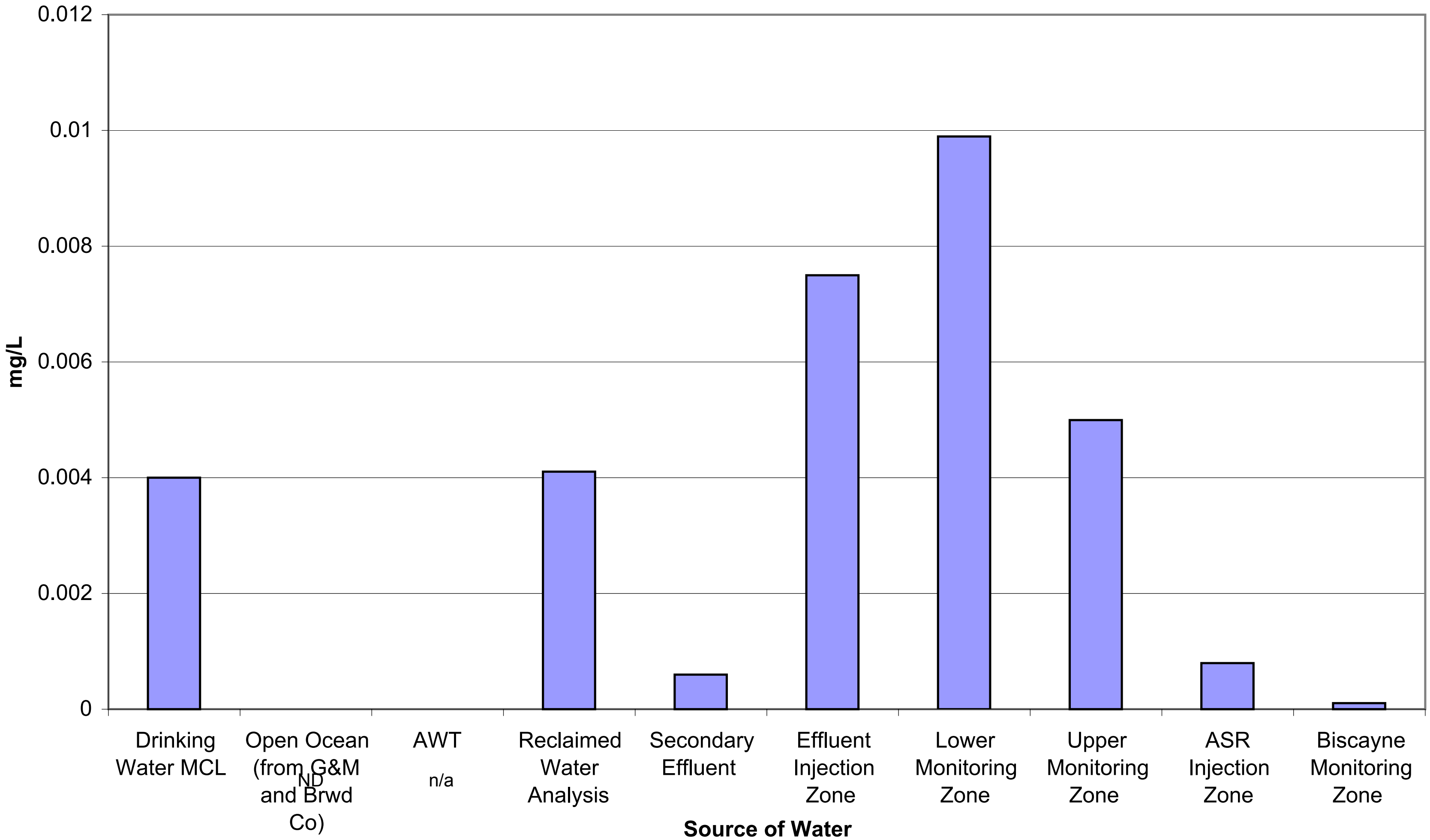


Figure E-15. COMPARISON OF AVERAGE BERYLLIUM VALUES IN TREATED WASTEWATER VERSUS THE BACKGOUND GROUNDWATER QUALITY

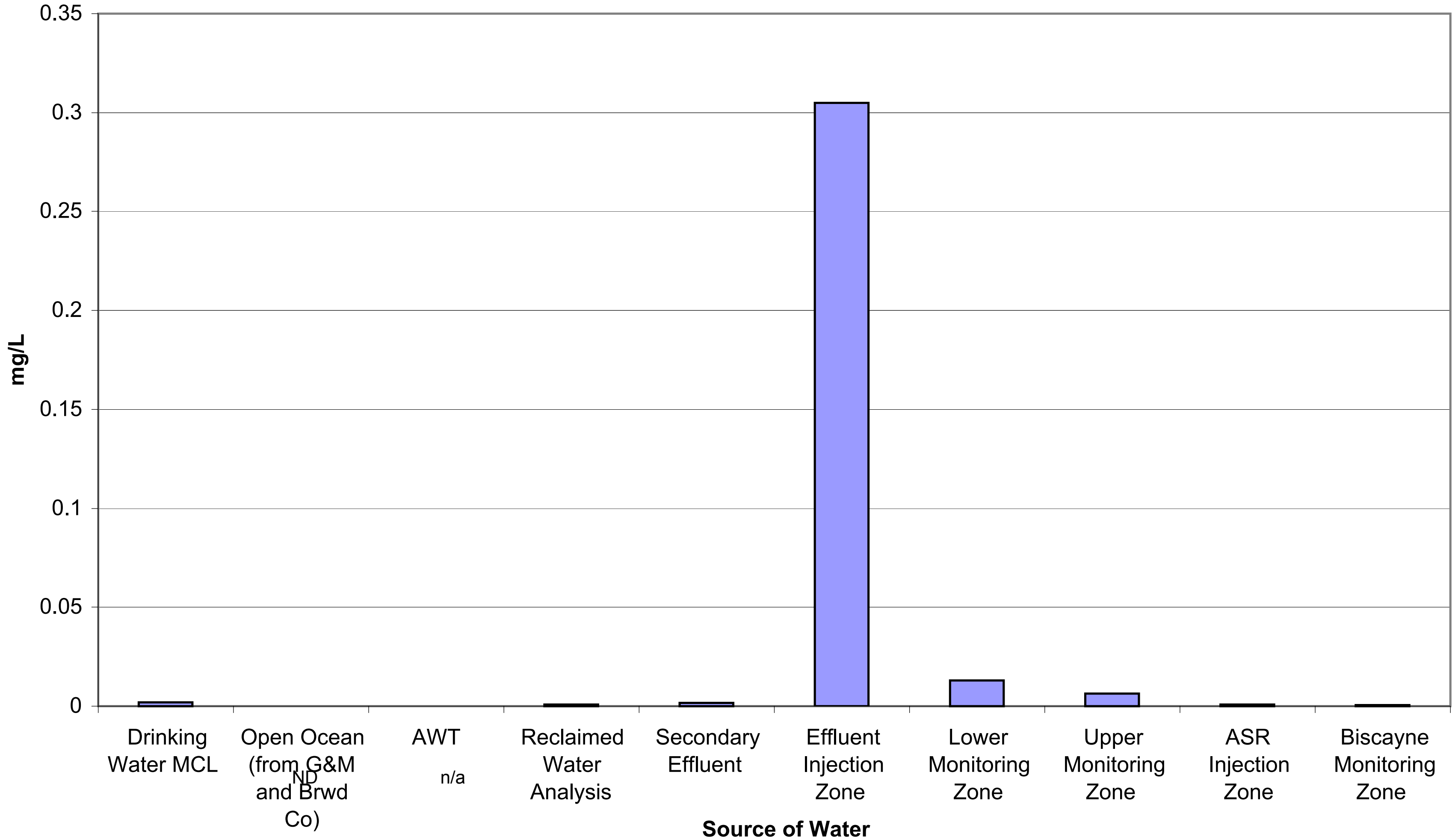


Figure E-16. COMPARISON OF AVERAGE THALLIUM VALUES IN TREATED WASTEWATER VERSUS THE BACKGOUND GROUNDWATER QUALITY

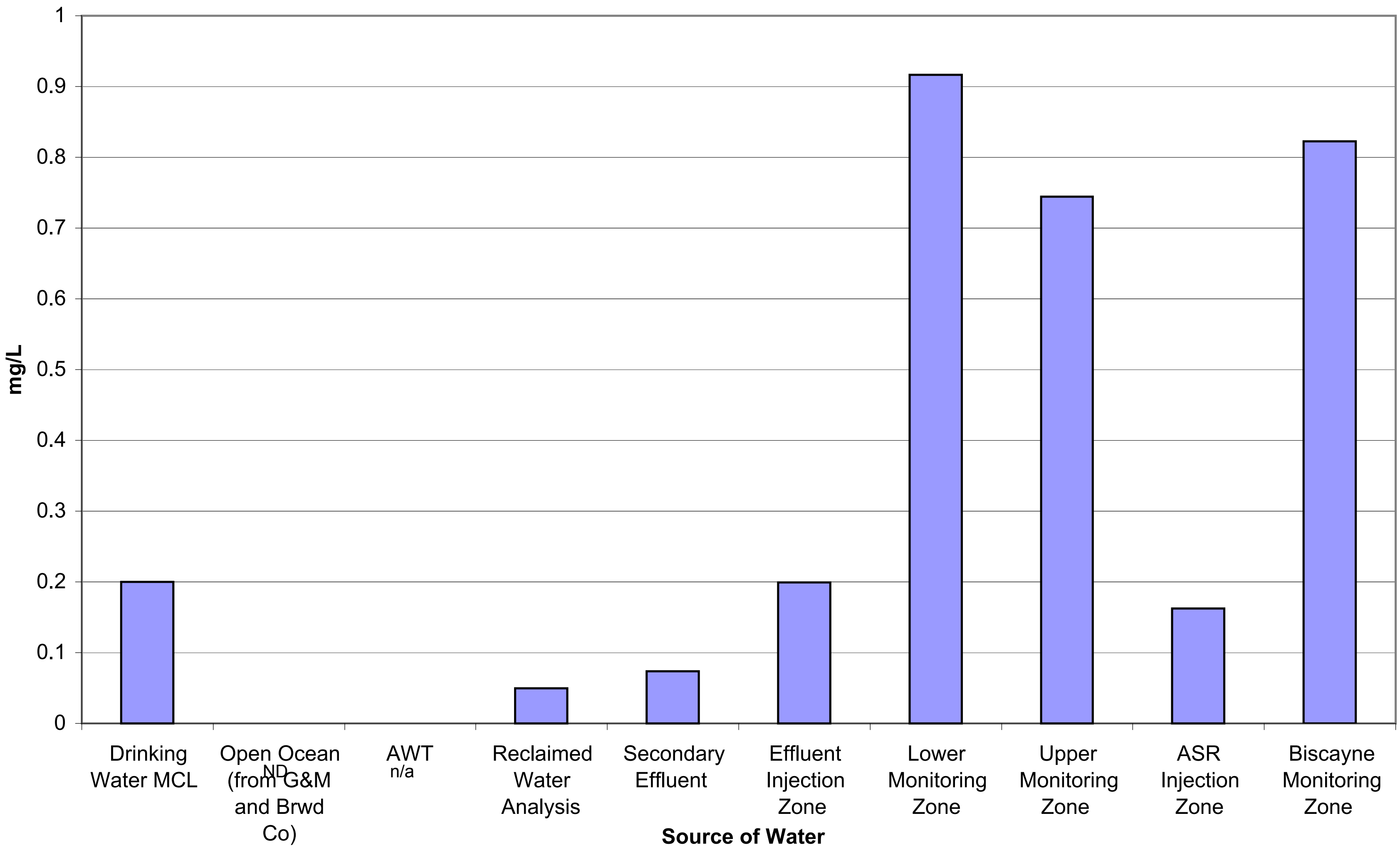


Figure E-17. COMPARISON OF AVERAGE ALUMINUM VALUES IN TREATED WASTEWATER VERSUS THE BACKGOUND GROUNDWATER QUALITY

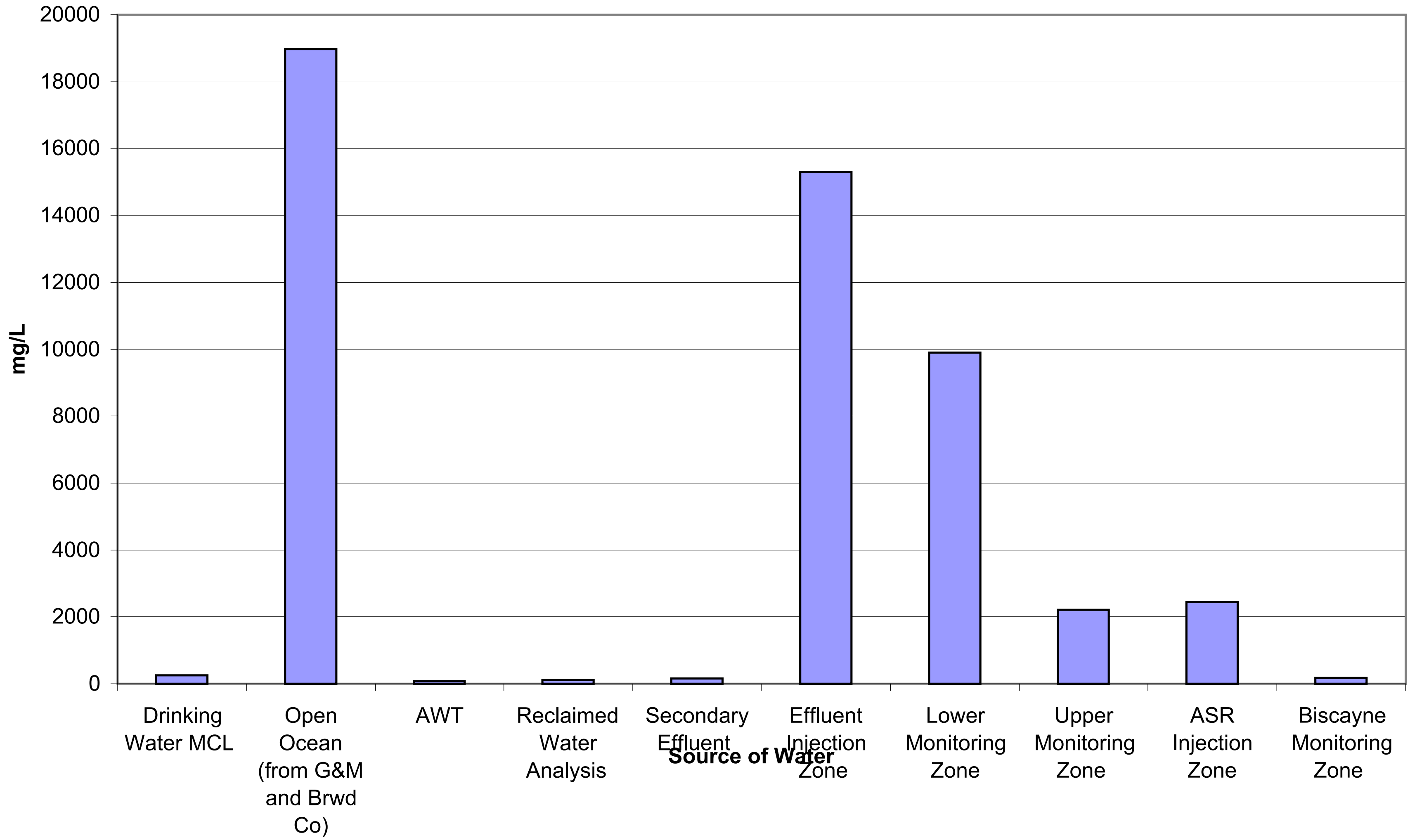


Figure E-18. COMPARISON OF AVERAGE CHLORIDE VALUES IN TREATED WASTEWATER VERSUS THE BACKGOUND GROUNDWATER QUALITY

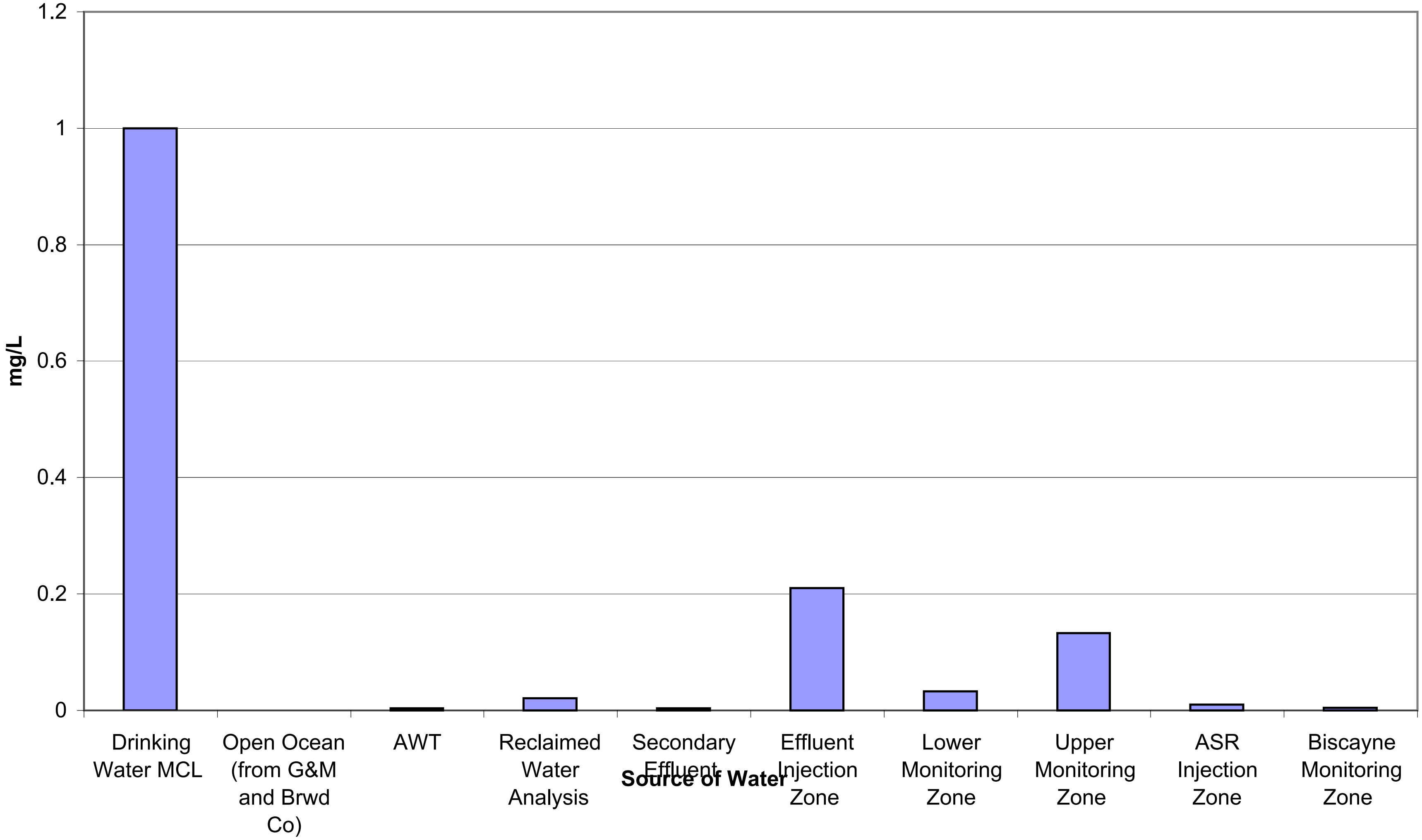


Figure E-19 COMPARISON OF AVERAGE COPPER VALUES IN TREATED WASTEWATER VERSUS THE BACKGOUND GROUNDWATER QUALITY

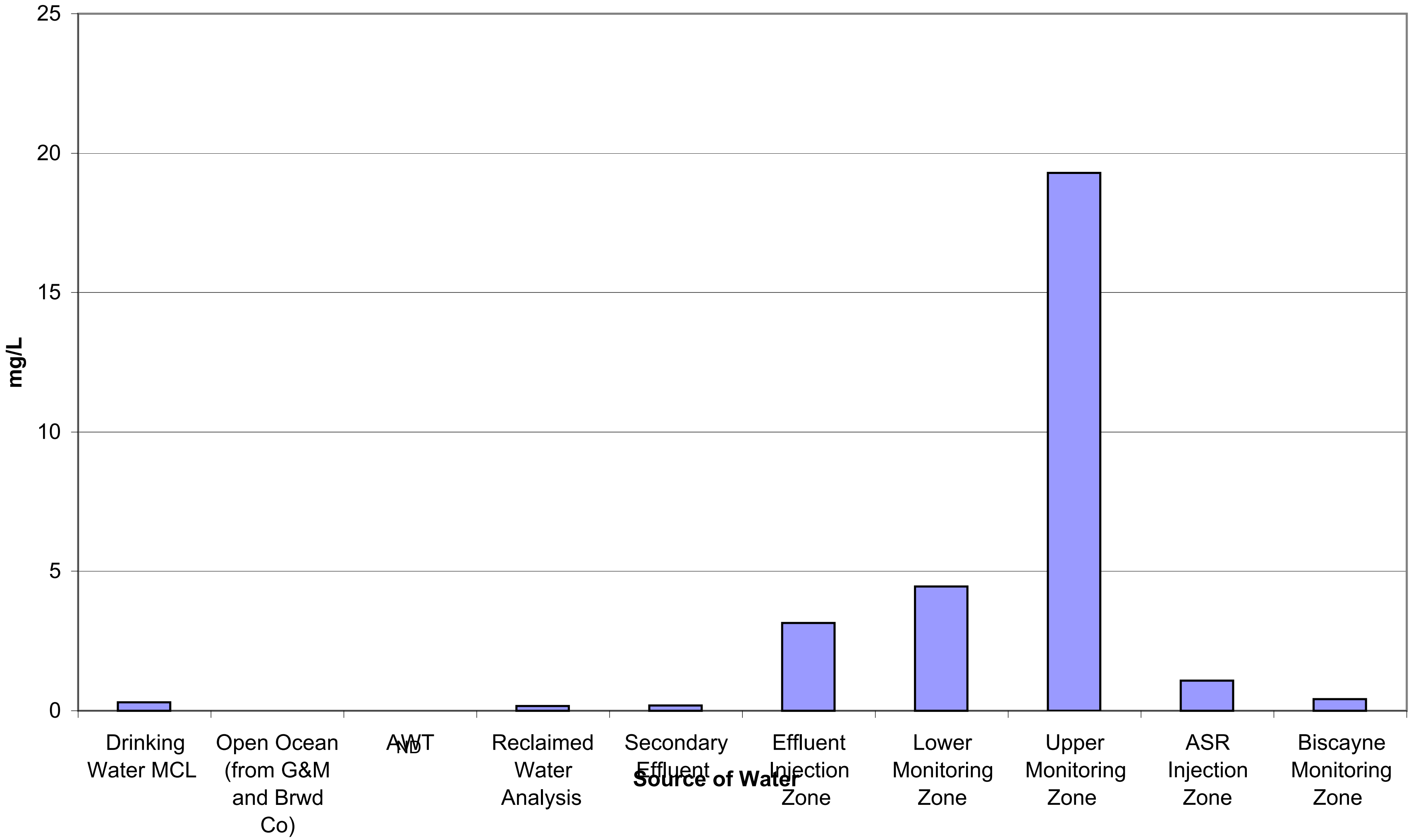


Figure E-20. COMPARISON OF AVERAGE IRON VALUES IN TREATED WASTEWATER VERSUS THE BACKGOUND GROUNDWATER QUALITY

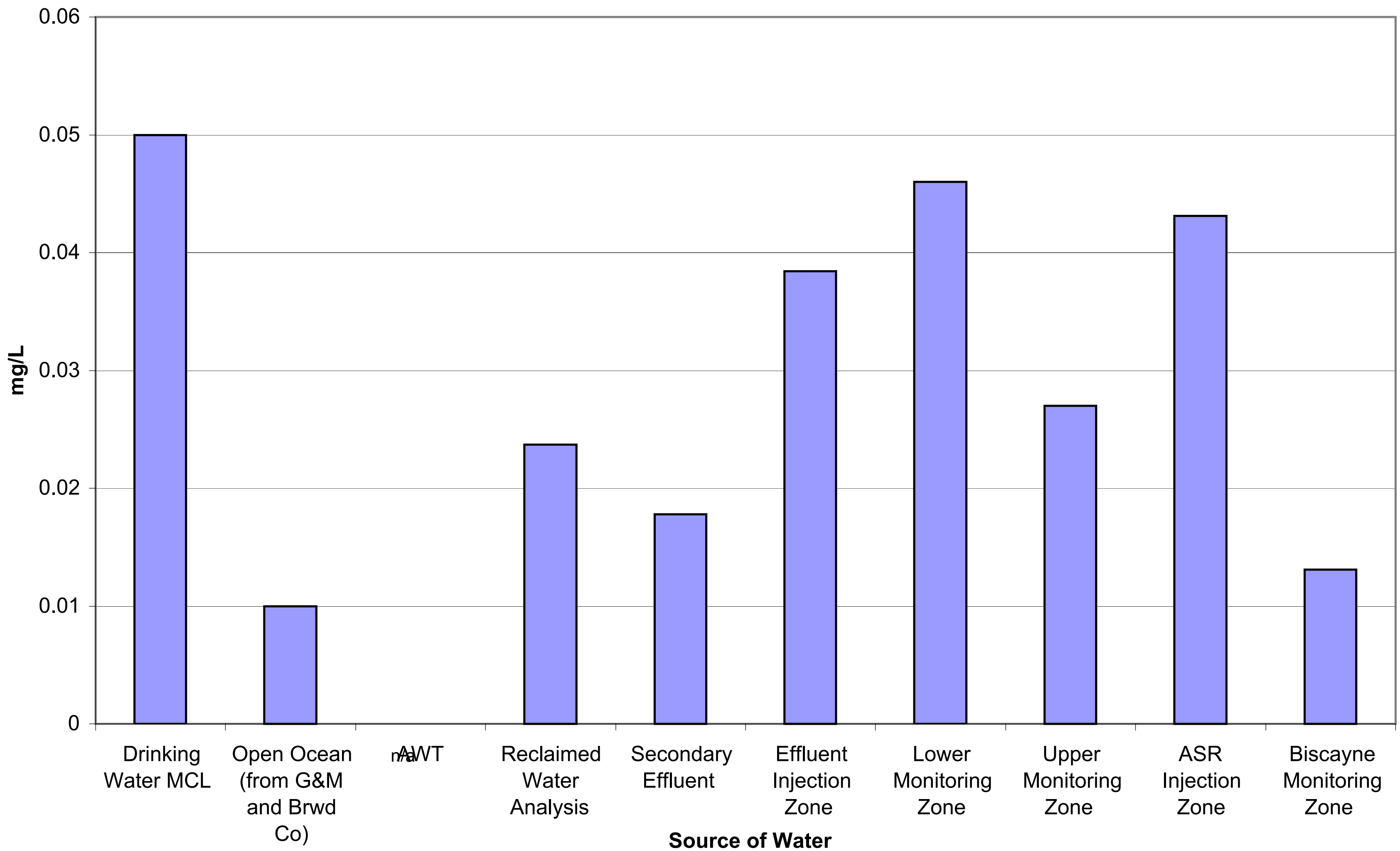


Figure E-21. COMPARISON OF AVERAGE MANGANESE VALUES IN TREATED WASTEWATER VERSUS THE BACKGOUND GROUNDWATER QUALITY

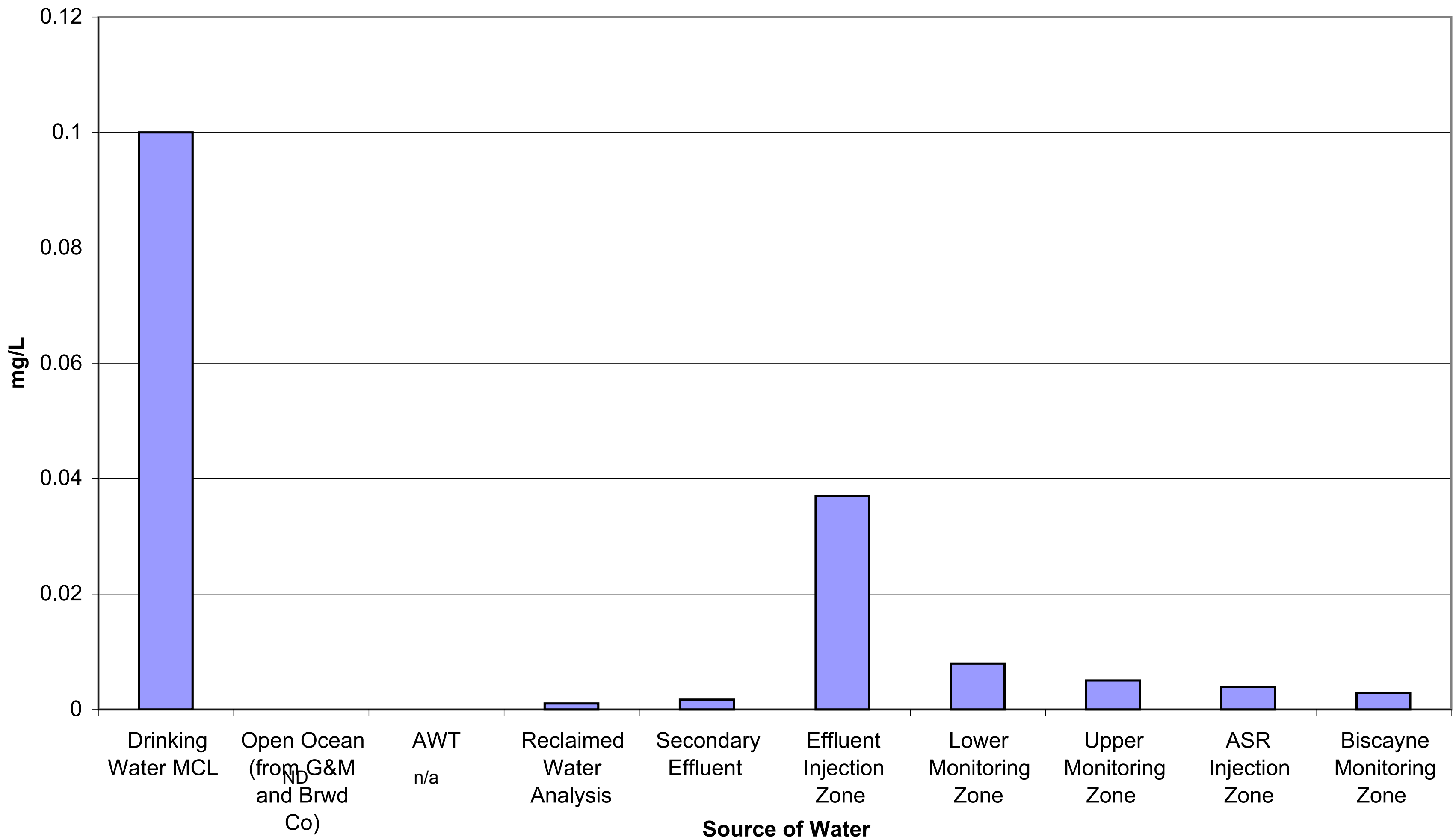


Figure E-22. COMPARISON OF AVERAGE SILVERVALUES IN TREATED WASTEWATER VERSUS THE BACKGOUND GROUNDWATER QUALITY

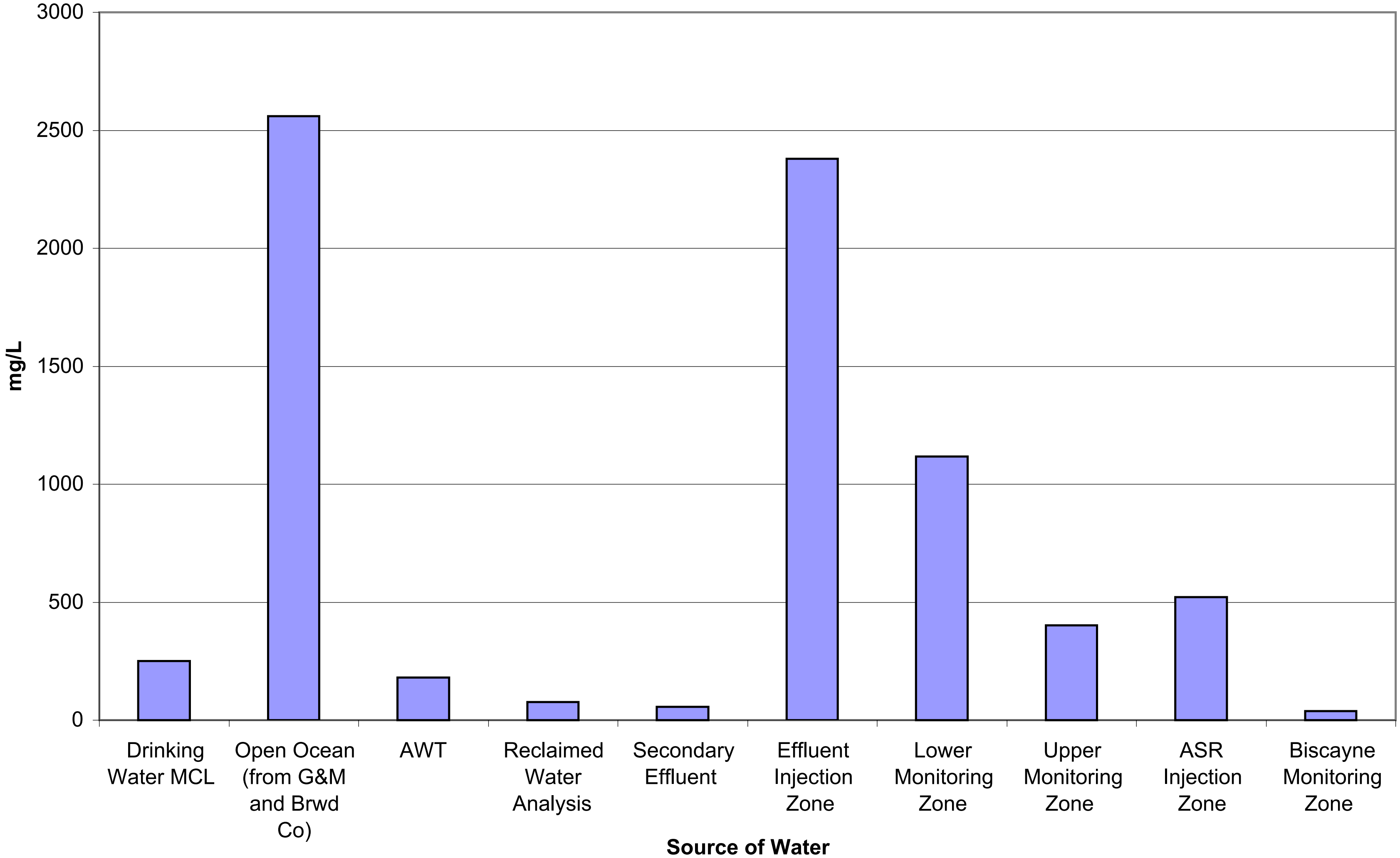


Figure E-23. COMPARISON OF AVERAGE SULFATE VALUES IN TREATED WASTEWATER VERSUS THE BACKGOUND GROUNDWATER QUALITY

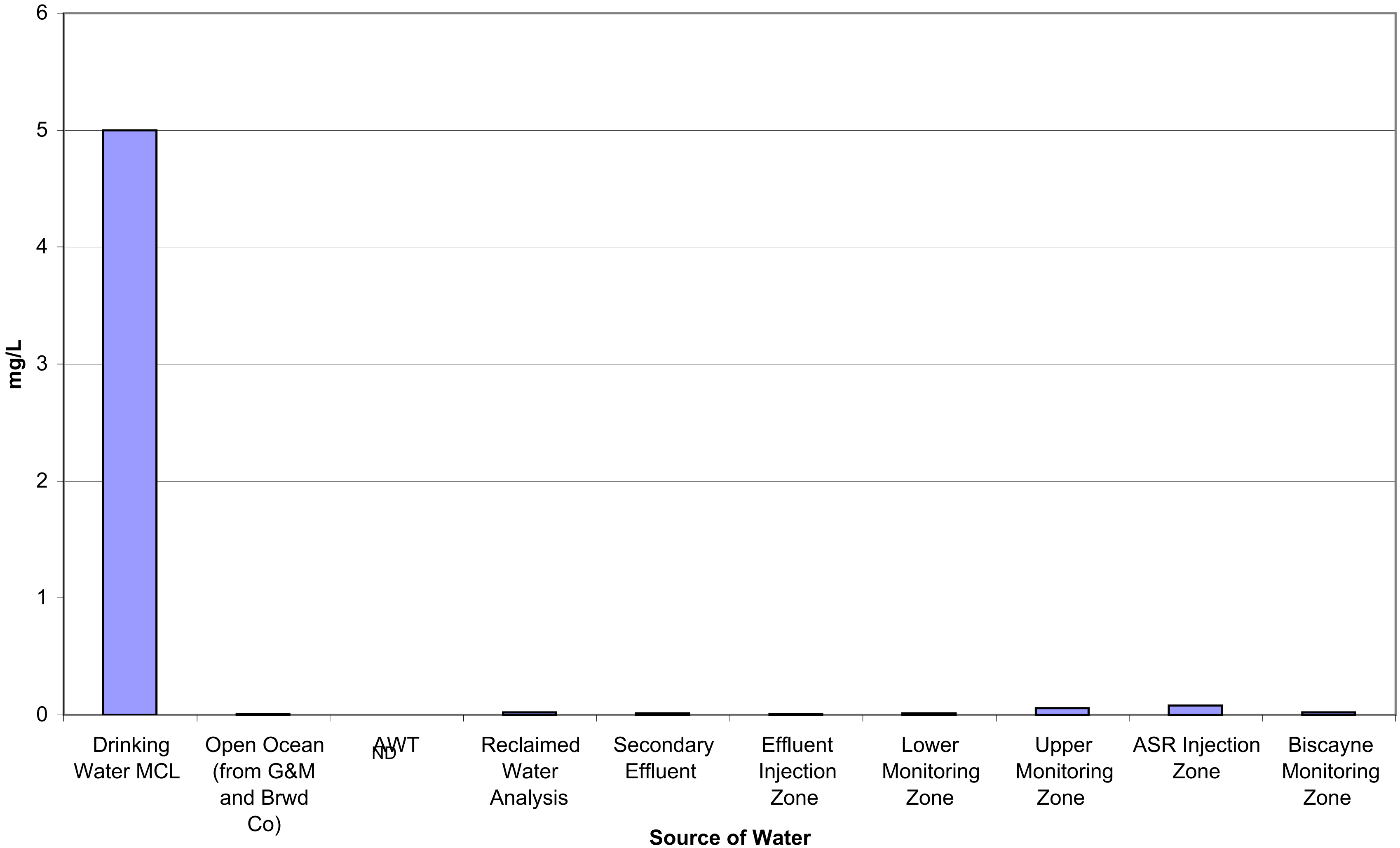


Figure E-24. COMPARISON OF AVERAGE ZINC VALUES IN TREATED WASTEWATER VERSUS THE BACKGOUND GROUNDWATER QUALITY

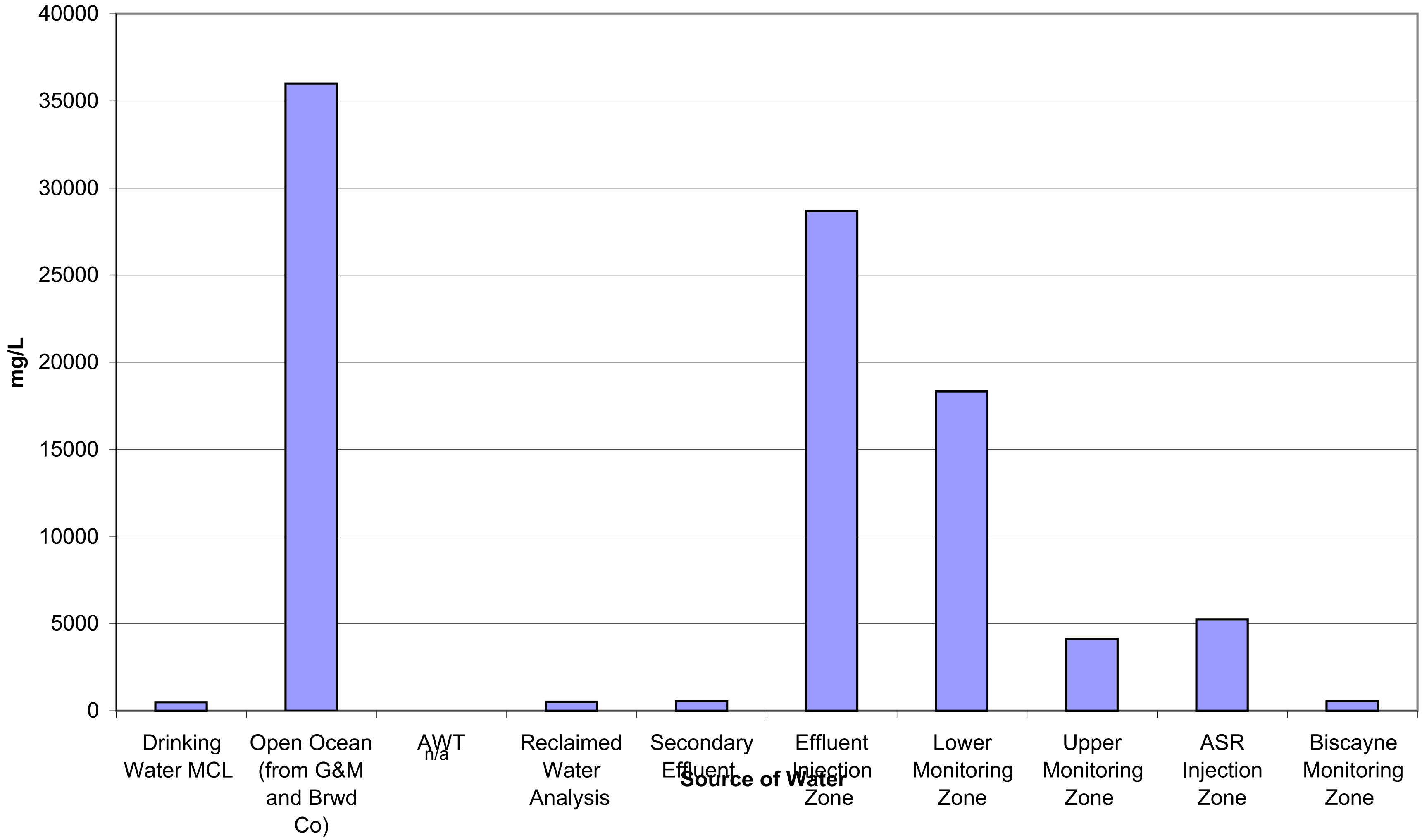
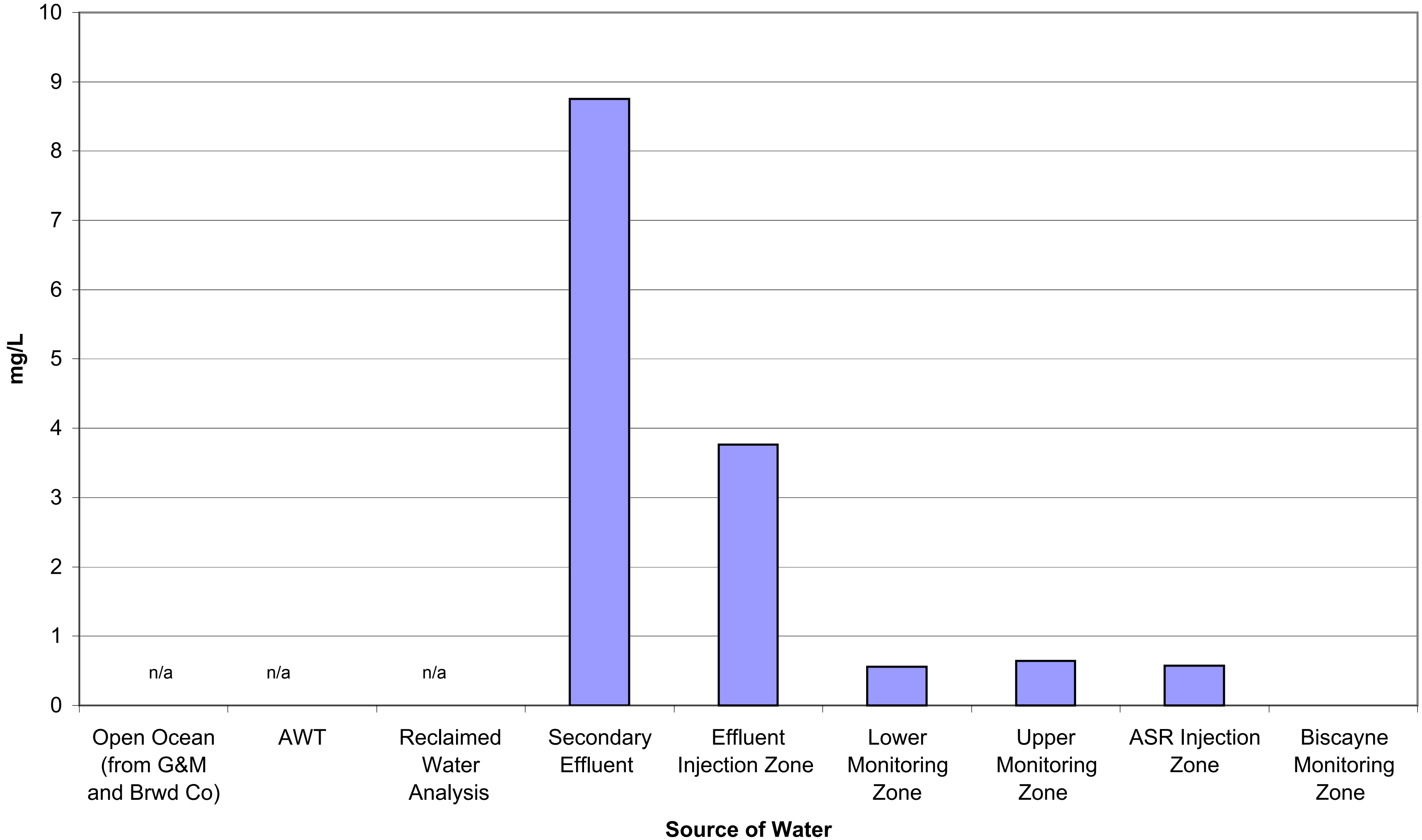


Figure E-25. COMPARISON OF AVERAGE TOTAL DISSOLVED SOLIDS (TDS) VALUES IN TREATED WASTEWATER VERSUS THE BACKGOUND GROUNDWATER QUALITY

COMPARISON OF AVERAGE AMMONIA VALUES IN TREATED WASTEWATER VERSUS THE BACKGOUND GROUNDWATER QUALITY



APPENDIX F. LISTS OF SAMPLING DATES AND SAMPLING METHODS

[Task 10 report]

Table F1. Data Descriptions for Preinjection Samples

Sampling Origin	Sampling Facility	Sampling Date	Sample Description	Sampling Type
Secondary Effluent	MD-North District	9/12/1995		Grab
Secondary Effluent	MD-South District	3/19/1999		Grab
Secondary Effluent	Broward County North Regional WWTP	12/11/1996		Grab
Secondary Effluent	Broward County North Regional WWTP	3/18/1997		Grab
Secondary Effluent	Broward County North Regional WWTP	5/7/1997		Grab
Secondary Effluent	Broward County North Regional WWTP	6/17/1997		Grab
Secondary Effluent	Broward County North Regional WWTP	7/9/1997		Grab
Secondary Effluent	Broward County North Regional WWTP	11/4/1997		Grab
Secondary Effluent	Broward County North Regional WWTP	4/8/1998		Grab
Secondary Effluent	Broward County North Regional WWTP	6/24/1998		Grab
Secondary Effluent	Broward County North Regional WWTP	7/9/1998		Grab
Secondary Effluent	Broward County North Regional WWTP	8/6/1998		Grab
Secondary Effluent	Broward County North Regional WWTP	9/10/1998		Grab
Secondary Effluent	Broward County North Regional WWTP	10/8/1998		Grab
Secondary Effluent	Broward County North Regional WWTP	11/5/1998		Grab
Secondary Effluent	Broward County North Regional WWTP	12/3/1998		Grab
Secondary Effluent	Broward County North Regional WWTP	9/9/1999		Grab
Sampling Origin	**Sampling Facility**	**Sampling Date**	**Sample Description**	**Sampling Type**

Secondary Effluent	Broward County North Regional WWTP	2/9/2000		Grab
Secondary Effluent	Broward County North Regional WWTP	4/11/2000		Grab
Secondary Effluent	Broward County North Regional WWTP	3/18/1997		Grab
Secondary effluent	City of Hollywood	5/3/2000		Grab
Secondary effluent	City of Hollywood	5/10/2000		Grab
Secondary effluent	City of Hollywood	5/17/2000		Grab
Secondary effluent	City of Hollywood	5/24/2000		Grab
Secondary effluent	City of Hollywood	5/31/2000		Grab
Secondary effluent	City of Hollywood	7/9/1999		Grab
Secondary effluent	City of Hollywood	11/9/1999		Grab
Secondary effluent	City of Hollywood	4/17/2000		Grab
Secondary effluent	City of Hollywood	7/10/2000		Grab
Secondary effluent	Seacoast	9/29/1988		Grab
Secondary effluent	Naples, Golden Gate WWTP	1/13/2000		
AWT	Southgate WWTP	12/1/1999		24-hour composite
AWT	Southgate WWTP (Sarasota)	12/6/1999		24-hour composite
AWT	Southgate WWTP (Sarasota)	12/7/1999		24-hour composite
AWT	Southgate WWTP (Sarasota)	12/8/1999		24-hour composite
AWT	Southgate WWTP (Sarasota)	12/10/1999		24-hour composite
AWT	Southgate WWTP (Sarasota)	12/13/1999		24-hour composite
AWT	Southgate WWTP (Sarasota)	12/15/1999		24-hour composite
AWT	Southgate WWTP (Sarasota)	12/17/1999		24-hour composite
AWT	Southgate WWTP (Sarasota)	12/20/1999		24-hour composite
AWT	Gulfgate WWTP	12/8/1999		24-hour composite
AWT	Gulfgate WWTP (Sarasota)	12/10/1999		24-hour composite
AWT	Gulfgate WWTP (Sarasota)	12/13/1999		24-hour composite
ASR	Five Ash ASR System	3/17/1998		Grab
ASR1	MDWASD - West	1/26/1997		Grab
ASR2	MDWASD - West Wellfield	2/25/1997		Grab
Sampling Origin	**Sampling Facility**	**Sampling Date**	**Sample Description**	**Sampling Type**
ASR3	MDWASD - West Wellfield	4/9/1997		Grab

ASR	Boynton Beach (Not working)	5/21/1992		Grab
Biscayne Aquifer	City of Hollywood	5/20/1999		Grab
Biscayne Aquifer	Five Ash ASR System	1/15/1998	(intake #: 51121)	
Biscayne Aquifer	MDWASD - S WWTP	7/9/1977	7622 (MW No:1)	
Biscayne Aquifer	MDWASD - S WWTP	7/9/1977	7623 (MW No:2)	
Biscayne Aquifer	MDWASD - S WWTP	7/9/1977	7624 (MW No:3)	
Biscayne Aquifer	MDWASD - S WWTP	7/9/1977	7625 (MW No:4)	
Biscayne Aquifer	MDWASD - S WWTP	7/9/1977	7626 (MW No:5)	
Biscayne Aquifer	MDWASD - S WWTP	7/9/1977	7627 (MW No:6)	
Biscayne Aquifer	MDWASD - S WWTP	7/9/1977	7628 (water supply well)	
Biscayne Aquifer	MDWASD - S WWTP	7/3/1977	7692 (water supply well)	
Biscayne Aquifer	MDWASD - S WWTP	7/3/1977	7693 (water supply well)	
Biscayne Aquifer	MDWASD - S WWTP	7/3/1977	7694 (water supply well)	
Biscayne Aquifer	WPB	11/1/1993	14629	grab
Biscayne Aquifer	WPB	8/31/1994	14575	Grab
Biscayne Aquifer	WPB	10/6/1994	15015	Grab
Biscayne Aquifer	WPB	8/31/1995	19151	Grab
UMZ	MDWASD - S WWTP	8/13/1977	7938	Grab
UMZ	MDWASD - S WWTP	8/15/1977	7939	Grab
UMZ	MDWASD - S WWTP	8/16/1977	7940	Grab
UMZ	City of WPB	10/15/1986	FA 1 upper	grab
UMZ	MD-South District	3/9/1995	(FA-10)	Grab
UMZ	MD-North District	3/27/1996	(FA-1N)	Grab
UMZ	MD-North District	8/21/1995	(FA-4)	Grab
UMZ	Boynton Beach	4/21/1992		Grab
LMZ	MD-North District	3/27/1996	(FA-2)	Grab
LMZ	MD-North District	8/21/1995	(FA-4)	Grab
UMZ	MDWASD - West Wellfield	2/6/1997		Grab
LMZ	City of WPB	10/15/1986	FA 2 lower	grab
Sampling Origin	**Sampling Facility**	**Sampling Date**	**Sample Description**	**Sampling Type**
LMZ	Broward County North Regional WWTP	11/19/1997	MW1	Grab
LMZ	Broward County North Regional WWTP	12/12/1997	MW1	Grab

LMZ	Broward County North Regional WWTP	12/10/1997	MW2	Grab
LMZ	Broward County North Regional WWTP	12/12/1997	MW2	Grab
LMZ	MDWASD - S WWTP	8/18/1977	7941	
LMZ	MDWASD - S WWTP	8/18/1977	7942	
LMZ	MDWASD - S WWTP	8/20/1977	7943	
LMZ	MDWASD - S WWTP	8/21/1977	7944	
LMZ	MDWASD - S WWTP	8/21/1977	7945	
LMZ	MDWASD - S WWTP	9/21/1977	8396	
LMZ	MDWASD - S WWTP	9/21/1977	8397	
LMZ	MDWASD - S WWTP	9/21/1977	8398	
LMZ	MDWASD - S WWTP	7/9/1977	7628	
LMZ	MDWASD - West Wellfield	2/6/1997		Grab
LMZ	MD-South District	3/9/1995	(FA-10)	Grab
LMZ	Boynton Beach	4/21/1992	-110969	Grab
Injection zone	Boynton Beach	9/30/1991		Grab
Injection zone	Broward County North	11/2/1999	IW5	Grab
Injection zone	Broward County North Regional WWTP	1/19/2000	IW6	Grab
Injection zone	City of WPB	9/16/1986	(water works job #: 4212)	grab
Injection zone	MDWASD - S WWTP	8/22/1977	7946	airlift
Injection zone	MDWASD - S WWTP	8/23/1977	7947	airlift
Injection zone	MDWASD - S WWTP	8/24/1977	7949	24-hr composite
Injection zone	MDWASD - S WWTP	8/25/1977	8101	packer test
Sampling Origin	**Sampling Facility**	**Sampling Date**	**Sample Description**	**Sampling Type**
Injection zone	MDWASD - S WWTP	8/26/1977	8102	packer test
Injection zone	MDWASD - S WWTP	8/26/1977	8103	packer test
Injection zone	MDWASD - S WWTP	8/27/1977	8105	packer test
Injection zone	MDWASD - S WWTP	8/27/1977	8106	packer test

Injection zone	MDWASD - S WWTP	8/26/1977	8107	packer test
Injection zone	MDWASD - S WWTP	8/27/1977	8108	packer test
Injection zone	MDWASD - S WWTP	8/26/1977	8109	packer test
Injection zone	MDWASD - S WWTP	8/27/1977	8110	24-hr composite
Injection zone	MDWASD - S WWTP	8/28/1977	8111	
Injection zone	MDWASD - S WWTP	8/28/1977	8112	packer test
Injection zone	MDWASD - S WWTP	8/27/1977	8113	packer test
Injection zone	MDWASD - S WWTP	10/20/1977	8524	6-hr composite
Injection zone	MDWASD - S WWTP	10/17/1977	8525	airlift
Injection zone	MDWASD - S WWTP	10/20/1977	8526	
Injection zone	MDWASD - S WWTP	9/15/1977	8399	airlift
Injection zone	MDWASD - S WWTP	8/17/1977	8400	airlift
Injection zone	Seacoast	8/25/1988	(Sample id: 57161)	Grab
Injection zone	MD-North District	8/21/1995	(IN-2)	Grab

Table F2. Data Descriptions for post injection samples

Sampling Origin	Sampling Facility	Sampling Date	Sample Description	Sampling Type
Biscayne Aquifer	City of Fort Lauderdale	8/7/1996	Monitoring wells for IW1	Grab
Biscayne Aquifer	City of Fort Lauderdale	8/16/1996	Monitoring wells for IW1	Grab
Biscayne Aquifer	City of Fort Lauderdale	8/22/1996	Monitoring wells for IW1	Grab
Biscayne Aquifer	City of Fort Lauderdale	8/27/1996	Monitoring wells for IW1	Grab
Biscayne Aquifer	City of Fort Lauderdale	9/5/1996	Monitoring wells for IW1	Grab
Biscayne Aquifer	City of Fort Lauderdale	9/11/1996	Monitoring wells for IW1	Grab
Biscayne Aquifer	City of Fort Lauderdale	9/20/1996	Monitoring wells for IW1	Grab
Biscayne Aquifer	City of Fort Lauderdale	9/25/1996	Monitoring wells for IW1	Grab
Biscayne Aquifer	City of Fort Lauderdale	10/3/1996	Monitoring wells for IW1	Grab
Biscayne Aquifer	City of Fort Lauderdale	10/7/1996	Monitoring wells for IW1	Grab
Biscayne Aquifer	City of Fort Lauderdale	10/17/1996	Monitoring wells for IW1	Grab
Biscayne Aquifer	City of Fort Lauderdale	10/25/1996	Monitoring wells for IW1	Grab
Biscayne Aquifer	City of Fort Lauderdale	10/31/1996	Monitoring wells for IW1	Grab
Biscayne Aquifer	City of Fort Lauderdale	11/9/1996	Monitoring wells for IW1	Grab
Biscayne Aquifer	City of Fort Lauderdale	11/12/1996	Monitoring wells for IW1	Grab
Biscayne Aquifer	City of Fort Lauderdale	11/22/1996	Monitoring wells for IW1	Grab
Biscayne Aquifer	City of Fort Lauderdale	11/27/1996	Monitoring wells for IW1	Grab
Biscayne Aquifer	City of Fort Lauderdale	12/15/1996	Monitoring wells for IW1	Grab
Biscayne Aquifer	City of Fort Lauderdale	12/19/1996	Monitoring wells for IW1	Grab
Biscayne Aquifer	City of Fort Lauderdale	12/29/1996	Monitoring wells for IW1	Grab
Biscayne Aquifer	City of Fort Lauderdale	1/4/1997	Monitoring wells for IW1	Grab
Biscayne Aquifer	City of Fort Lauderdale	1/9/1997	Monitoring wells for IW1	Grab
Biscayne Aquifer	City of Fort Lauderdale	1/17/1997	Monitoring wells for IW1	Grab
Biscayne Aquifer	City of Fort Lauderdale	1/22/1997	Monitoring wells for IW1	Grab
UMZ	City of Fort Lauderdale	3/1/1995	MW1	Grab
UMZ	City of Fort Lauderdale	3/10/1995	MW1	Grab
UMZ	City of Fort Lauderdale	3/17/1995	MW1	Grab
UMZ	City of Fort Lauderdale	3/24/1995	MW1	Grab
UMZ	City of Fort Lauderdale	3/31/1995	MW1	Grab
UMZ	City of Fort Lauderdale	4/7/1995	MW1	Grab
UMZ	City of Fort Lauderdale	4/11/1995	MW1	Grab
UMZ	City of Fort Lauderdale	4/19/1995	MW1	Grab
UMZ	City of Fort Lauderdale	4/25/1995	MW1	Grab
UMZ	City of Fort Lauderdale	5/2/1995	MW1	Grab
UMZ	City of Fort Lauderdale	5/9/1995	MW1	Grab
UMZ	City of Fort Lauderdale	5/16/1995	MW1	Grab
UMZ	City of Fort Lauderdale	5/23/1995	MW1	Grab
UMZ	City of Fort Lauderdale	5/30/1995	MW1	Grab
UMZ	City of Fort Lauderdale	6/5/1995	MW1	Grab
UMZ	City of Fort Lauderdale	6/13/1995	MW1	Grab
UMZ	City of Fort Lauderdale	6/20/1995	MW1	Grab
UMZ	City of Fort Lauderdale	6/27/1995	MW1	Grab
UMZ	City of Fort Lauderdale	7/4/1995	MW1	Grab
UMZ	City of Fort Lauderdale	7/11/1995	MW1	Grab
UMZ	City of Fort Lauderdale	7/18/1995	MW1	Grab
UMZ	City of Fort Lauderdale	7/25/1995	MW1	Grab
UMZ	City of Fort Lauderdale	7/31/1995	MW1	Grab
UMZ	City of Fort Lauderdale	8/8/1995	MW1	Grab
UMZ	City of Fort Lauderdale	8/15/1995	MW1	Grab
UMZ	City of Fort Lauderdale	8/22/1995	MW1	Grab
UMZ	City of Fort Lauderdale	8/29/1995	MW1	Grab
UMZ	City of Fort Lauderdale	9/5/1995	MW1	Grab
UMZ	City of Fort Lauderdale	9/12/1995	MW1	Grab
UMZ	City of Fort Lauderdale	9/19/1995	MW1	Grab
UMZ	City of Fort Lauderdale	9/26/1995	MW1	Grab
UMZ	City of Fort Lauderdale	10/3/1995	MW1	Grab
UMZ	City of Fort Lauderdale	10/10/1995	MW1	Grab
UMZ	City of Fort Lauderdale	10/17/1995	MW1	Grab
UMZ	City of Fort Lauderdale	10/24/1995	MW1	Grab
UMZ	City of Fort Lauderdale	10/31/1995	MW1	Grab
UMZ	City of Fort Lauderdale	11/7/1995	MW1	Grab
UMZ	City of Fort Lauderdale	11/14/1995	MW1	Grab
UMZ	City of Fort Lauderdale	11/21/1995	MW1	Grab
UMZ	City of Fort Lauderdale	11/28/1995	MW1	Grab
UMZ	City of Fort Lauderdale	12/5/1995	MW1	Grab
UMZ	City of Fort Lauderdale	12/12/1995	MW1	Grab
Sampling Origin	**Sampling Facility**	**Sampling Date**	**Sample Description**	**Sampling Type**
UMZ	City of Fort Lauderdale	12/19/1995	MW1	Grab
UMZ	City of Fort Lauderdale	12/26/1995	MW1	Grab
UMZ	City of Fort Lauderdale	1/2/1996	MW1	Grab

UMZ	City of Fort Lauderdale	1/9/1996	MW1	Grab
UMZ	City of Fort Lauderdale	1/16/1996	MW1	Grab
UMZ	City of Fort Lauderdale	1/23/1996	MW1	Grab
UMZ	City of Fort Lauderdale	1/30/1996	MW1	Grab
UMZ	City of Fort Lauderdale	2/6/1996	MW1	Grab
UMZ	City of Fort Lauderdale	2/13/1996	MW1	Grab
UMZ	City of Fort Lauderdale	2/20/1996	MW1	Grab
UMZ	City of Fort Lauderdale	2/27/1996	MW1	Grab
UMZ	City of Fort Lauderdale	3/5/1996	MW1	Grab
UMZ	City of Fort Lauderdale	3/12/1996	MW1	Grab
UMZ	City of Fort Lauderdale	3/19/1996	MW1	Grab
UMZ	City of Fort Lauderdale	3/26/1996	MW1	Grab
UMZ	City of Fort Lauderdale	4/2/1996	MW1	Grab
UMZ	City of Fort Lauderdale	4/9/1996	MW1	Grab
UMZ	City of Fort Lauderdale	4/16/1996	MW1	Grab
UMZ	City of Fort Lauderdale	4/23/1996	MW1	Grab
UMZ	City of Fort Lauderdale	4/30/1996	MW1	Grab
UMZ	City of Fort Lauderdale	5/7/1996	MW1	Grab
UMZ	City of Fort Lauderdale	5/14/1996	MW1	Grab
UMZ	City of Fort Lauderdale	6/4/1996	MW1	Grab
UMZ	City of Fort Lauderdale	6/11/1996	MW1	Grab
UMZ	City of Fort Lauderdale	6/19/1996	MW1	Grab
UMZ	City of Fort Lauderdale	6/25/1996	MW1	Grab
UMZ	City of Fort Lauderdale	7/2/1996	MW1	Grab
UMZ	City of Fort Lauderdale	7/9/1996	MW1	Grab
UMZ	City of Fort Lauderdale	7/16/1996	MW1	Grab
UMZ	City of Fort Lauderdale	7/23/1996	MW1	Grab
UMZ	City of Fort Lauderdale	7/30/1996	MW1	Grab
UMZ	City of Fort Lauderdale	8/6/1996	MW1	Grab
UMZ	City of Fort Lauderdale	8/15/1996	MW1	Grab
UMZ	City of Fort Lauderdale	8/20/1996	MW1	Grab
UMZ	City of Fort Lauderdale	8/27/1996	MW1	Grab
UMZ	City of Fort Lauderdale	9/4/1996	MW1	Grab
UMZ	City of Fort Lauderdale	9/17/1996	MW1	Grab
UMZ	City of Fort Lauderdale	10/8/1996	MW1	Grab
UMZ	City of Fort Lauderdale	10/15/1996	MW1	Grab
UMZ	City of Fort Lauderdale	10/22/1996	MW1	Grab
UMZ	City of Fort Lauderdale	10/29/1996	MW1	Grab
UMZ	City of Fort Lauderdale	11/5/1996	MW1	Grab
UMZ	City of Fort Lauderdale	11/12/1996	MW1	Grab
UMZ	City of Fort Lauderdale	11/18/1996	MW1	Grab
UMZ	City of Fort Lauderdale	11/26/1996	MW1	Grab
UMZ	City of Fort Lauderdale	12/2/1996	MW1	Grab
UMZ	City of Fort Lauderdale	12/10/1996	MW1	Grab
UMZ	City of Fort Lauderdale	12/17/1996	MW1	Grab
UMZ	City of Fort Lauderdale	12/24/1996	MW1	Grab
UMZ	City of Fort Lauderdale	12/31/1996	MW1	Grab
UMZ	City of Fort Lauderdale	1/7/1997	MW1	Grab
UMZ	City of Fort Lauderdale	1/14/1997	MW1	Grab
UMZ	City of Fort Lauderdale	1/21/1997	MW1	Grab
UMZ	City of Fort Lauderdale	1/28/1997	MW1	Grab
UMZ	City of Fort Lauderdale	2/4/1997	MW1	Grab
UMZ	City of Fort Lauderdale	2/11/1997	MW1	Grab
UMZ	City of Fort Lauderdale	2/18/1997	MW1	Grab
UMZ	City of Fort Lauderdale	2/25/1997	MW1	Grab
UMZ	City of Fort Lauderdale	3/4/1997	MW1	Grab
UMZ	City of Fort Lauderdale	3/11/1997	MW1	Grab
UMZ	City of Fort Lauderdale	3/18/1997	MW1	Grab
UMZ	City of Fort Lauderdale	3/25/1997	MW1	Grab
UMZ	City of Fort Lauderdale	4/1/1997	MW1	Grab
UMZ	City of Fort Lauderdale	4/8/1997	MW1	Grab
UMZ	City of Fort Lauderdale	5/6/1997	MW1	Grab
UMZ	City of Fort Lauderdale	5/13/1997	MW1	Grab
UMZ	City of Fort Lauderdale	5/20/1997	MW1	Grab
Sampling Origin	**Sampling Facility**	**Sampling Date**	**Sample Description**	**Sampling Type**
UMZ	City of Fort Lauderdale	5/27/1997	MW1	Grab
UMZ	City of Fort Lauderdale	6/3/1997	MW1	Grab
UMZ	City of Fort Lauderdale	6/10/1997	MW1	Grab
UMZ	City of Fort Lauderdale	6/18/1997	MW1	Grab
UMZ	City of Fort Lauderdale	6/24/1997	MW1	Grab
UMZ	City of Fort Lauderdale	7/1/1997	MW1	Grab
UMZ	City of Fort Lauderdale	7/8/1997	MW1	Grab

UMZ	City of Fort Lauderdale	7/15/1997	MW1	Grab
UMZ	City of Fort Lauderdale	7/22/1997	MW1	Grab
UMZ	City of Fort Lauderdale	7/29/1997	MW1	Grab
UMZ	City of Fort Lauderdale	8/5/1997	MW1	Grab
UMZ	City of Fort Lauderdale	8/12/1997	MW1	Grab
UMZ	City of Fort Lauderdale	8/18/1997	MW1	Grab
UMZ	City of Fort Lauderdale	8/26/1997	MW1	Grab
UMZ	City of Fort Lauderdale	9/3/1997	MW1	Grab
UMZ	City of Fort Lauderdale	9/9/1997	MW1	Grab
UMZ	City of Fort Lauderdale	9/16/1997	MW1	Grab
UMZ	City of Fort Lauderdale	9/23/1997	MW1	Grab
UMZ	City of Fort Lauderdale	9/30/1997	MW1	Grab
UMZ	City of Fort Lauderdale	10/7/1997	MW1	Grab
UMZ	City of Fort Lauderdale	10/14/1997	MW1	Grab
UMZ	City of Fort Lauderdale	10/22/1997	MW1	Grab
UMZ	City of Fort Lauderdale	10/29/1997	MW1	Grab
UMZ	City of Fort Lauderdale	11/5/1997	MW1	Grab
UMZ	City of Fort Lauderdale	11/12/1997	MW1	Grab
UMZ	City of Fort Lauderdale	11/18/1997	MW1	Grab
UMZ	City of Fort Lauderdale	11/25/1997	MW1	Grab
UMZ	City of Fort Lauderdale	12/2/1997	MW1	Grab
UMZ	City of Fort Lauderdale	12/9/1997	MW1	Grab
UMZ	City of Fort Lauderdale	12/16/1997	MW1	Grab
UMZ	City of Fort Lauderdale	12/23/1997	MW1	Grab
UMZ	City of Fort Lauderdale	12/30/1997	MW1	Grab
UMZ	City of Fort Lauderdale	1/6/1998	MW1	Grab
UMZ	City of Fort Lauderdale	1/13/1998	MW1	Grab
UMZ	City of Fort Lauderdale	1/20/1998	MW1	Grab
UMZ	City of Fort Lauderdale	1/27/1998	MW1	Grab
UMZ	City of Fort Lauderdale	2/3/1998	MW1	Grab
UMZ	City of Fort Lauderdale	2/10/1998	MW1	Grab
UMZ	City of Fort Lauderdale	2/17/1998	MW1	Grab
UMZ	City of Fort Lauderdale	2/24/1998	MW1	Grab
UMZ	City of Fort Lauderdale	3/3/1998	MW1	Grab
UMZ	City of Fort Lauderdale	3/10/1998	MW1	Grab
UMZ	City of Fort Lauderdale	3/17/1998	MW1	Grab
UMZ	City of Fort Lauderdale	3/24/1998	MW1	Grab
UMZ	City of Fort Lauderdale	3/31/1998	MW1	Grab
UMZ	City of Fort Lauderdale	4/7/1998	MW1	Grab
UMZ	City of Fort Lauderdale	4/14/1998	MW1	Grab
UMZ	City of Fort Lauderdale	4/21/1998	MW1	Grab
UMZ	City of Fort Lauderdale	4/28/1998	MW1	Grab
UMZ	City of Fort Lauderdale	5/5/1998	MW1	Grab
UMZ	City of Fort Lauderdale	5/12/1998	MW1	Grab
UMZ	City of Fort Lauderdale	5/19/1998	MW1	Grab
UMZ	City of Fort Lauderdale	5/26/1998	MW1	Grab
UMZ	City of Fort Lauderdale	6/2/1998	MW1	Grab
UMZ	City of Fort Lauderdale	6/9/1998	MW1	Grab
UMZ	City of Fort Lauderdale	6/16/1998	MW1	Grab
UMZ	City of Fort Lauderdale	6/23/1998	MW1	Grab
UMZ	City of Fort Lauderdale	6/30/1998	MW1	Grab
UMZ	City of Fort Lauderdale	7/7/1998	MW1	Grab
UMZ	City of Fort Lauderdale	7/14/1998	MW1	Grab
UMZ	City of Fort Lauderdale	7/21/1998	MW1	Grab
UMZ	City of Fort Lauderdale	7/28/1998	MW1	Grab
UMZ	City of Fort Lauderdale	8/4/1998	MW1	Grab
UMZ	City of Fort Lauderdale	8/11/1998	MW1	Grab
UMZ	City of Fort Lauderdale	8/18/1998	MW1	Grab
UMZ	City of Fort Lauderdale	8/25/1998	MW1	Grab
UMZ	City of Fort Lauderdale	9/1/1998	MW1	Grab
Sampling Origin	**Sampling Facility**	**Sampling Date**	**Sample Description**	**Sampling Type**
UMZ	City of Fort Lauderdale	9/8/1998	MW1	Grab
UMZ	City of Fort Lauderdale	9/15/1998	MW1	Grab
UMZ	City of Fort Lauderdale	9/22/1998	MW1	Grab
UMZ	City of Fort Lauderdale	9/29/1998	MW1	Grab
UMZ	City of Fort Lauderdale	10/6/1998	MW1	Grab
UMZ	City of Fort Lauderdale	10/13/1998	MW1	Grab
UMZ	City of Fort Lauderdale	10/20/1998	MW1	Grab
UMZ	City of Fort Lauderdale	10/27/1998	MW1	Grab
UMZ	City of Fort Lauderdale	11/3/1998	MW1	Grab
UMZ	City of Fort Lauderdale	11/10/1998	MW1	Grab
UMZ	City of Fort Lauderdale	11/17/1998	MW1	Grab

UMZ	City of Fort Lauderdale	11/24/1998	MW1	Grab
UMZ	City of Fort Lauderdale	12/1/1998	MW1	Grab
UMZ	City of Fort Lauderdale	12/8/1998	MW1	Grab
UMZ	City of Fort Lauderdale	12/15/1998	MW1	Grab
UMZ	City of Fort Lauderdale	12/22/1998	MW1	Grab
UMZ	City of Fort Lauderdale	12/29/1998	MW1	Grab
UMZ	City of Fort Lauderdale	1/5/1999	MW1	Grab
UMZ	City of Fort Lauderdale	1/12/1999	MW1	Grab
UMZ	City of Fort Lauderdale	1/19/1999	MW1	Grab
UMZ	City of Fort Lauderdale	1/26/1999	MW1	Grab
UMZ	City of Fort Lauderdale	2/2/1999	MW1	Grab
UMZ	City of Fort Lauderdale	2/9/1999	MW1	Grab
UMZ	City of Fort Lauderdale	2/16/1999	MW1	Grab
UMZ	City of Fort Lauderdale	2/23/1999	MW1	Grab
UMZ	City of Fort Lauderdale	3/2/1999	MW1	Grab
UMZ	City of Fort Lauderdale	3/9/1999	MW1	Grab
UMZ	City of Fort Lauderdale	3/16/1999	MW1	Grab
UMZ	City of Fort Lauderdale	4/6/1999	MW1	Grab
UMZ	City of Fort Lauderdale	4/13/1999	MW1	Grab
UMZ	City of Fort Lauderdale	4/20/1999	MW1	Grab
UMZ	City of Fort Lauderdale	4/27/1999	MW1	Grab
UMZ	City of Fort Lauderdale	5/4/1999	MW1	Grab
UMZ	City of Fort Lauderdale	5/11/1999	MW1	Grab
UMZ	City of Fort Lauderdale	5/18/1999	MW1	Grab
UMZ	City of Fort Lauderdale	5/25/1999	MW1	Grab
UMZ	City of Fort Lauderdale	6/1/1999	MW1	Grab
UMZ	City of Fort Lauderdale	6/8/1999	MW1	Grab
UMZ	City of Fort Lauderdale	6/15/1999	MW1	Grab
UMZ	City of Fort Lauderdale	6/22/1999	MW1	Grab
UMZ	City of Fort Lauderdale	6/29/1999	MW1	Grab
UMZ	City of Fort Lauderdale	7/6/1999	MW1	Grab
UMZ	City of Fort Lauderdale	7/13/1999	MW1	Grab
UMZ	City of Fort Lauderdale	8/3/1999	MW1	Grab
UMZ	City of Fort Lauderdale	8/10/1999	MW1	Grab
UMZ	City of Fort Lauderdale	8/17/1999	MW1	Grab
UMZ	City of Fort Lauderdale	8/24/1999	MW1	Grab
UMZ	City of Fort Lauderdale	8/31/1999	MW1	Grab
UMZ	City of Fort Lauderdale	9/7/1999	MW1	Grab
UMZ	City of Fort Lauderdale	9/15/1999	MW1	Grab
UMZ	City of Fort Lauderdale	9/21/1999	MW1	Grab
UMZ	City of Fort Lauderdale	9/28/1999	MW1	Grab
UMZ	City of Fort Lauderdale	10/5/1999	MW1	Grab
UMZ	City of Fort Lauderdale	10/12/1999	MW1	Grab
UMZ	City of Fort Lauderdale	10/19/1999	MW1	Grab
UMZ	City of Fort Lauderdale	10/26/1999	MW1	Grab
UMZ	City of Fort Lauderdale	11/2/1999	MW1	Grab
UMZ	City of Fort Lauderdale	11/9/1999	MW1	Grab
UMZ	City of Fort Lauderdale	11/16/1999	MW1	Grab
UMZ	City of Fort Lauderdale	11/23/1999	MW1	Grab
UMZ	City of Fort Lauderdale	11/30/1999	MW1	Grab
UMZ	City of Fort Lauderdale	12/7/1999	MW1	Grab
UMZ	City of Fort Lauderdale	12/14/1999	MW1	Grab
UMZ	City of Fort Lauderdale	12/21/1999	MW1	Grab
UMZ	City of Fort Lauderdale	12/28/1999	MW1	Grab
UMZ	MD-North District	3/19/1996	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	3/27/1996	FAL 1, 2, 3, 4	Grab
Sampling Origin	**Sampling Facility**	**Sampling Date**	**Sample Description**	**Sampling Type**
UMZ	MD-North District	4/1/1996	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	4/9/1996	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	4/16/1996	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	4/25/1996	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	5/1/1996	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	5/9/1996	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	5/23/1996	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	5/30/1996	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	6/3/1996	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	6/19/1996	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	6/27/1996	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	7/16/1996	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	7/23/1996	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	7/31/1996	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	8/8/1996	FAL 1, 2, 3, 4	Grab

UMZ	MD-North District	8/14/1996	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	9/5/1996	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	9/11/1996	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	9/19/1996	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	10/2/1996	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	10/7/1996	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	10/16/1996	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	10/21/1996	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	10/28/1996	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	12/30/1996	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District		FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	1/8/1997	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	1/13/1997	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	1/27/1997	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	2/3/1997	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	2/10/1997	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	2/24/1997	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	3/3/1997	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	3/17/1997	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	3/31/1997	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	4/7/1997	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	4/15/1997	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	4/22/1997	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	4/29/1997	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	5/6/1997	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	5/12/1997	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	5/19/1997	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	5/27/1997	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	6/3/1997	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	6/9/1997	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	6/16/1997	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	6/23/1997	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	6/30/1997	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	7/9/1997	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	7/15/1997	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	7/22/1997	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	7/29/1997	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	8/4/1997	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	8/11/1997	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	8/18/1997	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	8/25/1997	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	9/2/1997	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	9/8/1997	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	9/15/1997	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	9/22/1997	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	9/29/1997	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	10/6/1997	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	10/13/1997	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	10/21/1997	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	10/28/1997	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	11/5/1997	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	11/10/1997	FAL 1, 2, 3, 4	Grab
Sampling Origin	**Sampling Facility**	**Sampling Date**	**Sample Description**	**Sampling Type**
UMZ	MD-North District	11/17/1997	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	11/24/1997	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	12/1/1997	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	12/8/1997	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	12/15/1997	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	12/23/1997	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	1/6/1998	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	1/13/1998	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	1/20/1998	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	1/28/1998	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	2/2/1998	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	2/9/1998	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	2/17/1998	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	2/24/1998	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	3/2/1998	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	3/9/1998	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	3/16/1998	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	3/23/1998	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	4/8/1998	FAL 1, 2, 3, 4	Grab

UMZ	MD-North District	4/14/1998	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	4/22/1998	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	4/27/1998	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	5/4/1998	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	5/13/1998	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	5/18/1998	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	5/27/1998	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	6/1/1998	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	6/9/1998	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	6/15/1998	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	6/29/1998	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	7/5/1998	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	7/10/1998	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	7/20/1998	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	7/27/1998	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	8/10/1998	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	8/17/1998	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	8/25/1998	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	8/31/1998	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	9/9/1998	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	9/14/1998	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	9/23/1998	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	9/28/1998	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	10/5/1998	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	10/13/1998	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	10/19/1998	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	11/4/1998	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	11/9/1998	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	11/18/1998	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	11/23/1998	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	12/9/1998	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	12/22/1998	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	12/28/1998	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	1/5/1999	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	1/20/1999	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	1/25/1999	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	2/8/1999	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	2/16/1999	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	2/27/1999	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	3/1/1999	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	3/8/1999	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	3/15/1999	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	3/22/1999	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	3/29/1999	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	4/7/1999	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	4/12/1999	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	4/19/1999	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	4/29/1999	FAL 1, 2, 3, 4	Grab
Sampling Origin	**Sampling Facility**	**Sampling Date**	**Sample Description**	**Sampling Type**
UMZ	MD-North District	5/4/1999	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	5/10/1999	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	5/17/1999	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	5/24/1999	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	6/2/1999	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	6/7/1999	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	6/14/1999	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	6/30/1999	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	7/7/1999	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	7/12/1999	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	7/19/1999	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	7/26/1999	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	8/2/1999	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	8/9/1999	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	8/16/1999	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	8/23/1999	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	9/1/1999	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	9/7/1999	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	9/13/1999	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	9/20/1999	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	10/6/1999	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	10/13/1999	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	10/18/1999	FAL 1, 2, 3, 4	Grab

UMZ	MD-North District	10/25/1999	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	11/1/1999	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	11/8/1999	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	11/15/1999	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	11/22/1999	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	12/6/1999	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	12/13/1999	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	12/20/1999	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	12/27/1999	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	1/3/2000	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	1/10/2000	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	1/18/2000	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	1/24/2000	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	2/7/2000	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	2/14/2000	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	2/22/2000	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	2/28/2000	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	3/6/2000	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	3/13/2000	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	3/20/2000	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	3/27/2000	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	4/4/2000	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	4/10/2000	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	4/22/2000	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	4/26/2000	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	5/1/2000	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	5/8/2000	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	5/21/2000	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	5/24/2000	FAL 1, 2, 3, 4	Grab
UMZ	MD-North District	5/31/2000	FAL 1, 2, 3, 4	Grab
UMZ	MD-South District	12/1/1983	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	3/1/1984	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	6/1/1984	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	9/1/1984	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	12/1/1984	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	3/1/1985	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	6/1/1985	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	9/1/1985	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	12/1/1985	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	3/1/1986	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	6/1/1986	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	9/1/1986	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
Sampling Origin	**Sampling Facility**	**Sampling Date**	**Sample Description**	**Sampling Type**
UMZ	MD-South District	12/1/1986	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	3/1/1987	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	6/1/1987	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	9/1/1987	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	12/1/1987	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	3/1/1988	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	6/1/1988	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	9/1/1988	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	12/1/1988	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	3/1/1989	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	6/1/1989	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	9/1/1989	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	10/1/1989	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	11/1/1989	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	12/1/1989	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	3/1/1990	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	4/1/1990	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	5/1/1990	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	6/1/1990	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	8/1/1990	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	9/1/1990	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	10/1/1990	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	11/1/1990	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	1/1/1991	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab

UMZ	MD-South District	2/1/1991	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	3/1/1991	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	4/1/1991	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	5/7/1991	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	5/14/1991	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	5/21/1991	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	5/28/1991	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	6/4/1991	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	6/11/1991	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	6/18/1991	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	6/25/1991	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	7/2/1991	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	7/9/1991	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	7/16/1991	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	7/23/1991	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	7/30/1991	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	8/6/1991	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	8/13/1991	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	8/20/1991	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	8/27/1991	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	9/3/1991	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	9/10/1991	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	9/17/1991	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	10/1/1991	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	10/8/1991	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	10/16/1991	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	10/22/1991	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	10/29/1991	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	11/5/1991	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	11/13/1991	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	11/19/1991	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	11/26/1991	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	12/3/1991	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	12/10/1991	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	12/17/1991	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
Sampling Origin	**Sampling Facility**	**Sampling Date**	**Sample Description**	**Sampling Type**
UMZ	MD-South District	12/26/1991	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	1/2/1992	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	1/14/1992	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	1/21/1992	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	1/28/1992	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	2/4/1992	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	2/13/1992	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	2/18/1992	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	2/25/1992	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	3/3/1992	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	3/10/1992	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	3/17/1992	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	3/26/1992	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	3/31/1992	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	4/7/1992	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	4/14/1992	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	4/21/1992	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	4/28/1992	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	5/5/1992	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	5/12/1992	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	5/20/1992	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	5/26/1992	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	6/3/1992	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	6/9/1992	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	6/16/1992	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	6/23/1992	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	6/30/1992	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	7/7/1992	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab

UMZ	MD-South District	7/14/1992	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	7/21/1992	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	7/28/1992	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	8/4/1992	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	8/11/1992	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	8/18/1992	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	7/13/1993	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	12/7/1993	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	12/14/1993	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	12/21/1993	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	12/28/1993	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	1/6/1994	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	1/11/1994	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	1/18/1994	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	1/25/1994	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	2/2/1994	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	2/8/1994	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	2/15/1994	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	2/22/1994	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	3/1/1994	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	3/8/1994	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	3/15/1994	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	3/22/1994	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	3/29/1994	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	4/6/1994	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	4/13/1994	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	4/19/1994	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	4/26/1994	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	5/3/1994	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	5/10/1994	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	5/17/1994	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
Sampling Origin	**Sampling Facility**	**Sampling Date**	**Sample Description**	**Sampling Type**
UMZ	MD-South District	5/24/1994	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	5/31/1994	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	6/7/1994	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	6/14/1994	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	6/21/1994	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	6/28/1994	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	7/5/1994	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	7/12/1994	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	7/19/1994	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	7/26/1994	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	8/2/1994	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	8/9/1994	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	8/16/1994	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	8/23/1994	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	8/30/1994	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	9/6/1994	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	9/12/1994	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	9/19/1994	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	9/26/1994	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	10/3/1994	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	10/11/1994	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	10/17/1994	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	10/26/1994	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	10/31/1994	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	11/8/1994	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	11/21/1994	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	11/28/1994	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	12/6/1994	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	12/12/1994	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	12/19/1994	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	12/28/1994	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	1/4/1995	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab

UMZ	MD-South District	1/10/1995	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	1/17/1995	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	1/23/1995	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	1/31/1995	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	2/6/1995	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	2/13/1995	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	2/21/1995	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	2/28/1995	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	3/8/1995	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	3/14/1995	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	3/21/1995	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	3/28/1995	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	4/4/1995	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	4/12/1995	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	4/18/1995	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	4/25/1995	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	5/2/1995	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	5/8/1995	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	5/16/1995	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	5/23/1995	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	5/31/1995	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	6/7/1995	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	6/13/1995	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	6/20/1995	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	6/27/1995	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	7/5/1995	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	7/11/1995	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
Sampling Origin	**Sampling Facility**	**Sampling Date**	**Sample Description**	**Sampling Type**
UMZ	MD-South District	7/18/1995	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	7/21/1995	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	8/3/1995	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	8/8/1995	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	8/15/1995	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	8/23/1995	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	8/29/1995	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	9/5/1995	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	9/12/1995	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	9/19/1995	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	9/28/1995	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	10/3/1995	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	10/11/1995	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	10/17/1995	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	10/24/1995	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	10/31/1995	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	11/7/1995	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	11/14/1995	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	11/21/1995	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	11/28/1995	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	12/5/1995	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	12/12/1995	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	12/19/1995	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	12/29/1995	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	1/4/1996	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	1/11/1996	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	1/19/1996	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	1/25/1996	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	2/1/1996	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	2/7/1996	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	2/13/1996	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	2/21/1996	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	2/27/1996	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	3/5/1996	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	3/12/1996	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	3/20/1996	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab

UMZ	MD-South District	3/26/1996	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	4/2/1996	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	4/9/1996	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	4/17/1996	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	4/23/1996	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	4/30/1996	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	5/7/1996	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	5/14/1996	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	5/21/1996	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	5/28/1996	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	6/4/1996	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	6/11/1996	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	6/18/1996	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	6/25/1996	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	7/2/1996	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	7/9/1996	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	7/16/1996	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	7/25/1996	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	8/1/1996	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	8/6/1996	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	8/14/1996	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	8/21/1996	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	8/27/1996	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
Sampling Origin	**Sampling Facility**	**Sampling Date**	**Sample Description**	**Sampling Type**
UMZ	MD-South District	9/4/1996	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	9/10/1996	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	9/17/1996	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	9/24/1996	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	10/1/1996	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	10/8/1996	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	10/16/1996	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	10/22/1996	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	10/29/1996	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	11/5/1996	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	11/12/1996	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	11/19/1996	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	11/26/1996	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	12/3/1996	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	12/10/1996	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	12/17/1996	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	12/24/1996	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	12/31/1996	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	1/7/1997	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	1/14/1997	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	1/21/1997	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	1/28/1997	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	2/4/1997	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	2/11/1997	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	2/18/1997	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	2/25/1997	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	3/4/1997	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	3/11/1997	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	3/18/1997	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	3/25/1997	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	4/2/1997	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	4/8/1997	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	4/15/1997	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	4/22/1997	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	4/29/1997	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	5/6/1997	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	5/13/1997	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	5/20/1997	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	5/27/1997	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	6/3/1997	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab

UMZ	MD-South District	6/10/1997	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	6/17/1997	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	6/24/1997	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	7/1/1997	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	7/8/1997	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	7/15/1997	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	7/22/1997	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	7/29/1997	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	8/5/1997	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	8/12/1997	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	8/19/1997	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	8/26/1997	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	9/2/1997	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	9/10/1997	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	9/16/1997	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	9/25/1997	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	10/1/1997	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	10/7/1997	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	10/14/1997	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
Sampling Origin	**Sampling Facility**	**Sampling Date**	**Sample Description**	**Sampling Type**
UMZ	MD-South District	10/22/1997	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	10/28/1997	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	11/4/1997	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	11/11/1997	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	11/18/1997	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	11/25/1997	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	12/2/1997	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	12/9/1997	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	12/16/1997	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	12/23/1997	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	12/30/1997	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	1/6/1998	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	1/13/1998	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	1/20/1998	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	1/27/1998	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	2/3/1998	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	2/10/1998	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	2/17/1998	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	2/24/1998	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	3/3/1998	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	3/10/1998	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	3/17/1998	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	3/24/1998	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	3/31/1998	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	4/7/1998	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	4/14/1998	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	4/22/1998	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	4/28/1998	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	5/5/1998	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	5/13/1998	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	5/19/1998	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	6/2/1998	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	6/9/1998	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	6/16/1998	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	6/23/1998	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	7/1/1998	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	7/7/1998	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	7/14/1998	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	7/21/1998	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	7/28/1998	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	8/4/1998	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	8/11/1998	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	8/18/1998	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	8/25/1998	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab

UMZ	MD-South District	9/1/1998	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	9/8/1998	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	9/15/1998	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	9/22/1998	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	9/29/1998	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	10/6/1998	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	10/14/1998	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	10/20/1998	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	11/3/1998	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	11/12/1998	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	11/17/1998	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	11/24/1998	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	12/1/1998	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	12/9/1998	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	12/17/1998	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
Sampling Origin	**Sampling Facility**	**Sampling Date**	**Sample Description**	**Sampling Type**
UMZ	MD-South District	12/22/1998	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	1/5/1999	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	1/12/1999	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	1/20/1999	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	1/27/1999	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	2/3/1999	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	2/10/1999	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	2/17/1999	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	2/24/1999	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	3/4/1999	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	3/10/1999	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	3/17/1999	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	3/24/1999	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	4/7/1999	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	4/14/1999	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	4/21/1999	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	4/28/1999	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	5/5/1999	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	5/12/1999	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	5/19/1999	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	5/28/1999	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	6/2/1999	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	6/9/1999	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	6/16/1999	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	6/23/1999	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	7/7/1999	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	7/14/1999	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	7/21/1999	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	7/28/1999	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	8/4/1999	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	8/9/1999	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	8/18/1999	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	8/25/1999	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	9/2/1999	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	9/8/1999	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	9/16/1999	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	9/22/1999	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	10/6/1999	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	10/13/1999	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	10/20/1999	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	10/27/1999	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	11/3/1999	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	11/10/1999	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	11/25/1999	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	11/30/1999	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	12/8/1999	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	12/14/1999	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	12/22/1999	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab

UMZ	MD-South District	12/29/1999	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	1/5/2000	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	2/2/2000	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	3/8/2000	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	4/2/2000	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	MD-South District	5/10/2000	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
UMZ	West Palm Beach	6/21/1995		Grab
LMZ	Broward County North Regional WWTP	11/18/1997	MW1	Grab
LMZ	Broward County North Regional WWTP	11/25/1997	MW1	Grab
LMZ	Broward County North Regional WWTP	12/2/1997	MW1	Grab
LMZ	Broward County North Regional WWTP	12/9/1997	MW1	Grab
Sampling Origin	**Sampling Facility**	**Sampling Date**	**Sample Description**	**Sampling Type**
LMZ	Broward County North Regional WWTP	12/12/1997	MW1	Grab
LMZ	Broward County North Regional WWTP	12/16/1997	MW1	Grab
LMZ	Broward County North Regional WWTP	12/19/1997	MW1	Grab
LMZ	Broward County North Regional WWTP	12/23/1997	MW1	Grab
LMZ	Broward County North Regional WWTP	12/29/1997	MW1	Grab
LMZ	Broward County North Regional WWTP	12/30/1997	MW1	Grab
LMZ	Broward County North Regional WWTP	12/9/1997	MW2	Grab
LMZ	Broward County North Regional WWTP	12/12/1997	MW2	Grab
LMZ	Broward County North Regional WWTP	12/16/1997	MW2	Grab
LMZ	Broward County North Regional WWTP	12/19/1997	MW2	Grab
LMZ	Broward County North Regional WWTP	12/23/1997	MW2	Grab
LMZ	Broward County North Regional WWTP	12/29/1997	MW2	Grab
LMZ	Broward County North Regional WWTP	12/30/1997	MW2	Grab
LMZ	City of Fort Lauderdale	3/1/1995	MW1	Grab
LMZ	City of Fort Lauderdale	3/10/1995	MW1	Grab
LMZ	City of Fort Lauderdale	3/17/1995	MW1	Grab
LMZ	City of Fort Lauderdale	3/24/1995	MW1	Grab
LMZ	City of Fort Lauderdale	3/31/1995	MW1	Grab
LMZ	City of Fort Lauderdale	4/7/1995	MW1	Grab
LMZ	City of Fort Lauderdale	4/11/1995	MW1	Grab
LMZ	City of Fort Lauderdale	4/19/1995	MW1	Grab
LMZ	City of Fort Lauderdale	4/25/1995	MW1	Grab
LMZ	City of Fort Lauderdale	5/2/1995	MW1	Grab
LMZ	City of Fort Lauderdale	5/9/1995	MW1	Grab
LMZ	City of Fort Lauderdale	5/16/1995	MW1	Grab
LMZ	City of Fort Lauderdale	5/23/1995	MW1	Grab
LMZ	City of Fort Lauderdale	5/30/1995	MW1	Grab
LMZ	City of Fort Lauderdale	6/5/1995	MW1	Grab
LMZ	City of Fort Lauderdale	6/13/1995	MW1	Grab
LMZ	City of Fort Lauderdale	6/20/1995	MW1	Grab
LMZ	City of Fort Lauderdale	6/27/1995	MW1	Grab
LMZ	City of Fort Lauderdale	7/4/1995	MW1	Grab
LMZ	City of Fort Lauderdale	7/11/1995	MW1	Grab
LMZ	City of Fort Lauderdale	7/18/1995	MW1	Grab
LMZ	City of Fort Lauderdale	7/25/1995	MW1	Grab
LMZ	City of Fort Lauderdale	7/31/1995	MW1	Grab
LMZ	City of Fort Lauderdale	8/8/1995	MW1	Grab
LMZ	City of Fort Lauderdale	8/15/1995	MW1	Grab
LMZ	City of Fort Lauderdale	8/22/1995	MW1	Grab
LMZ	City of Fort Lauderdale	8/29/1995	MW1	Grab
LMZ	City of Fort Lauderdale	9/5/1995	MW1	Grab
LMZ	City of Fort Lauderdale	9/12/1995	MW1	Grab
LMZ	City of Fort Lauderdale	9/19/1995	MW1	Grab
LMZ	City of Fort Lauderdale	9/26/1995	MW1	Grab
LMZ	City of Fort Lauderdale	10/3/1995	MW1	Grab
LMZ	City of Fort Lauderdale	10/10/1995	MW1	Grab
LMZ	City of Fort Lauderdale	10/17/1995	MW1	Grab
LMZ	City of Fort Lauderdale	10/24/1995	MW1	Grab
LMZ	City of Fort Lauderdale	10/31/1995	MW1	Grab
LMZ	City of Fort Lauderdale	11/7/1995	MW1	Grab
LMZ	City of Fort Lauderdale	11/14/1995	MW1	Grab
LMZ	City of Fort Lauderdale	11/21/1995	MW1	Grab
LMZ	City of Fort Lauderdale	11/28/1995	MW1	Grab
LMZ	City of Fort Lauderdale	12/5/1995	MW1	Grab
LMZ	City of Fort Lauderdale	12/12/1995	MW1	Grab
LMZ	City of Fort Lauderdale	12/19/1995	MW1	Grab
LMZ	City of Fort Lauderdale	12/26/1995	MW1	Grab

LMZ	City of Fort Lauderdale	1/2/1996	MW1	Grab
LMZ	City of Fort Lauderdale	1/9/1996	MW1	Grab
LMZ	City of Fort Lauderdale	1/16/1996	MW1	Grab
LMZ	City of Fort Lauderdale	1/23/1996	MW1	Grab
LMZ	City of Fort Lauderdale	1/30/1996	MW1	Grab
LMZ	City of Fort Lauderdale	2/6/1996	MW1	Grab
LMZ	City of Fort Lauderdale	2/13/1996	MW1	Grab
LMZ	City of Fort Lauderdale	2/20/1996	MW1	Grab
Sampling Origin	**Sampling Facility**	**Sampling Date**	**Sample Description**	**Sampling Type**
LMZ	City of Fort Lauderdale	2/27/1996	MW1	Grab
LMZ	City of Fort Lauderdale	3/5/1996	MW1	Grab
LMZ	City of Fort Lauderdale	3/12/1996	MW1	Grab
LMZ	City of Fort Lauderdale	3/19/1996	MW1	Grab
LMZ	City of Fort Lauderdale	3/26/1996	MW1	Grab
LMZ	City of Fort Lauderdale	4/2/1996	MW1	Grab
LMZ	City of Fort Lauderdale	4/9/1996	MW1	Grab
LMZ	City of Fort Lauderdale	4/16/1996	MW1	Grab
LMZ	City of Fort Lauderdale	4/23/1996	MW1	Grab
LMZ	City of Fort Lauderdale	4/30/1996	MW1	Grab
LMZ	City of Fort Lauderdale	5/7/1996	MW1	Grab
LMZ	City of Fort Lauderdale	5/14/1996	MW1	Grab
LMZ	City of Fort Lauderdale	6/4/1996	MW1	Grab
LMZ	City of Fort Lauderdale	6/11/1996	MW1	Grab
LMZ	City of Fort Lauderdale	6/19/1996	MW1	Grab
LMZ	City of Fort Lauderdale	6/25/1996	MW1	Grab
LMZ	City of Fort Lauderdale	7/2/1996	MW1	Grab
LMZ	City of Fort Lauderdale	7/9/1996	MW1	Grab
LMZ	City of Fort Lauderdale	7/16/1996	MW1	Grab
LMZ	City of Fort Lauderdale	7/23/1996	MW1	Grab
LMZ	City of Fort Lauderdale	7/30/1996	MW1	Grab
LMZ	City of Fort Lauderdale	8/6/1996	MW1	Grab
LMZ	City of Fort Lauderdale	8/15/1996	MW1	Grab
LMZ	City of Fort Lauderdale	8/20/1996	MW1	Grab
LMZ	City of Fort Lauderdale	8/27/1996	MW1	Grab
LMZ	City of Fort Lauderdale	9/4/1996	MW1	Grab
LMZ	City of Fort Lauderdale	9/17/1996	MW1	Grab
LMZ	City of Fort Lauderdale	10/8/1996	MW1	Grab
LMZ	City of Fort Lauderdale	10/15/1996	MW1	Grab
LMZ	City of Fort Lauderdale	10/22/1996	MW1	Grab
LMZ	City of Fort Lauderdale	10/29/1996	MW1	Grab
LMZ	City of Fort Lauderdale	11/5/1996	MW1	Grab
LMZ	City of Fort Lauderdale	11/12/1996	MW1	Grab
LMZ	City of Fort Lauderdale	11/18/1996	MW1	Grab
LMZ	City of Fort Lauderdale	11/26/1996	MW1	Grab
LMZ	City of Fort Lauderdale	12/2/1996	MW1	Grab
LMZ	City of Fort Lauderdale	12/10/1996	MW1	Grab
LMZ	City of Fort Lauderdale	12/17/1996	MW1	Grab
LMZ	City of Fort Lauderdale	12/24/1996	MW1	Grab
LMZ	City of Fort Lauderdale	12/31/1996	MW1	Grab
LMZ	City of Fort Lauderdale	1/7/1997	MW1	Grab
LMZ	City of Fort Lauderdale	1/14/1997	MW1	Grab
LMZ	City of Fort Lauderdale	1/21/1997	MW1	Grab
LMZ	City of Fort Lauderdale	1/28/1997	MW1	Grab
LMZ	City of Fort Lauderdale	2/4/1997	MW1	Grab
LMZ	City of Fort Lauderdale	2/11/1997	MW1	Grab
LMZ	City of Fort Lauderdale	2/18/1997	MW1	Grab
LMZ	City of Fort Lauderdale	2/25/1997	MW1	Grab
LMZ	City of Fort Lauderdale	3/4/1997	MW1	Grab
LMZ	City of Fort Lauderdale	3/11/1997	MW1	Grab
LMZ	City of Fort Lauderdale	3/18/1997	MW1	Grab
LMZ	City of Fort Lauderdale	3/25/1997	MW1	Grab
LMZ	City of Fort Lauderdale	4/1/1997	MW1	Grab
LMZ	City of Fort Lauderdale	4/8/1997	MW1	Grab
LMZ	City of Fort Lauderdale	5/6/1997	MW1	Grab
LMZ	City of Fort Lauderdale	5/13/1997	MW1	Grab
LMZ	City of Fort Lauderdale	5/20/1997	MW1	Grab
LMZ	City of Fort Lauderdale	5/27/1997	MW1	Grab
LMZ	City of Fort Lauderdale	6/3/1997	MW1	Grab
LMZ	City of Fort Lauderdale	6/10/1997	MW1	Grab
LMZ	City of Fort Lauderdale	6/18/1997	MW1	Grab
LMZ	City of Fort Lauderdale	6/24/1997	MW1	Grab
LMZ	City of Fort Lauderdale	7/1/1997	MW1	Grab

LMZ	City of Fort Lauderdale	7/8/1997	MW1	Grab
LMZ	City of Fort Lauderdale	7/15/1997	MW1	Grab
LMZ	City of Fort Lauderdale	7/22/1997	MW1	Grab
LMZ	City of Fort Lauderdale	7/29/1997	MW1	Grab
Sampling Origin	**Sampling Facility**	**Sampling Date**	**Sample Description**	**Sampling Type**
LMZ	City of Fort Lauderdale	8/5/1997	MW1	Grab
LMZ	City of Fort Lauderdale	8/12/1997	MW1	Grab
LMZ	City of Fort Lauderdale	8/18/1997	MW1	Grab
LMZ	City of Fort Lauderdale	8/26/1997	MW1	Grab
LMZ	City of Fort Lauderdale	9/3/1997	MW1	Grab
LMZ	City of Fort Lauderdale	9/9/1997	MW1	Grab
LMZ	City of Fort Lauderdale	9/16/1997	MW1	Grab
LMZ	City of Fort Lauderdale	9/23/1997	MW1	Grab
LMZ	City of Fort Lauderdale	9/30/1997	MW1	Grab
LMZ	City of Fort Lauderdale	10/7/1997	MW1	Grab
LMZ	City of Fort Lauderdale	10/14/1997	MW1	Grab
LMZ	City of Fort Lauderdale	10/22/1997	MW1	Grab
LMZ	City of Fort Lauderdale	10/29/1997	MW1	Grab
LMZ	City of Fort Lauderdale	11/5/1997	MW1	Grab
LMZ	City of Fort Lauderdale	11/12/1997	MW1	Grab
LMZ	City of Fort Lauderdale	11/18/1997	MW1	Grab
LMZ	City of Fort Lauderdale	11/25/1997	MW1	Grab
LMZ	City of Fort Lauderdale	12/2/1997	MW1	Grab
LMZ	City of Fort Lauderdale	12/9/1997	MW1	Grab
LMZ	City of Fort Lauderdale	12/16/1997	MW1	Grab
LMZ	City of Fort Lauderdale	12/23/1997	MW1	Grab
LMZ	City of Fort Lauderdale	12/30/1997	MW1	Grab
LMZ	City of Fort Lauderdale	1/6/1998	MW1	Grab
LMZ	City of Fort Lauderdale	1/13/1998	MW1	Grab
LMZ	City of Fort Lauderdale	1/20/1998	MW1	Grab
LMZ	City of Fort Lauderdale	1/27/1998	MW1	Grab
LMZ	City of Fort Lauderdale	2/3/1998	MW1	Grab
LMZ	City of Fort Lauderdale	2/10/1998	MW1	Grab
LMZ	City of Fort Lauderdale	2/17/1998	MW1	Grab
LMZ	City of Fort Lauderdale	2/24/1998	MW1	Grab
LMZ	City of Fort Lauderdale	3/3/1998	MW1	Grab
LMZ	City of Fort Lauderdale	3/10/1998	MW1	Grab
LMZ	City of Fort Lauderdale	3/17/1998	MW1	Grab
LMZ	City of Fort Lauderdale	3/24/1998	MW1	Grab
LMZ	City of Fort Lauderdale	3/31/1998	MW1	Grab
LMZ	City of Fort Lauderdale	4/7/1998	MW1	Grab
LMZ	City of Fort Lauderdale	4/14/1998	MW1	Grab
LMZ	City of Fort Lauderdale	4/21/1998	MW1	Grab
LMZ	City of Fort Lauderdale	4/28/1998	MW1	Grab
LMZ	City of Fort Lauderdale	5/5/1998	MW1	Grab
LMZ	City of Fort Lauderdale	5/12/1998	MW1	Grab
LMZ	City of Fort Lauderdale	5/19/1998	MW1	Grab
LMZ	City of Fort Lauderdale	5/26/1998	MW1	Grab
LMZ	City of Fort Lauderdale	6/2/1998	MW1	Grab
LMZ	City of Fort Lauderdale	6/9/1998	MW1	Grab
LMZ	City of Fort Lauderdale	6/16/1998	MW1	Grab
LMZ	City of Fort Lauderdale	6/23/1998	MW1	Grab
LMZ	City of Fort Lauderdale	6/30/1998	MW1	Grab
LMZ	City of Fort Lauderdale	7/7/1998	MW1	Grab
LMZ	City of Fort Lauderdale	7/14/1998	MW1	Grab
LMZ	City of Fort Lauderdale	7/21/1998	MW1	Grab
LMZ	City of Fort Lauderdale	7/28/1998	MW1	Grab
LMZ	City of Fort Lauderdale	8/4/1998	MW1	Grab
LMZ	City of Fort Lauderdale	8/11/1998	MW1	Grab
LMZ	City of Fort Lauderdale	8/18/1998	MW1	Grab
LMZ	City of Fort Lauderdale	8/25/1998	MW1	Grab
LMZ	City of Fort Lauderdale	9/1/1998	MW1	Grab
LMZ	City of Fort Lauderdale	9/8/1998	MW1	Grab
LMZ	City of Fort Lauderdale	9/15/1998	MW1	Grab
LMZ	City of Fort Lauderdale	9/22/1998	MW1	Grab
LMZ	City of Fort Lauderdale	9/29/1998	MW1	Grab
LMZ	City of Fort Lauderdale	10/6/1998	MW1	Grab
LMZ	City of Fort Lauderdale	10/13/1998	MW1	Grab
LMZ	City of Fort Lauderdale	10/20/1998	MW1	Grab
LMZ	City of Fort Lauderdale	10/27/1998	MW1	Grab
LMZ	City of Fort Lauderdale	11/3/1998	MW1	Grab
LMZ	City of Fort Lauderdale	11/10/1998	MW1	Grab

Sampling Origin	Sampling Facility	Sampling Date	Sample Description	Sampling Type
LMZ	City of Fort Lauderdale	11/17/1998	MW1	Grab
LMZ	City of Fort Lauderdale	11/24/1998	MW1	Grab
LMZ	City of Fort Lauderdale	12/1/1998	MW1	Grab
LMZ	City of Fort Lauderdale	12/8/1998	MW1	Grab
LMZ	City of Fort Lauderdale	12/15/1998	MW1	Grab
LMZ	City of Fort Lauderdale	12/22/1998	MW1	Grab
LMZ	City of Fort Lauderdale	12/29/1998	MW1	Grab
LMZ	City of Fort Lauderdale	1/5/1999	MW1	Grab
LMZ	City of Fort Lauderdale	1/12/1999	MW1	Grab
LMZ	City of Fort Lauderdale	1/19/1999	MW1	Grab
LMZ	City of Fort Lauderdale	1/26/1999	MW1	Grab
LMZ	City of Fort Lauderdale	2/2/1999	MW1	Grab
LMZ	City of Fort Lauderdale	2/9/1999	MW1	Grab
LMZ	City of Fort Lauderdale	2/16/1999	MW1	Grab
LMZ	City of Fort Lauderdale	2/23/1999	MW1	Grab
LMZ	City of Fort Lauderdale	3/2/1999	MW1	Grab
LMZ	City of Fort Lauderdale	3/9/1999	MW1	Grab
LMZ	City of Fort Lauderdale	3/16/1999	MW1	Grab
LMZ	City of Fort Lauderdale	4/6/1999	MW1	Grab
LMZ	City of Fort Lauderdale	4/13/1999	MW1	Grab
LMZ	City of Fort Lauderdale	4/20/1999	MW1	Grab
LMZ	City of Fort Lauderdale	4/27/1999	MW1	Grab
LMZ	City of Fort Lauderdale	5/4/1999	MW1	Grab
LMZ	City of Fort Lauderdale	5/11/1999	MW1	Grab
LMZ	City of Fort Lauderdale	5/18/1999	MW1	Grab
LMZ	City of Fort Lauderdale	5/25/1999	MW1	Grab
LMZ	City of Fort Lauderdale	6/1/1999	MW1	Grab
LMZ	City of Fort Lauderdale	6/8/1999	MW1	Grab
LMZ	City of Fort Lauderdale	6/15/1999	MW1	Grab
LMZ	City of Fort Lauderdale	6/22/1999	MW1	Grab
LMZ	City of Fort Lauderdale	6/29/1999	MW1	Grab
LMZ	City of Fort Lauderdale	7/6/1999	MW1	Grab
LMZ	City of Fort Lauderdale	7/13/1999	MW1	Grab
LMZ	City of Fort Lauderdale	8/3/1999	MW1	Grab
LMZ	City of Fort Lauderdale	8/10/1999	MW1	Grab
LMZ	City of Fort Lauderdale	8/17/1999	MW1	Grab
LMZ	City of Fort Lauderdale	8/24/1999	MW1	Grab
LMZ	City of Fort Lauderdale	8/31/1999	MW1	Grab
LMZ	City of Fort Lauderdale	9/7/1999	MW1	Grab
LMZ	City of Fort Lauderdale	9/15/1999	MW1	Grab
LMZ	City of Fort Lauderdale	9/21/1999	MW1	Grab
LMZ	City of Fort Lauderdale	9/28/1999	MW1	Grab
LMZ	City of Fort Lauderdale	10/5/1999	MW1	Grab
LMZ	City of Fort Lauderdale	10/12/1999	MW1	Grab
LMZ	City of Fort Lauderdale	10/19/1999	MW1	Grab
LMZ	City of Fort Lauderdale	10/26/1999	MW1	Grab
LMZ	City of Fort Lauderdale	11/2/1999	MW1	Grab
LMZ	City of Fort Lauderdale	11/9/1999	MW1	Grab
LMZ	City of Fort Lauderdale	11/16/1999	MW1	Grab
LMZ	City of Fort Lauderdale	11/23/1999	MW1	Grab
LMZ	City of Fort Lauderdale	11/30/1999	MW1	Grab
LMZ	City of Fort Lauderdale	12/7/1999	MW1	Grab
LMZ	City of Fort Lauderdale	12/14/1999	MW1	Grab
LMZ	City of Fort Lauderdale	12/21/1999	MW1	Grab
LMZ	City of Fort Lauderdale	12/28/1999	MW1	Grab
LMZ	City of Fort Lauderdale	3/1/1995	MW2	Grab
LMZ	City of Fort Lauderdale	3/10/1995	MW2	Grab
LMZ	City of Fort Lauderdale	3/17/1995	MW2	Grab
LMZ	City of Fort Lauderdale	3/24/1995	MW2	Grab
LMZ	City of Fort Lauderdale	3/31/1995	MW2	Grab
LMZ	City of Fort Lauderdale	4/7/1995	MW2	Grab
LMZ	City of Fort Lauderdale	4/11/1995	MW2	Grab
LMZ	City of Fort Lauderdale	4/19/1995	MW2	Grab
LMZ	City of Fort Lauderdale	4/25/1995	MW2	Grab
LMZ	City of Fort Lauderdale	5/2/1995	MW2	Grab
LMZ	City of Fort Lauderdale	5/9/1995	MW2	Grab
LMZ	City of Fort Lauderdale	5/16/1995	MW2	Grab
Sampling Origin	**Sampling Facility**	**Sampling Date**	**Sample Description**	**Sampling Type**
LMZ	City of Fort Lauderdale	5/23/1995	MW2	Grab
LMZ	City of Fort Lauderdale	5/30/1995	MW2	Grab
LMZ	City of Fort Lauderdale	6/5/1995	MW2	Grab

LMZ	City of Fort Lauderdale	6/13/1995	MW2	Grab
LMZ	City of Fort Lauderdale	6/20/1995	MW2	Grab
LMZ	City of Fort Lauderdale	6/27/1995	MW2	Grab
LMZ	City of Fort Lauderdale	7/4/1995	MW2	Grab
LMZ	City of Fort Lauderdale	7/11/1995	MW2	Grab
LMZ	City of Fort Lauderdale	7/18/1995	MW2	Grab
LMZ	City of Fort Lauderdale	7/25/1995	MW2	Grab
LMZ	City of Fort Lauderdale	7/31/1995	MW2	Grab
LMZ	City of Fort Lauderdale	8/8/1995	MW2	Grab
LMZ	City of Fort Lauderdale	8/15/1995	MW2	Grab
LMZ	City of Fort Lauderdale	8/22/1995	MW2	Grab
LMZ	City of Fort Lauderdale	8/29/1995	MW2	Grab
LMZ	City of Fort Lauderdale	9/5/1995	MW2	Grab
LMZ	City of Fort Lauderdale	9/12/1995	MW2	Grab
LMZ	City of Fort Lauderdale	9/19/1995	MW2	Grab
LMZ	City of Fort Lauderdale	9/26/1995	MW2	Grab
LMZ	City of Fort Lauderdale	10/3/1995	MW2	Grab
LMZ	City of Fort Lauderdale	10/10/1995	MW2	Grab
LMZ	City of Fort Lauderdale	10/17/1995	MW2	Grab
LMZ	City of Fort Lauderdale	10/24/1995	MW2	Grab
LMZ	City of Fort Lauderdale	10/31/1995	MW2	Grab
LMZ	City of Fort Lauderdale	11/7/1995	MW2	Grab
LMZ	City of Fort Lauderdale	11/14/1995	MW2	Grab
LMZ	City of Fort Lauderdale	11/21/1995	MW2	Grab
LMZ	City of Fort Lauderdale	11/28/1995	MW2	Grab
LMZ	City of Fort Lauderdale	12/5/1995	MW2	Grab
LMZ	City of Fort Lauderdale	12/12/1995	MW2	Grab
LMZ	City of Fort Lauderdale	12/19/1995	MW2	Grab
LMZ	City of Fort Lauderdale	12/26/1995	MW2	Grab
LMZ	City of Fort Lauderdale	1/2/1996	MW2	Grab
LMZ	City of Fort Lauderdale	1/9/1996	MW2	Grab
LMZ	City of Fort Lauderdale	1/16/1996	MW2	Grab
LMZ	City of Fort Lauderdale	1/23/1996	MW2	Grab
LMZ	City of Fort Lauderdale	1/30/1996	MW2	Grab
LMZ	City of Fort Lauderdale	2/6/1996	MW2	Grab
LMZ	City of Fort Lauderdale	2/13/1996	MW2	Grab
LMZ	City of Fort Lauderdale	2/20/1996	MW2	Grab
LMZ	City of Fort Lauderdale	2/27/1996	MW2	Grab
LMZ	City of Fort Lauderdale	3/5/1996	MW2	Grab
LMZ	City of Fort Lauderdale	3/12/1996	MW2	Grab
LMZ	City of Fort Lauderdale	3/19/1996	MW2	Grab
LMZ	City of Fort Lauderdale	3/26/1996	MW2	Grab
LMZ	City of Fort Lauderdale	4/2/1996	MW2	Grab
LMZ	City of Fort Lauderdale	4/9/1996	MW2	Grab
LMZ	City of Fort Lauderdale	4/16/1996	MW2	Grab
LMZ	City of Fort Lauderdale	4/23/1996	MW2	Grab
LMZ	City of Fort Lauderdale	4/30/1996	MW2	Grab
LMZ	City of Fort Lauderdale	5/7/1996	MW2	Grab
LMZ	City of Fort Lauderdale	5/14/1996	MW2	Grab
LMZ	City of Fort Lauderdale	6/4/1996	MW2	Grab
LMZ	City of Fort Lauderdale	6/11/1996	MW2	Grab
LMZ	City of Fort Lauderdale	6/189/96	MW2	Grab
LMZ	City of Fort Lauderdale	6/25/1996	MW2	Grab
LMZ	City of Fort Lauderdale	7/2/1996	MW2	Grab
LMZ	City of Fort Lauderdale	7/9/1996	MW2	Grab
LMZ	City of Fort Lauderdale	7/16/1996	MW2	Grab
LMZ	City of Fort Lauderdale	7/23/1996	MW2	Grab
LMZ	City of Fort Lauderdale	7/30/1996	MW2	Grab
LMZ	City of Fort Lauderdale	8/6/1996	MW2	Grab
LMZ	City of Fort Lauderdale	8/15/1996	MW2	Grab
LMZ	City of Fort Lauderdale	8/20/1996	MW2	Grab
LMZ	City of Fort Lauderdale	8/27/1996	MW2	Grab
LMZ	City of Fort Lauderdale	9/4/1996	MW2	Grab
LMZ	City of Fort Lauderdale	9/17/1996	MW2	Grab
Sampling Origin	**Sampling Facility**	**Sampling Date**	**Sample Description**	**Sampling Type**
LMZ	City of Fort Lauderdale	10/8/1996	MW2	Grab
LMZ	City of Fort Lauderdale	10/15/1996	MW2	Grab
LMZ	City of Fort Lauderdale	10/22/1996	MW2	Grab
LMZ	City of Fort Lauderdale	10/29/1996	MW2	Grab
LMZ	City of Fort Lauderdale	11/5/1996	MW2	Grab
LMZ	City of Fort Lauderdale	11/12/1996	MW2	Grab
LMZ	City of Fort Lauderdale	11/18/1996	MW2	Grab

LMZ	City of Fort Lauderdale	11/26/1996	MW2	Grab
LMZ	City of Fort Lauderdale	12/2/1996	MW2	Grab
LMZ	City of Fort Lauderdale	12/10/1996	MW2	Grab
LMZ	City of Fort Lauderdale	12/17/1996	MW2	Grab
LMZ	City of Fort Lauderdale	12/24/1996	MW2	Grab
LMZ	City of Fort Lauderdale	12/31/1996	MW2	Grab
LMZ	City of Fort Lauderdale	1/7/1997	MW2	Grab
LMZ	City of Fort Lauderdale	1/14/1997	MW2	Grab
LMZ	City of Fort Lauderdale	1/21/1997	MW2	Grab
LMZ	City of Fort Lauderdale	1/28/1997	MW2	Grab
LMZ	City of Fort Lauderdale	2/4/1997	MW2	Grab
LMZ	City of Fort Lauderdale	2/11/1997	MW2	Grab
LMZ	City of Fort Lauderdale	2/18/1997	MW2	Grab
LMZ	City of Fort Lauderdale	2/25/1997	MW2	Grab
LMZ	City of Fort Lauderdale	3/4/1997	MW2	Grab
LMZ	City of Fort Lauderdale	3/11/1997	MW2	Grab
LMZ	City of Fort Lauderdale	3/18/1997	MW2	Grab
LMZ	City of Fort Lauderdale	3/25/1997	MW2	Grab
LMZ	City of Fort Lauderdale	4/1/1997	MW2	Grab
LMZ	City of Fort Lauderdale	4/8/1997	MW2	Grab
LMZ	City of Fort Lauderdale	5/6/1997	MW2	Grab
LMZ	City of Fort Lauderdale	5/13/1997	MW2	Grab
LMZ	City of Fort Lauderdale	5/20/1997	MW2	Grab
LMZ	City of Fort Lauderdale	5/27/1997	MW2	Grab
LMZ	City of Fort Lauderdale	6/3/1997	MW2	Grab
LMZ	City of Fort Lauderdale	6/10/1997	MW2	Grab
LMZ	City of Fort Lauderdale	6/18/1997	MW2	Grab
LMZ	City of Fort Lauderdale	6/24/1997	MW2	Grab
LMZ	City of Fort Lauderdale	7/1/1997	MW2	Grab
LMZ	City of Fort Lauderdale	7/8/1997	MW2	Grab
LMZ	City of Fort Lauderdale	7/15/1997	MW2	Grab
LMZ	City of Fort Lauderdale	7/22/1997	MW2	Grab
LMZ	City of Fort Lauderdale	7/29/1997	MW2	Grab
LMZ	City of Fort Lauderdale	8/5/1997	MW2	Grab
LMZ	City of Fort Lauderdale	8/12/1997	MW2	Grab
LMZ	City of Fort Lauderdale	8/18/1997	MW2	Grab
LMZ	City of Fort Lauderdale	8/26/1997	MW2	Grab
LMZ	City of Fort Lauderdale	9/3/1997	MW2	Grab
LMZ	City of Fort Lauderdale	9/9/1997	MW2	Grab
LMZ	City of Fort Lauderdale	9/16/1997	MW2	Grab
LMZ	City of Fort Lauderdale	9/23/1997	MW2	Grab
LMZ	City of Fort Lauderdale	9/30/1997	MW2	Grab
LMZ	City of Fort Lauderdale	10/7/1997	MW2	Grab
LMZ	City of Fort Lauderdale	10/14/1997	MW2	Grab
LMZ	City of Fort Lauderdale	10/22/1997	MW2	Grab
LMZ	City of Fort Lauderdale	10/29/1997	MW2	Grab
LMZ	City of Fort Lauderdale	11/5/1997	MW2	Grab
LMZ	City of Fort Lauderdale	11/12/1997	MW2	Grab
LMZ	City of Fort Lauderdale	11/18/1997	MW2	Grab
LMZ	City of Fort Lauderdale	11/25/1997	MW2	Grab
LMZ	City of Fort Lauderdale	12/2/1997	MW2	Grab
LMZ	City of Fort Lauderdale	12/9/1997	MW2	Grab
LMZ	City of Fort Lauderdale	12/16/1997	MW2	Grab
LMZ	City of Fort Lauderdale	12/23/1997	MW2	Grab
LMZ	City of Fort Lauderdale	12/30/1997	MW2	Grab
LMZ	City of Fort Lauderdale	1/6/1998	MW2	Grab
LMZ	City of Fort Lauderdale	1/13/1998	MW2	Grab
LMZ	City of Fort Lauderdale	1/20/1998	MW2	Grab
LMZ	City of Fort Lauderdale	1/27/1998	MW2	Grab
LMZ	City of Fort Lauderdale	2/3/1998	MW2	Grab
Sampling Origin	**Sampling Facility**	**Sampling Date**	**Sample Description**	**Sampling Type**
LMZ	City of Fort Lauderdale	2/10/1998	MW2	Grab
LMZ	City of Fort Lauderdale	2/17/1998	MW2	Grab
LMZ	City of Fort Lauderdale	2/24/1998	MW2	Grab
LMZ	City of Fort Lauderdale	3/3/1998	MW2	Grab
LMZ	City of Fort Lauderdale	3/10/1998	MW2	Grab
LMZ	City of Fort Lauderdale	3/17/1998	MW2	Grab
LMZ	City of Fort Lauderdale	3/24/1998	MW2	Grab
LMZ	City of Fort Lauderdale	3/31/1998	MW2	Grab
LMZ	City of Fort Lauderdale	4/7/1998	MW2	Grab
LMZ	City of Fort Lauderdale	4/14/1998	MW2	Grab
LMZ	City of Fort Lauderdale	4/21/1998	MW2	Grab

LMZ	City of Fort Lauderdale	4/28/1998	MW2	Grab
LMZ	City of Fort Lauderdale	5/5/1998	MW2	Grab
LMZ	City of Fort Lauderdale	5/12/1998	MW2	Grab
LMZ	City of Fort Lauderdale	5/19/1998	MW2	Grab
LMZ	City of Fort Lauderdale	5/26/1998	MW2	Grab
LMZ	City of Fort Lauderdale	6/2/1998	MW2	Grab
LMZ	City of Fort Lauderdale	6/9/1998	MW2	Grab
LMZ	City of Fort Lauderdale	6/16/1998	MW2	Grab
LMZ	City of Fort Lauderdale	6/23/1998	MW2	Grab
LMZ	City of Fort Lauderdale	6/30/1998	MW2	Grab
LMZ	City of Fort Lauderdale	7/7/1998	MW2	Grab
LMZ	City of Fort Lauderdale	7/14/1998	MW2	Grab
LMZ	City of Fort Lauderdale	7/21/1998	MW2	Grab
LMZ	City of Fort Lauderdale	7/28/1998	MW2	Grab
LMZ	City of Fort Lauderdale	8/4/1998	MW2	Grab
LMZ	City of Fort Lauderdale	8/11/1998	MW2	Grab
LMZ	City of Fort Lauderdale	8/18/1998	MW2	Grab
LMZ	City of Fort Lauderdale	8/25/1998	MW2	Grab
LMZ	City of Fort Lauderdale	9/1/1998	MW2	Grab
LMZ	City of Fort Lauderdale	9/8/1998	MW2	Grab
LMZ	City of Fort Lauderdale	9/15/1998	MW2	Grab
LMZ	City of Fort Lauderdale	9/22/1998	MW2	Grab
LMZ	City of Fort Lauderdale	9/29/1998	MW2	Grab
LMZ	City of Fort Lauderdale	10/6/1998	MW2	Grab
LMZ	City of Fort Lauderdale	10/13/1998	MW2	Grab
LMZ	City of Fort Lauderdale	10/20/1998	MW2	Grab
LMZ	City of Fort Lauderdale	10/27/1998	MW2	Grab
LMZ	City of Fort Lauderdale	11/3/1998	MW2	Grab
LMZ	City of Fort Lauderdale	11/10/1998	MW2	Grab
LMZ	City of Fort Lauderdale	11/17/1998	MW2	Grab
LMZ	City of Fort Lauderdale	11/24/1998	MW2	Grab
LMZ	City of Fort Lauderdale	12/1/1998	MW2	Grab
LMZ	City of Fort Lauderdale	12/8/1998	MW2	Grab
LMZ	City of Fort Lauderdale	12/15/1998	MW2	Grab
LMZ	City of Fort Lauderdale	12/22/1998	MW2	Grab
LMZ	City of Fort Lauderdale	12/29/1998	MW2	Grab
LMZ	City of Fort Lauderdale	1/5/1999	MW2	Grab
LMZ	City of Fort Lauderdale	1/12/1999	MW2	Grab
LMZ	City of Fort Lauderdale	1/19/1999	MW2	Grab
LMZ	City of Fort Lauderdale	1/26/1999	MW2	Grab
LMZ	City of Fort Lauderdale	2/2/1999	MW2	Grab
LMZ	City of Fort Lauderdale	2/9/1999	MW2	Grab
LMZ	City of Fort Lauderdale	2/16/1999	MW2	Grab
LMZ	City of Fort Lauderdale	2/23/1999	MW2	Grab
LMZ	City of Fort Lauderdale	3/2/1999	MW2	Grab
LMZ	City of Fort Lauderdale	3/9/1999	MW2	Grab
LMZ	City of Fort Lauderdale	3/16/1999	MW2	Grab
LMZ	City of Fort Lauderdale	4/6/1999	MW2	Grab
LMZ	City of Fort Lauderdale	4/13/1999	MW2	Grab
LMZ	City of Fort Lauderdale	4/20/1999	MW2	Grab
LMZ	City of Fort Lauderdale	4/27/1999	MW2	Grab
LMZ	City of Fort Lauderdale	5/4/1999	MW2	Grab
LMZ	City of Fort Lauderdale	5/11/1999	MW2	Grab
LMZ	City of Fort Lauderdale	5/18/1999	MW2	Grab
LMZ	City of Fort Lauderdale	5/25/1999	MW2	Grab
LMZ	City of Fort Lauderdale	6/1/1999	MW2	Grab
Sampling Origin	**Sampling Facility**	**Sampling Date**	**Sample Description**	**Sampling Type**
LMZ	City of Fort Lauderdale	6/8/1999	MW2	Grab
LMZ	City of Fort Lauderdale	6/15/1999	MW2	Grab
LMZ	City of Fort Lauderdale	6/22/1999	MW2	Grab
LMZ	City of Fort Lauderdale	6/29/1999	MW2	Grab
LMZ	City of Fort Lauderdale	7/6/1999	MW2	Grab
LMZ	City of Fort Lauderdale	7/13/1999	MW2	Grab
LMZ	City of Fort Lauderdale	8/3/1999	MW2	Grab
LMZ	City of Fort Lauderdale	8/10/1999	MW2	Grab
LMZ	City of Fort Lauderdale	8/17/1999	MW2	Grab
LMZ	City of Fort Lauderdale	8/24/1999	MW2	Grab
LMZ	City of Fort Lauderdale	8/31/1999	MW2	Grab
LMZ	City of Fort Lauderdale	9/7/1999	MW2	Grab
LMZ	City of Fort Lauderdale	9/15/1999	MW2	Grab
LMZ	City of Fort Lauderdale	9/21/1999	MW2	Grab
LMZ	City of Fort Lauderdale	9/28/1999	MW2	Grab

LMZ	City of Fort Lauderdale	10/5/1999	MW2	Grab
LMZ	City of Fort Lauderdale	10/12/1999	MW2	Grab
LMZ	City of Fort Lauderdale	10/19/1999	MW2	Grab
LMZ	City of Fort Lauderdale	10/26/1999	MW2	Grab
LMZ	City of Fort Lauderdale	11/2/1999	MW2	Grab
LMZ	City of Fort Lauderdale	11/9/1999	MW2	Grab
LMZ	City of Fort Lauderdale	11/16/1999	MW2	Grab
LMZ	City of Fort Lauderdale	11/23/1999	MW2	Grab
LMZ	City of Fort Lauderdale	11/30/1999	MW2	Grab
LMZ	City of Fort Lauderdale	12/7/1999	MW2	Grab
LMZ	City of Fort Lauderdale	12/14/1999	MW2	Grab
LMZ	City of Fort Lauderdale	12/21/1999	MW2	Grab
LMZ	City of Fort Lauderdale	12/28/1999	MW2	Grab
LMZ	City of Fort Lauderdale	3/1/1995	MW3	Grab
LMZ	City of Fort Lauderdale	3/10/1995	MW3	Grab
LMZ	City of Fort Lauderdale	3/17/1995	MW3	Grab
LMZ	City of Fort Lauderdale	3/24/1995	MW3	Grab
LMZ	City of Fort Lauderdale	3/31/1995	MW3	Grab
LMZ	City of Fort Lauderdale	4/7/1995	MW3	Grab
LMZ	City of Fort Lauderdale	4/11/1995	MW3	Grab
LMZ	City of Fort Lauderdale	4/19/1995	MW3	Grab
LMZ	City of Fort Lauderdale	4/25/1995	MW3	Grab
LMZ	City of Fort Lauderdale	5/2/1995	MW3	Grab
LMZ	City of Fort Lauderdale	5/9/1995	MW3	Grab
LMZ	City of Fort Lauderdale	5/16/1995	MW3	Grab
LMZ	City of Fort Lauderdale	5/23/1995	MW3	Grab
LMZ	City of Fort Lauderdale	5/30/1995	MW3	Grab
LMZ	City of Fort Lauderdale	6/5/1995	MW3	Grab
LMZ	City of Fort Lauderdale	6/13/1995	MW3	Grab
LMZ	City of Fort Lauderdale	6/20/1995	MW3	Grab
LMZ	City of Fort Lauderdale	6/27/1995	MW3	Grab
LMZ	City of Fort Lauderdale	7/4/1995	MW3	Grab
LMZ	City of Fort Lauderdale	7/11/1995	MW3	Grab
LMZ	City of Fort Lauderdale	7/18/1995	MW3	Grab
LMZ	City of Fort Lauderdale	7/25/1995	MW3	Grab
LMZ	City of Fort Lauderdale	7/31/1995	MW3	Grab
LMZ	City of Fort Lauderdale	8/8/1995	MW3	Grab
LMZ	City of Fort Lauderdale	8/15/1995	MW3	Grab
LMZ	City of Fort Lauderdale	8/22/1995	MW3	Grab
LMZ	City of Fort Lauderdale	8/29/1995	MW3	Grab
LMZ	City of Fort Lauderdale	9/5/1995	MW3	Grab
LMZ	City of Fort Lauderdale	9/12/1995	MW3	Grab
LMZ	City of Fort Lauderdale	9/19/1995	MW3	Grab
LMZ	City of Fort Lauderdale	9/26/1995	MW3	Grab
LMZ	City of Fort Lauderdale	10/3/1995	MW3	Grab
LMZ	City of Fort Lauderdale	10/10/1995	MW3	Grab
LMZ	City of Fort Lauderdale	10/17/1995	MW3	Grab
LMZ	City of Fort Lauderdale	10/24/1995	MW3	Grab
LMZ	City of Fort Lauderdale	10/31/1995	MW3	Grab
LMZ	City of Fort Lauderdale	11/7/1995	MW3	Grab
LMZ	City of Fort Lauderdale	11/14/1995	MW3	Grab
LMZ	City of Fort Lauderdale	11/21/1995	MW3	Grab
Sampling Origin	**Sampling Facility**	**Sampling Date**	**Sample Description**	**Sampling Type**
LMZ	City of Fort Lauderdale	11/28/1995	MW3	Grab
LMZ	City of Fort Lauderdale	12/5/1995	MW3	Grab
LMZ	City of Fort Lauderdale	12/12/1995	MW3	Grab
LMZ	City of Fort Lauderdale	12/19/1995	MW3	Grab
LMZ	City of Fort Lauderdale	12/26/1995	MW3	Grab
LMZ	City of Fort Lauderdale	1/2/1996	MW3	Grab
LMZ	City of Fort Lauderdale	1/9/1996	MW3	Grab
LMZ	City of Fort Lauderdale	1/16/1996	MW3	Grab
LMZ	City of Fort Lauderdale	1/23/1996	MW3	Grab
LMZ	City of Fort Lauderdale	1/30/1996	MW3	Grab
LMZ	City of Fort Lauderdale	2/6/1996	MW3	Grab
LMZ	City of Fort Lauderdale	2/13/1996	MW3	Grab
LMZ	City of Fort Lauderdale	2/20/1996	MW3	Grab
LMZ	City of Fort Lauderdale	2/27/1996	MW3	Grab
LMZ	City of Fort Lauderdale	3/5/1996	MW3	Grab
LMZ	City of Fort Lauderdale	3/12/1996	MW3	Grab
LMZ	City of Fort Lauderdale	3/19/1996	MW3	Grab
LMZ	City of Fort Lauderdale	3/26/1996	MW3	Grab
LMZ	City of Fort Lauderdale	4/2/1996	MW3	Grab

LMZ	City of Fort Lauderdale	4/9/1996	MW3	Grab
LMZ	City of Fort Lauderdale	4/16/1996	MW3	Grab
LMZ	City of Fort Lauderdale	4/23/1996	MW3	Grab
LMZ	City of Fort Lauderdale	4/30/1996	MW3	Grab
LMZ	City of Fort Lauderdale	5/7/1996	MW3	Grab
LMZ	City of Fort Lauderdale	5/14/1996	MW3	Grab
LMZ	City of Fort Lauderdale	6/4/1996	MW3	Grab
LMZ	City of Fort Lauderdale	6/11/1996	MW3	Grab
LMZ	City of Fort Lauderdale	6/19/1996	MW3	Grab
LMZ	City of Fort Lauderdale	6/25/1996	MW3	Grab
LMZ	City of Fort Lauderdale	7/2/1996	MW3	Grab
LMZ	City of Fort Lauderdale	7/9/1996	MW3	Grab
LMZ	City of Fort Lauderdale	7/16/1996	MW3	Grab
LMZ	City of Fort Lauderdale	7/23/1996	MW3	Grab
LMZ	City of Fort Lauderdale	7/30/1996	MW3	Grab
LMZ	City of Fort Lauderdale	8/6/1996	MW3	Grab
LMZ	City of Fort Lauderdale	8/15/1996	MW3	Grab
LMZ	City of Fort Lauderdale	8/20/1996	MW3	Grab
LMZ	City of Fort Lauderdale	9/4/1996	MW3	Grab
LMZ	City of Fort Lauderdale	9/10/1996	MW3	Grab
LMZ	City of Fort Lauderdale	9/17/1996	MW3	Grab
LMZ	City of Fort Lauderdale	10/8/1996	MW3	Grab
LMZ	City of Fort Lauderdale	10/15/1996	MW3	Grab
LMZ	City of Fort Lauderdale	10/22/1996	MW3	Grab
LMZ	City of Fort Lauderdale	10/29/1996	MW3	Grab
LMZ	City of Fort Lauderdale	11/5/1996	MW3	Grab
LMZ	City of Fort Lauderdale	11/12/1996	MW3	Grab
LMZ	City of Fort Lauderdale	11/18/1996	MW3	Grab
LMZ	City of Fort Lauderdale	11/26/1996	MW3	Grab
LMZ	City of Fort Lauderdale	12/2/1996	MW3	Grab
LMZ	City of Fort Lauderdale	12/10/1996	MW3	Grab
LMZ	City of Fort Lauderdale	12/17/1996	MW3	Grab
LMZ	City of Fort Lauderdale	12/24/1996	MW3	Grab
LMZ	City of Fort Lauderdale	12/31/1996	MW3	Grab
LMZ	City of Fort Lauderdale	1/7/1997	MW3	Grab
LMZ	City of Fort Lauderdale	1/14/1997	MW3	Grab
LMZ	City of Fort Lauderdale	1/21/1997	MW3	Grab
LMZ	City of Fort Lauderdale	1/28/1997	MW3	Grab
LMZ	City of Fort Lauderdale	2/4/1997	MW3	Grab
LMZ	City of Fort Lauderdale	2/11/1997	MW3	Grab
LMZ	City of Fort Lauderdale	2/18/1997	MW3	Grab
LMZ	City of Fort Lauderdale	2/25/1997	MW3	Grab
LMZ	City of Fort Lauderdale	3/4/1997	MW3	Grab
LMZ	City of Fort Lauderdale	3/11/1997	MW3	Grab
LMZ	City of Fort Lauderdale	3/18/1997	MW3	Grab
LMZ	City of Fort Lauderdale	3/25/1997	MW3	Grab
LMZ	City of Fort Lauderdale	4/1/1997	MW3	Grab
LMZ	City of Fort Lauderdale	4/8/1997	MW3	Grab
Sampling Origin	**Sampling Facility**	**Sampling Date**	**Sample Description**	**Sampling Type**
LMZ	City of Fort Lauderdale	5/6/1997	MW3	Grab
LMZ	City of Fort Lauderdale	5/13/1997	MW3	Grab
LMZ	City of Fort Lauderdale	5/20/1997	MW3	Grab
LMZ	City of Fort Lauderdale	5/27/1997	MW3	Grab
LMZ	City of Fort Lauderdale	6/3/1997	MW3	Grab
LMZ	City of Fort Lauderdale	6/10/1997	MW3	Grab
LMZ	City of Fort Lauderdale	6/18/1997	MW3	Grab
LMZ	City of Fort Lauderdale	6/24/1997	MW3	Grab
LMZ	City of Fort Lauderdale	7/1/1997	MW3	Grab
LMZ	City of Fort Lauderdale	7/8/1997	MW3	Grab
LMZ	City of Fort Lauderdale	7/15/1997	MW3	Grab
LMZ	City of Fort Lauderdale	7/22/1997	MW3	Grab
LMZ	City of Fort Lauderdale	7/29/1997	MW3	Grab
LMZ	City of Fort Lauderdale	8/5/1997	MW3	Grab
LMZ	City of Fort Lauderdale	8/12/1997	MW3	Grab
LMZ	City of Fort Lauderdale	8/18/1997	MW3	Grab
LMZ	City of Fort Lauderdale	8/26/1997	MW3	Grab
LMZ	City of Fort Lauderdale	9/3/1997	MW3	Grab
LMZ	City of Fort Lauderdale	9/9/1997	MW3	Grab
LMZ	City of Fort Lauderdale	9/16/1997	MW3	Grab
LMZ	City of Fort Lauderdale	9/23/1997	MW3	Grab
LMZ	City of Fort Lauderdale	9/30/1997	MW3	Grab
LMZ	City of Fort Lauderdale	10/7/1997	MW3	Grab

LMZ	City of Fort Lauderdale	10/14/1997	MW3	Grab
LMZ	City of Fort Lauderdale	10/22/1997	MW3	Grab
LMZ	City of Fort Lauderdale	10/29/1997	MW3	Grab
LMZ	City of Fort Lauderdale	11/5/1997	MW3	Grab
LMZ	City of Fort Lauderdale	11/12/1997	MW3	Grab
LMZ	City of Fort Lauderdale	11/18/1997	MW3	Grab
LMZ	City of Fort Lauderdale	11/25/1997	MW3	Grab
LMZ	City of Fort Lauderdale	12/2/1997	MW3	Grab
LMZ	City of Fort Lauderdale	12/9/1997	MW3	Grab
LMZ	City of Fort Lauderdale	12/16/1997	MW3	Grab
LMZ	City of Fort Lauderdale	12/23/1997	MW3	Grab
LMZ	City of Fort Lauderdale	12/30/1997	MW3	Grab
LMZ	City of Fort Lauderdale	1/6/1998	MW3	Grab
LMZ	City of Fort Lauderdale	1/13/1998	MW3	Grab
LMZ	City of Fort Lauderdale	1/20/1998	MW3	Grab
LMZ	City of Fort Lauderdale	1/27/1998	MW3	Grab
LMZ	City of Fort Lauderdale	2/3/1998	MW3	Grab
LMZ	City of Fort Lauderdale	2/10/1998	MW3	Grab
LMZ	City of Fort Lauderdale	2/17/1998	MW3	Grab
LMZ	City of Fort Lauderdale	2/24/1998	MW3	Grab
LMZ	City of Fort Lauderdale	3/3/1998	MW3	Grab
LMZ	City of Fort Lauderdale	3/10/1998	MW3	Grab
LMZ	City of Fort Lauderdale	3/17/1998	MW3	Grab
LMZ	City of Fort Lauderdale	3/24/1998	MW3	Grab
LMZ	City of Fort Lauderdale	3/31/1998	MW3	Grab
LMZ	City of Fort Lauderdale	4/7/1998	MW3	Grab
LMZ	City of Fort Lauderdale	4/14/1998	MW3	Grab
LMZ	City of Fort Lauderdale	4/21/1998	MW3	Grab
LMZ	City of Fort Lauderdale	4/28/1998	MW3	Grab
LMZ	City of Fort Lauderdale	5/5/1998	MW3	Grab
LMZ	City of Fort Lauderdale	5/12/1998	MW3	Grab
LMZ	City of Fort Lauderdale	5/19/1998	MW3	Grab
LMZ	City of Fort Lauderdale	5/26/1998	MW3	Grab
LMZ	City of Fort Lauderdale	6/2/1998	MW3	Grab
LMZ	City of Fort Lauderdale	6/9/1998	MW3	Grab
LMZ	City of Fort Lauderdale	6/16/1998	MW3	Grab
LMZ	City of Fort Lauderdale	6/23/1998	MW3	Grab
LMZ	City of Fort Lauderdale	6/30/1998	MW3	Grab
LMZ	City of Fort Lauderdale	7/7/1998	MW3	Grab
LMZ	City of Fort Lauderdale	7/14/1998	MW3	Grab
LMZ	City of Fort Lauderdale	7/21/1998	MW3	Grab
LMZ	City of Fort Lauderdale	7/28/1998	MW3	Grab
LMZ	City of Fort Lauderdale	8/4/1998	MW3	Grab
LMZ	City of Fort Lauderdale	8/11/1998	MW3	Grab
Sampling Origin	**Sampling Facility**	**Sampling Date**	**Sample Description**	**Sampling Type**
LMZ	City of Fort Lauderdale	8/18/1998	MW3	Grab
LMZ	City of Fort Lauderdale	8/25/1998	MW3	Grab
LMZ	City of Fort Lauderdale	9/1/1998	MW3	Grab
LMZ	City of Fort Lauderdale	9/8/1998	MW3	Grab
LMZ	City of Fort Lauderdale	9/15/1998	MW3	Grab
LMZ	City of Fort Lauderdale	9/22/1998	MW3	Grab
LMZ	City of Fort Lauderdale	9/29/1998	MW3	Grab
LMZ	City of Fort Lauderdale	10/6/1998	MW3	Grab
LMZ	City of Fort Lauderdale	10/13/1998	MW3	Grab
LMZ	City of Fort Lauderdale	10/20/1998	MW3	Grab
LMZ	City of Fort Lauderdale	10/27/1998	MW3	Grab
LMZ	City of Fort Lauderdale	11/3/1998	MW3	Grab
LMZ	City of Fort Lauderdale	11/10/1998	MW3	Grab
LMZ	City of Fort Lauderdale	11/17/1998	MW3	Grab
LMZ	City of Fort Lauderdale	11/24/1998	MW3	Grab
LMZ	City of Fort Lauderdale	12/1/1998	MW3	Grab
LMZ	City of Fort Lauderdale	12/8/1998	MW3	Grab
LMZ	City of Fort Lauderdale	12/15/1998	MW3	Grab
LMZ	City of Fort Lauderdale	12/22/1998	MW3	Grab
LMZ	City of Fort Lauderdale	12/29/1998	MW3	Grab
LMZ	City of Fort Lauderdale	1/5/1999	MW3	Grab
LMZ	City of Fort Lauderdale	1/12/1999	MW3	Grab
LMZ	City of Fort Lauderdale	1/19/1999	MW3	Grab
LMZ	City of Fort Lauderdale	1/26/1999	MW3	Grab
LMZ	City of Fort Lauderdale	2/2/1999	MW3	Grab
LMZ	City of Fort Lauderdale	2/9/1999	MW3	Grab
LMZ	City of Fort Lauderdale	2/16/1999	MW3	Grab

LMZ	City of Fort Lauderdale	2/23/1999	MW3	Grab
LMZ	City of Fort Lauderdale	3/2/1999	MW3	Grab
LMZ	City of Fort Lauderdale	3/9/1999	MW3	Grab
LMZ	City of Fort Lauderdale	3/16/1999	MW3	Grab
LMZ	City of Fort Lauderdale	4/6/1999	MW3	Grab
LMZ	City of Fort Lauderdale	4/13/1999	MW3	Grab
LMZ	City of Fort Lauderdale	4/20/1999	MW3	Grab
LMZ	City of Fort Lauderdale	4/27/1999	MW3	Grab
LMZ	City of Fort Lauderdale	5/4/1999	MW3	Grab
LMZ	City of Fort Lauderdale	5/11/1999	MW3	Grab
LMZ	City of Fort Lauderdale	5/18/1999	MW3	Grab
LMZ	City of Fort Lauderdale	5/25/1999	MW3	Grab
LMZ	City of Fort Lauderdale	6/1/1999	MW3	Grab
LMZ	City of Fort Lauderdale	6/8/1999	MW3	Grab
LMZ	City of Fort Lauderdale	6/15/1999	MW3	Grab
LMZ	City of Fort Lauderdale	6/22/1999	MW3	Grab
LMZ	City of Fort Lauderdale	6/29/1999	MW3	Grab
LMZ	City of Fort Lauderdale	7/6/1999	MW3	Grab
LMZ	City of Fort Lauderdale	7/13/1999	MW3	Grab
LMZ	City of Fort Lauderdale	8/3/1999	MW3	Grab
LMZ	City of Fort Lauderdale	8/10/1999	MW3	Grab
LMZ	City of Fort Lauderdale	8/17/1999	MW3	Grab
LMZ	City of Fort Lauderdale	8/24/1999	MW3	Grab
LMZ	City of Fort Lauderdale	8/31/1999	MW3	Grab
LMZ	City of Fort Lauderdale	9/7/1999	MW3	Grab
LMZ	City of Fort Lauderdale	9/15/1999	MW3	Grab
LMZ	City of Fort Lauderdale	9/21/1999	MW3	Grab
LMZ	City of Fort Lauderdale	9/28/1999	MW3	Grab
LMZ	City of Fort Lauderdale	10/5/1999	MW3	Grab
LMZ	City of Fort Lauderdale	10/12/1999	MW3	Grab
LMZ	City of Fort Lauderdale	10/19/1999	MW3	Grab
LMZ	City of Fort Lauderdale	10/26/1999	MW3	Grab
LMZ	City of Fort Lauderdale	11/2/1999	MW3	Grab
LMZ	City of Fort Lauderdale	11/9/1999	MW3	Grab
LMZ	City of Fort Lauderdale	11/16/1999	MW3	Grab
LMZ	City of Fort Lauderdale	11/23/1999	MW3	Grab
LMZ	City of Fort Lauderdale	11/30/1999	MW3	Grab
LMZ	City of Fort Lauderdale	12/7/1999	MW3	Grab
LMZ	City of Fort Lauderdale	12/14/1999	MW3	Grab
LMZ	City of Fort Lauderdale	12/21/1999	MW3	Grab
Sampling Origin	**Sampling Facility**	**Sampling Date**	**Sample Description**	**Sampling Type**
LMZ	City of Fort Lauderdale	12/28/1999	MW3	Grab
LMZ	City of Fort Lauderdale	3/31/1995	RMW1	Grab
LMZ	City of Fort Lauderdale	4/7/1995	RMW1	Grab
LMZ	City of Fort Lauderdale	4/11/1995	RMW1	Grab
LMZ	City of Fort Lauderdale	4/19/1995	RMW1	Grab
LMZ	City of Fort Lauderdale	4/25/1995	RMW1	Grab
LMZ	City of Fort Lauderdale	5/2/1995	RMW1	Grab
LMZ	City of Fort Lauderdale	5/9/1995	RMW1	Grab
LMZ	City of Fort Lauderdale	5/16/1995	RMW1	Grab
LMZ	City of Fort Lauderdale	5/23/1995	RMW1	Grab
LMZ	City of Fort Lauderdale	5/30/1995	RMW1	Grab
LMZ	City of Fort Lauderdale	6/5/1995	RMW1	Grab
LMZ	City of Fort Lauderdale	6/13/1995	RMW1	Grab
LMZ	City of Fort Lauderdale	6/20/1995	RMW1	Grab
LMZ	City of Fort Lauderdale	6/27/1995	RMW1	Grab
LMZ	City of Fort Lauderdale	7/4/1995	RMW1	Grab
LMZ	City of Fort Lauderdale	7/11/1995	RMW1	Grab
LMZ	City of Fort Lauderdale	7/18/1995	RMW1	Grab
LMZ	City of Fort Lauderdale	7/25/1995	RMW1	Grab
LMZ	City of Fort Lauderdale	7/31/1995	RMW1	Grab
LMZ	City of Fort Lauderdale	8/8/1995	RMW1	Grab
LMZ	City of Fort Lauderdale	8/15/1995	RMW1	Grab
LMZ	City of Fort Lauderdale	8/22/1995	RMW1	Grab
LMZ	City of Fort Lauderdale	8/29/1995	RMW1	Grab
LMZ	City of Fort Lauderdale	9/5/1995	RMW1	Grab
LMZ	City of Fort Lauderdale	9/12/1995	RMW1	Grab
LMZ	City of Fort Lauderdale	9/19/1995	RMW1	Grab
LMZ	City of Fort Lauderdale	9/26/1995	RMW1	Grab
LMZ	City of Fort Lauderdale	10/3/1995	RMW1	Grab
LMZ	City of Fort Lauderdale	10/10/1995	RMW1	Grab
LMZ	City of Fort Lauderdale	11/7/1995	RMW1	Grab

LMZ	City of Fort Lauderdale	12/5/1995	RMW1	Grab
LMZ	City of Fort Lauderdale	1/2/1996	RMW1	Grab
LMZ	City of Fort Lauderdale	2/6/1996	RMW1	Grab
LMZ	City of Fort Lauderdale	3/5/1996	RMW1	Grab
LMZ	City of Fort Lauderdale	3/19/1996	RMW1	Grab
LMZ	City of Fort Lauderdale	4/2/1996	RMW1	Grab
LMZ	City of Fort Lauderdale	5/7/1996	RMW1	Grab
LMZ	City of Fort Lauderdale	6/4/1996	RMW1	Grab
LMZ	City of Fort Lauderdale	7/2/1996	RMW1	Grab
LMZ	City of Fort Lauderdale	8/6/1996	RMW1	Grab
LMZ	City of Fort Lauderdale	9/4/1996	RMW1	Grab
LMZ	City of Fort Lauderdale	10/8/1996	RMW1	Grab
LMZ	City of Fort Lauderdale	11/5/1996	RMW1	Grab
LMZ	City of Fort Lauderdale	12/2/1996	RMW1	Grab
LMZ	City of Fort Lauderdale	1/7/1997	RMW1	Grab
LMZ	City of Fort Lauderdale	2/4/1997	RMW1	Grab
LMZ	City of Fort Lauderdale	3/4/1997	RMW1	Grab
LMZ	City of Fort Lauderdale	4/8/1997	RMW1	Grab
LMZ	City of Fort Lauderdale	5/6/1997	RMW1	Grab
LMZ	City of Fort Lauderdale	6/3/1997	RMW1	Grab
LMZ	City of Fort Lauderdale	7/8/1997	RMW1	Grab
LMZ	City of Fort Lauderdale	8/5/1997	RMW1	Grab
LMZ	City of Fort Lauderdale	9/3/1997	RMW1	Grab
LMZ	City of Fort Lauderdale	10/7/1997	RMW1	Grab
LMZ	City of Fort Lauderdale	11/5/1997	RMW1	Grab
LMZ	City of Fort Lauderdale	12/2/1997	RMW1	Grab
LMZ	City of Fort Lauderdale	1/6/1998	RMW1	Grab
LMZ	City of Fort Lauderdale	2/3/1998	RMW1	Grab
LMZ	City of Fort Lauderdale	3/3/1998	RMW1	Grab
LMZ	City of Fort Lauderdale	5/5/1998	RMW1	Grab
LMZ	City of Fort Lauderdale	6/2/1998	RMW1	Grab
LMZ	City of Fort Lauderdale	7/7/1998	RMW1	Grab
LMZ	City of Fort Lauderdale	8/4/1998	RMW1	Grab
LMZ	City of Fort Lauderdale	9/1/1998	RMW1	Grab
LMZ	City of Fort Lauderdale	10/6/1998	RMW1	Grab
LMZ	City of Fort Lauderdale	12/8/1998	RMW1	Grab
Sampling Origin	**Sampling Facility**	**Sampling Date**	**Sample Description**	**Sampling Type**
LMZ	City of Fort Lauderdale	10/5/1999	RMW1	Grab
LMZ	City of Fort Lauderdale	11/2/1999	RMW1	Grab
LMZ	City of Fort Lauderdale	12/7/1999	RMW1	Grab
LMZ	MD-North District	3/19/1996	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	3/27/1996	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	4/1/1996	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	4/9/1996	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	4/16/1996	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	5/1/1996	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	5/9/1996	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	5/23/1996	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	5/30/1996	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	6/3/1996	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	6/19/1996	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	6/27/1996	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	7/16/1996	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	7/23/1996	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	7/31/1996	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	8/8/1996	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	8/14/1996	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	9/5/1996	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	9/11/1996	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	9/19/1996	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	10/2/1996	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	10/7/1996	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	10/16/1996	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	10/21/1996	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District		FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	1/8/1997	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	1/13/1997	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	1/27/1997	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	2/3/1997	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	2/10/1997	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	2/24/1997	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	3/3/1997	FAL 1, 2, 3, 4	Grab

LMZ	MD-North District	3/17/1997	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	3/31/1997	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	4/7/1997	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	4/15/1997	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	4/22/1997	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	4/29/1997	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	5/6/1997	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	5/12/1997	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	5/19/1997	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	5/27/1997	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	6/3/1997	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	6/9/1997	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	6/16/1997	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	6/23/1997	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	6/30/1997	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	7/9/1997	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	7/15/1997	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	7/22/1997	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	7/29/1997	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	8/4/1997	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	8/11/1997	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	8/18/1997	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	8/25/1997	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	9/2/1997	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	9/8/1997	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	9/15/1997	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	9/22/1997	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	9/29/1997	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	10/6/1997	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	10/13/1997	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	10/21/1997	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	10/28/1997	FAL 1, 2, 3, 4	Grab
Sampling Origin	**Sampling Facility**	**Sampling Date**	**Sample Description**	**Sampling Type**
LMZ	MD-North District	11/5/1997	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	11/10/1997	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	11/17/1997	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	11/24/1997	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	12/1/1997	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	12/8/1997	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	12/15/1997	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	12/23/1997	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	1/6/1998	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	1/13/1998	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	1/20/1998	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	1/28/1998	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	2/2/1998	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	2/9/1998	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	2/17/1998	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	2/24/1998	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	3/2/1998	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	3/9/1998	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	3/16/1998	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	3/23/1998	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	4/8/1998	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	4/14/1998	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	4/22/1998	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	4/27/1998	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	5/4/1998	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	5/13/1998	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	5/18/1998	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	5/27/1998	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	6/1/1998	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	6/9/1998	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	6/15/1998	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	6/22/1998	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	6/29/1998	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	7/5/1998	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	7/10/1998	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	7/20/1998	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	7/27/1998	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	8/10/1998	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	8/17/1998	FAL 1, 2, 3, 4	Grab

LMZ	MD-North District	8/25/1998	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	8/31/1998	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	9/9/1998	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	9/14/1998	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	9/23/1998	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	9/28/1998	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	10/5/1998	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	10/13/1998	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	10/19/1998	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	10/30/1998	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	11/2/1998	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	11/4/1998	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	11/9/1998	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	11/18/1998	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	11/23/1998	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	12/9/1998	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	12/22/1998	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	12/28/1998	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	1/5/1999	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	1/20/1999	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	1/25/1999	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	2/8/1999	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	2/16/1999	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	2/27/1999	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	3/1/1999	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	3/8/1999	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	3/15/1999	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	3/22/1999	FAL 1, 2, 3, 4	Grab
Sampling Origin	**Sampling Facility**	**Sampling Date**	**Sample Description**	**Sampling Type**
LMZ	MD-North District	3/29/1999	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	4/7/1999	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	4/12/1999	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	4/19/1999	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	4/29/1999	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	5/4/1999	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	5/10/1999	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	5/17/1999	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	5/24/1999	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	6/2/1999	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	6/7/1999	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	6/14/1999	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	6/30/1999	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	7/7/1999	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	7/12/1999	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	7/19/1999	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	7/26/1999	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	8/2/1999	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	8/9/1999	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	8/16/1999	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	8/23/1999	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	9/1/1999	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	9/7/1999	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	9/13/1999	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	9/20/1999	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	10/6/1999	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	10/13/1999	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	10/18/1999	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	10/25/1999	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	11/1/1999	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	11/8/1999	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	11/15/1999	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	11/22/1999	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	12/6/1999	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	12/3/1999	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	12/20/1999	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	12/27/1999	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	1/3/2000	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	1/10/2000	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	1/18/2000	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	1/24/2000	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	2/7/2000	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	2/14/2000	FAL 1, 2, 3, 4	Grab

LMZ	MD-North District	2/22/2000	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	2/28/2000	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	3/6/2000	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	3/13/2000	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	3/20/2000	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	3/27/2000	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	4/4/2000	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	4/10/2000	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	4/22/2000	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	4/26/2000	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	5/1/2000	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	5/8/2000	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	5/21/2000	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	5/24/2000	FAL 1, 2, 3, 4	Grab
LMZ	MD-North District	5/31/2000	FAL 1, 2, 3, 4	Grab
LMZ	MD-South District	12/1/1983	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	3/1/1984	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	6/1/1984	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	9/1/1984	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	12/1/1984	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	3/1/1985	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	6/1/1985	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	9/1/1985	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
Sampling Origin	**Sampling Facility**	**Sampling Date**	**Sample Description**	**Sampling Type**
LMZ	MD-South District	12/1/1985	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	3/1/1986	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	6/1/1986	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	9/1/1986	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	12/1/1986	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	3/1/1987	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	6/1/1987	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	9/1/1987	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	12/1/1987	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	3/1/1988	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	6/1/1988	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	9/1/1988	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	12/1/1988	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	3/1/1989	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	6/1/1989	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	9/1/1989	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	10/1/1989	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	11/1/1989	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	12/1/1989	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	1/1/1990	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	3/1/1990	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	4/1/1990	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	5/1/1990	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	6/1/1990	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	8/1/1990	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	9/1/1990	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	10/1/1990	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	11/1/1990	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	1/1/1991	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	2/1/1991	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	3/1/1991	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	4/1/1991	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	5/7/1991	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	5/14/1991	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	5/21/1991	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	5/28/1991	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	6/4/1991	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	6/11/1991	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	6/18/1991	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	6/25/1991	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	7/2/1991	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	7/9/1991	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab

LMZ	MD-South District	7/16/1991	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	7/23/1991	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	7/30/1991	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	8/6/1991	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	8/13/1991	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	8/20/1991	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	8/27/1991	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	9/3/1991	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	9/10/1991	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	9/17/1991	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	10/1/1991	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	10/8/1991	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	10/16/1991	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	10/22/1991	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	10/29/1991	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	11/5/1991	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	11/13/1991	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
Sampling Origin	**Sampling Facility**	**Sampling Date**	**Sample Description**	**Sampling Type**
LMZ	MD-South District	11/26/1991	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	12/3/1991	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	12/10/1991	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	12/17/1991	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	12/26/1991	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	1/2/1992	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	1/14/1992	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	1/21/1992	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	1/28/1992	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	2/4/1992	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	2/13/1992	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	2/18/1992	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	2/25/1992	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	3/3/1992	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	3/10/1992	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	3/17/1992	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	3/26/1992	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	3/31/1992	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	4/7/1992	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	4/14/1992	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	4/21/1992	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	4/28/1992	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	5/5/1992	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	5/12/1992	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	5/20/1992	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	5/26/1992	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	6/3/1992	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	6/9/1992	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	6/16/1992	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	6/23/1992	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	6/30/1992	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	7/7/1992	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	7/14/1992	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	7/21/1992	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	7/28/1992	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	8/4/1992	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	8/11/1992	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	8/18/1992	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	7/13/1993	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	10/13/1993	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	12/7/1993	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	12/14/1993	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	12/21/1993	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	12/28/1993	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	1/6/1994	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	1/11/1994	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab

LMZ	MD-South District	1/18/1994	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	1/25/1994	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	2/2/1994	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	2/8/1994	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	2/15/1994	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	2/22/1994	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	3/1/1994	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	3/8/1994	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	3/15/1994	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	3/22/1994	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	3/29/1994	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	4/6/1994	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	4/13/1994	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
Sampling Origin	**Sampling Facility**	**Sampling Date**	**Sample Description**	**Sampling Type**
LMZ	MD-South District	4/19/1994	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	4/26/1994	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	5/3/1994	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	5/10/1994	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	5/17/1994	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	5/24/1994	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	5/31/1994	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	6/7/1994	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	6/14/1994	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	6/21/1994	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	6/28/1994	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	7/5/1994	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	7/12/1994	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	7/19/1994	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	7/26/1994	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	8/2/1994	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	8/9/1994	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	8/16/1994	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	8/23/1994	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	8/30/1994	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	9/6/1994	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	9/12/1994	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	9/19/1994	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	9/26/1994	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	10/3/1994	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	10/11/1994	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	10/17/1994	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	10/26/1994	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	10/31/1994	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	11/8/1994	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	11/21/1994	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	11/28/1994	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	12/6/1994	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	12/12/1994	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	12/19/1994	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	12/28/1994	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	1/4/1995	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	1/10/1995	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	1/17/1995	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	1/23/1995	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	1/31/1995	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	2/3/1995	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	2/13/1995	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	2/21/1995	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	2/28/1995	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	3/8/1995	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	3/14/1995	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	3/21/1995	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	3/28/1995	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	4/4/1995	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab

LMZ	MD-South District	4/12/1995	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	4/18/1995	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	4/25/1995	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	5/2/1995	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	5/8/1995	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	5/16/1995	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	5/23/1995	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	5/31/1995	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	6/7/1995	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
Sampling Origin	**Sampling Facility**	**Sampling Date**	**Sample Description**	**Sampling Type**
LMZ	MD-South District	6/13/1995	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	6/20/1995	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	6/27/1995	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	7/5/1995	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	7/11/1995	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	7/18/1995	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	7/21/1995	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	8/3/1995	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	8/8/1995	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	8/15/1995	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	8/23/1995	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	8/29/1995	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	9/5/1995	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	9/12/1995	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	9/19/1995	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	9/28/1995	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	10/3/1995	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	10/11/1995	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	10/17/1995	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	10/24/1995	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	10/31/1995	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	11/7/1995	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	11/14/1995	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	11/21/1995	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	11/28/1995	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	12/5/1995	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	12/12/1995	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	12/19/1995	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	12/29/1995	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	1/4/1996	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	1/11/1996	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	1/19/1996	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	1/25/1996	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	2/1/1996	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	2/7/1996	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	2/13/1996	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	2/21/1996	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	2/27/1996	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	3/5/1996	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	3/12/1996	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	3/20/1996	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	3/26/1996	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	4/2/1996	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	4/9/1996	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	4/17/1996	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	4/23/1996	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	4/30/1996	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	5/7/1996	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	5/14/1996	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	5/21/1996	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	5/28/1996	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	6/4/1996	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	6/11/1996	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	6/18/1996	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab

LMZ	MD-South District	6/25/1996	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	7/2/1996	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	7/9/1996	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	7/16/1996	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	7/25/1996	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
Sampling Origin	**Sampling Facility**	**Sampling Date**	**Sample Description**	**Sampling Type**
LMZ	MD-South District	8/1/1996	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	8/6/1996	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	8/14/1996	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	8/21/1996	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	8/27/1996	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	9/4/1996	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	9/10/1996	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	9/17/1996	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	9/24/1996	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	10/1/1996	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	10/8/1996	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	10/16/1996	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	10/22/1996	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	10/29/1996	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	11/5/1996	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	11/12/1996	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	11/19/1996	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	11/26/1996	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	12/3/1996	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	12/10/1996	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	12/17/1996	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	12/24/1996	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	12/31/1996	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	1/7/1997	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	1/14/1997	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	1/21/1997	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	1/28/1997	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	2/4/1997	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	2/11/1997	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	2/18/1997	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	2/25/1997	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	3/4/1997	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	3/11/1997	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	3/18/1997	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	3/25/1997	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	4/2/1997	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	4/8/1997	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	4/15/1997	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	4/22/1997	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	4/29/1997	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	5/6/1997	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	5/13/1997	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	5/20/1997	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	5/27/1997	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	6/3/1997	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	6/10/1997	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	6/17/1997	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	6/24/1997	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	7/1/1997	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	7/8/1997	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	7/15/1997	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	7/22/1997	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	7/29/1997	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	8/5/1997	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	8/12/1997	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	8/19/1997	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	8/26/1997	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	9/2/1997	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab

LMZ	MD-South District	9/10/1997	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
Sampling Origin	**Sampling Facility**	**Sampling Date**	**Sample Description**	**Sampling Type**
LMZ	MD-South District	9/16/1997	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	9/25/1997	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	10/1/1997	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	10/7/1997	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	10/14/1997	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	10/22/1997	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	10/28/1997	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	11/4/1997	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	11/11/1997	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	11/18/1997	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	11/25/1997	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	12/2/1997	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	12/9/1997	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	12/16/1997	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	12/23/1997	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	12/30/1997	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	1/6/1998	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	1/13/1998	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	1/20/1998	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	1/27/1998	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	2/3/1998	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	2/10/1998	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	2/17/1998	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	2/24/1998	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	3/3/1998	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	3/10/1998	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	3/17/1998	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	3/24/1998	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	3/31/1998	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	4/7/1998	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	4/14/1998	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	4/22/1998	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	4/28/1998	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	5/5/1998	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	5/13/1998	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	5/19/1998	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	6/2/1998	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	6/9/1998	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	6/16/1998	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	6/23/1998	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	7/1/1998	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	7/7/1998	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	7/14/1998	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	7/21/1998	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	7/28/1998	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	8/4/1998	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	8/11/1998	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	8/18/1998	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	8/25/1998	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	9/1/1998	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	9/8/1998	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	9/15/1998	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	9/22/1998	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	9/29/1998	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	10/6/1998	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	10/14/1998	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	10/20/1998	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	11/3/1998	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	11/12/1998	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
Sampling Origin	**Sampling Facility**	**Sampling Date**	**Sample Description**	**Sampling Type**
LMZ	MD-South District	11/17/1998	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	11/24/1998	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab

LMZ	MD-South District	12/1/1998	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	12/9/1998	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	12/17/1998	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	12/22/1998	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	1/5/1999	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	1/12/1999	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	1/20/1999	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	1/27/1999	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	2/3/1999	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	2/10/1999	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	2/17/1999	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	2/24/1999	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	3/4/1999	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	3/10/1999	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	3/17/1999	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	3/24/1999	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	4/7/1999	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	4/14/1999	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	4/21/1999	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	4/28/1999	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	5/5/1999	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	5/12/1999	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	5/19/1999	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	5/28/1999	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	6/2/1999	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	6/9/1999	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	6/16/1999	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	6/23/1999	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	7/7/1999	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	7/14/1999	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	7/21/1999	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	7/28/1999	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	8/4/1999	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	8/9/1999	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	8/18/1999	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	8/25/1999	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	9/2/1999	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	9/8/1999	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	9/16/1999	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	9/22/1999	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	10/6/1999	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	10/13/1999	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	10/20/1999	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	11/3/1999	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	11/10/1999	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	11/23/1999	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	11/30/1999	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	12/8/1999	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	12/14/1999	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	12/22/1999	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	12/29/1999	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	1/5/2000	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	2/2/2000	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	3/8/2000	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	4/5/2000	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	MD-South District	5/10/2000	FAL1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	Grab
LMZ	West Palm Beach	1999		Grab

APPENDIX G. SCHEMATIC DIAGRAMS OF TREATMENT AND DISPOSAL PROCESSES

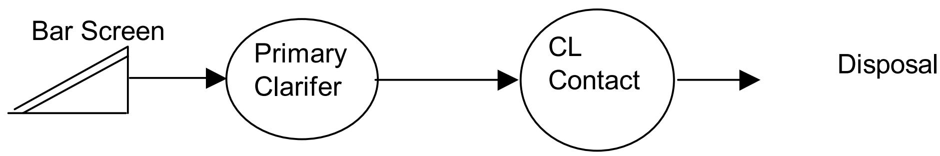


Figure G-1. Primary Wastewater Treatment

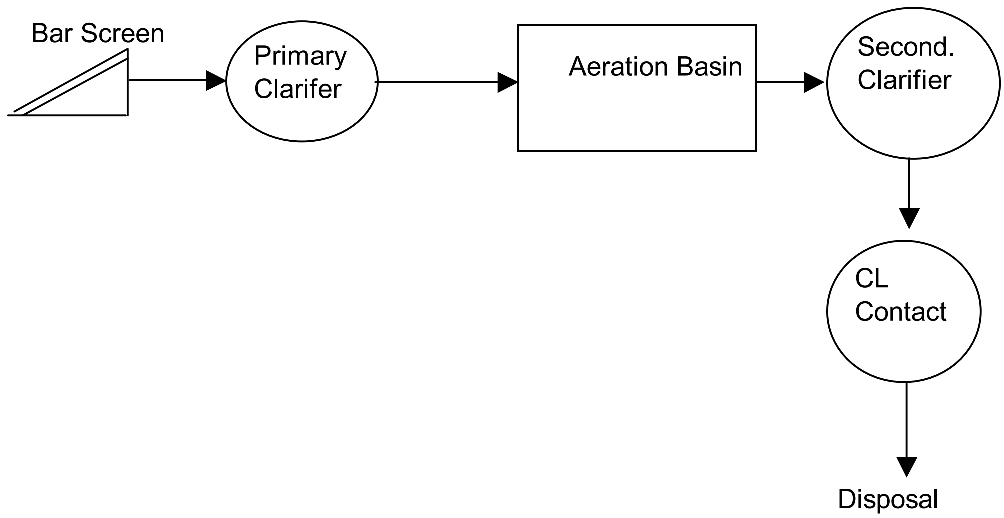


Figure G-2. Secondary Wastewater Treatment

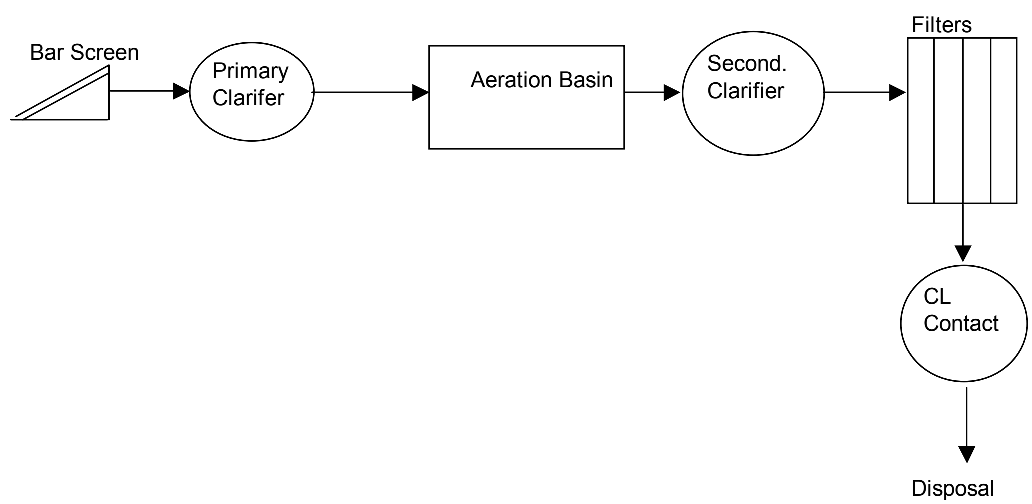


Figure G-3. Advanced Secondary Wastewater Treatment

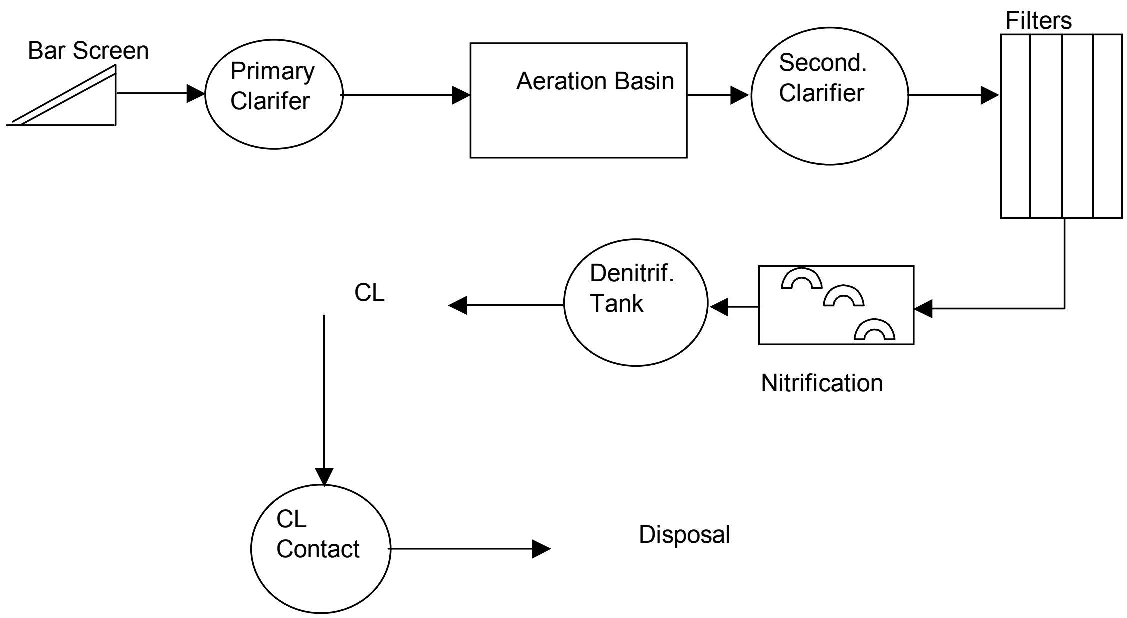


Figure G-4. Principal Wastewater Treatment

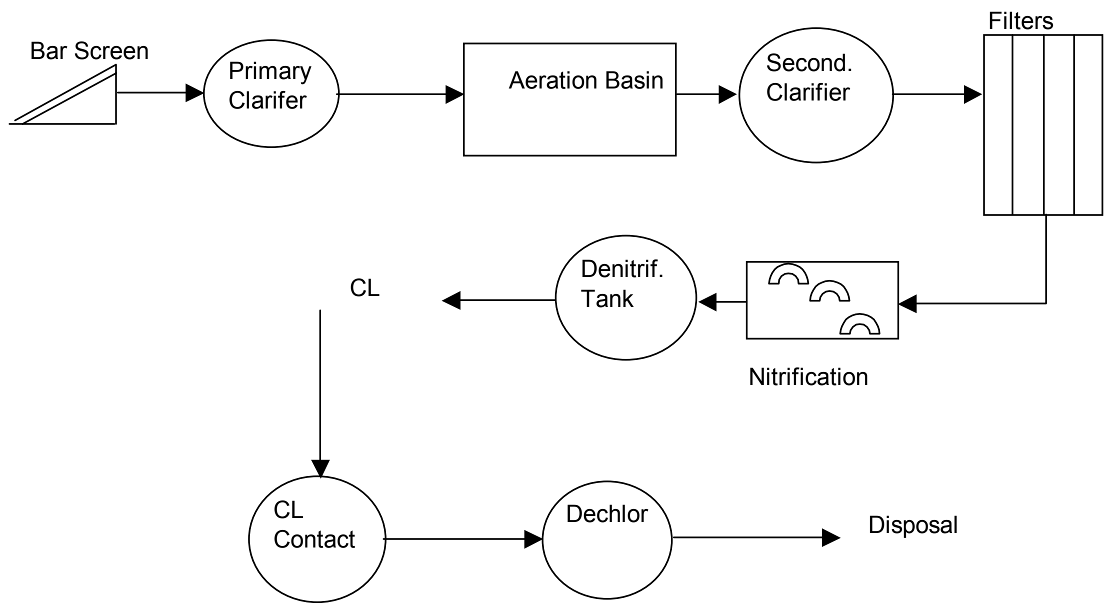


Figure G-5. Advanced Wastewater Treatment (AWT)

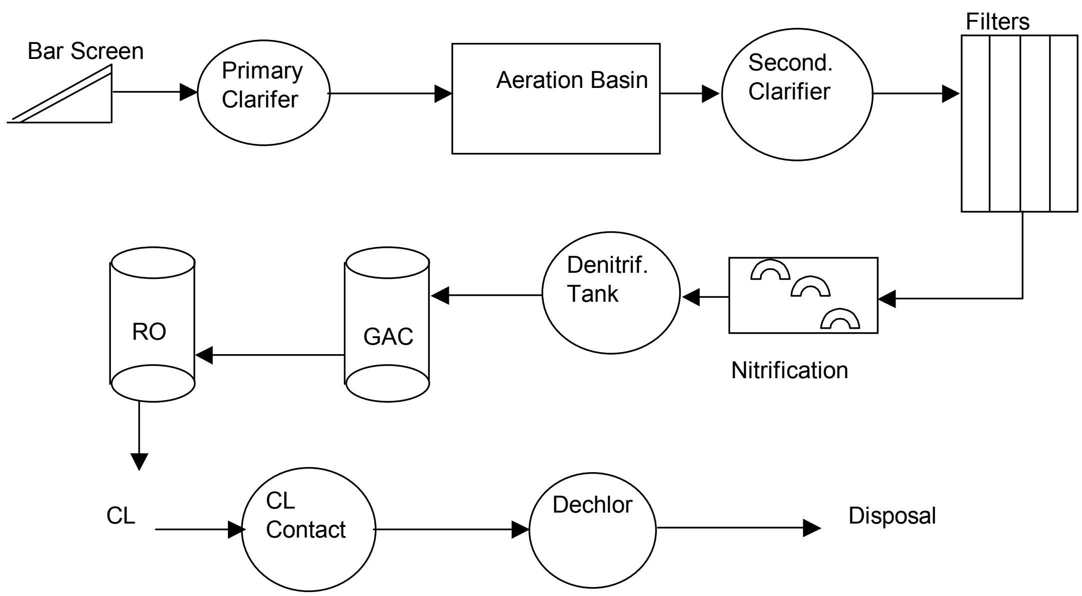


Figure G-6. Full Wastewater Treatment

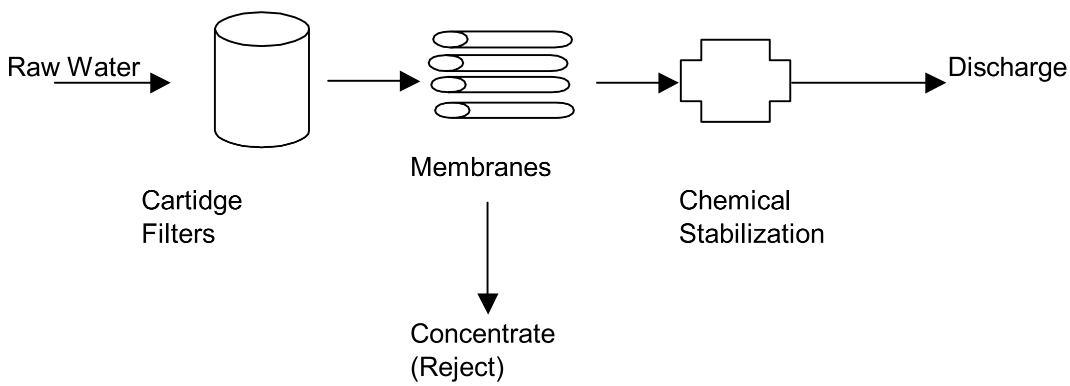


Figure G-7. Membrane Treatment

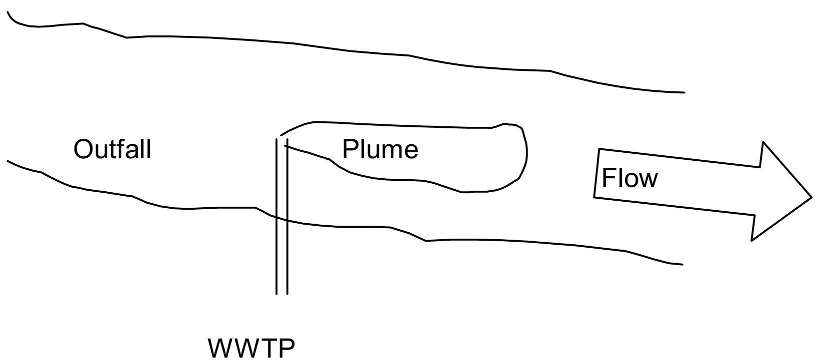


Figure G-8. Outfall Disposal of Treated Wastewater Effluent

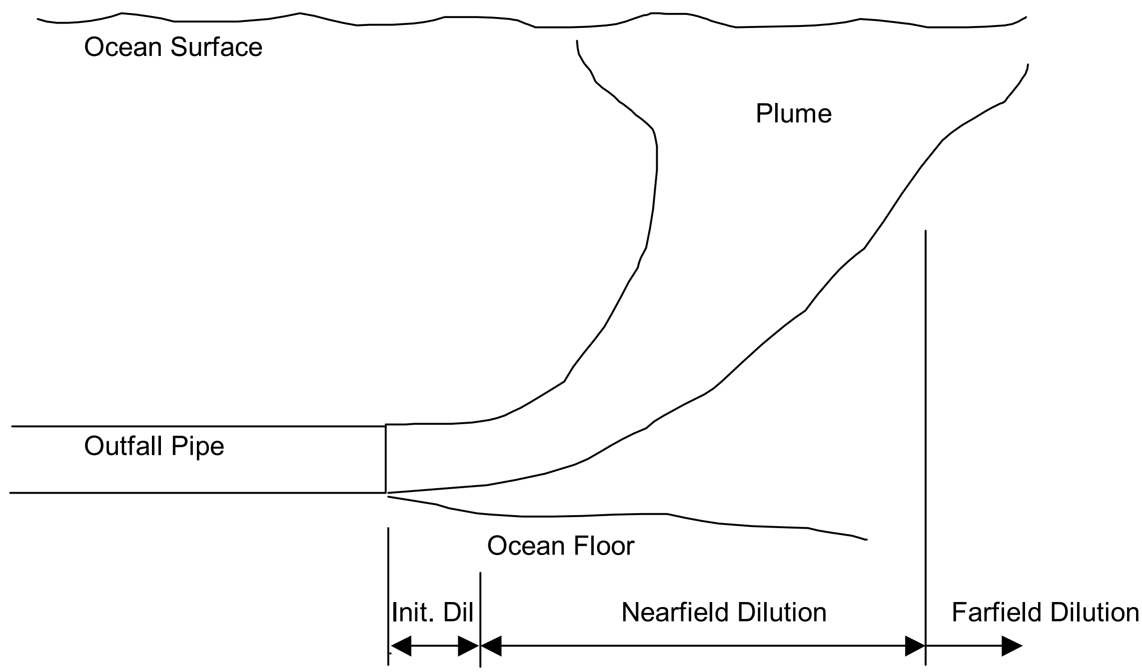


Figure G-9. Open Ocean Outfall Disposal of Treated Wastewater Effluent

APPENDIX H. CONCEPTUAL DIAGRAM OF HYDRAULIC CONDUCTIVITIES IN THE FLORIDAN AQUIFER SYSTEM, AND GEOLOGIC DATA FOR SOUTHEAST FLORIDA

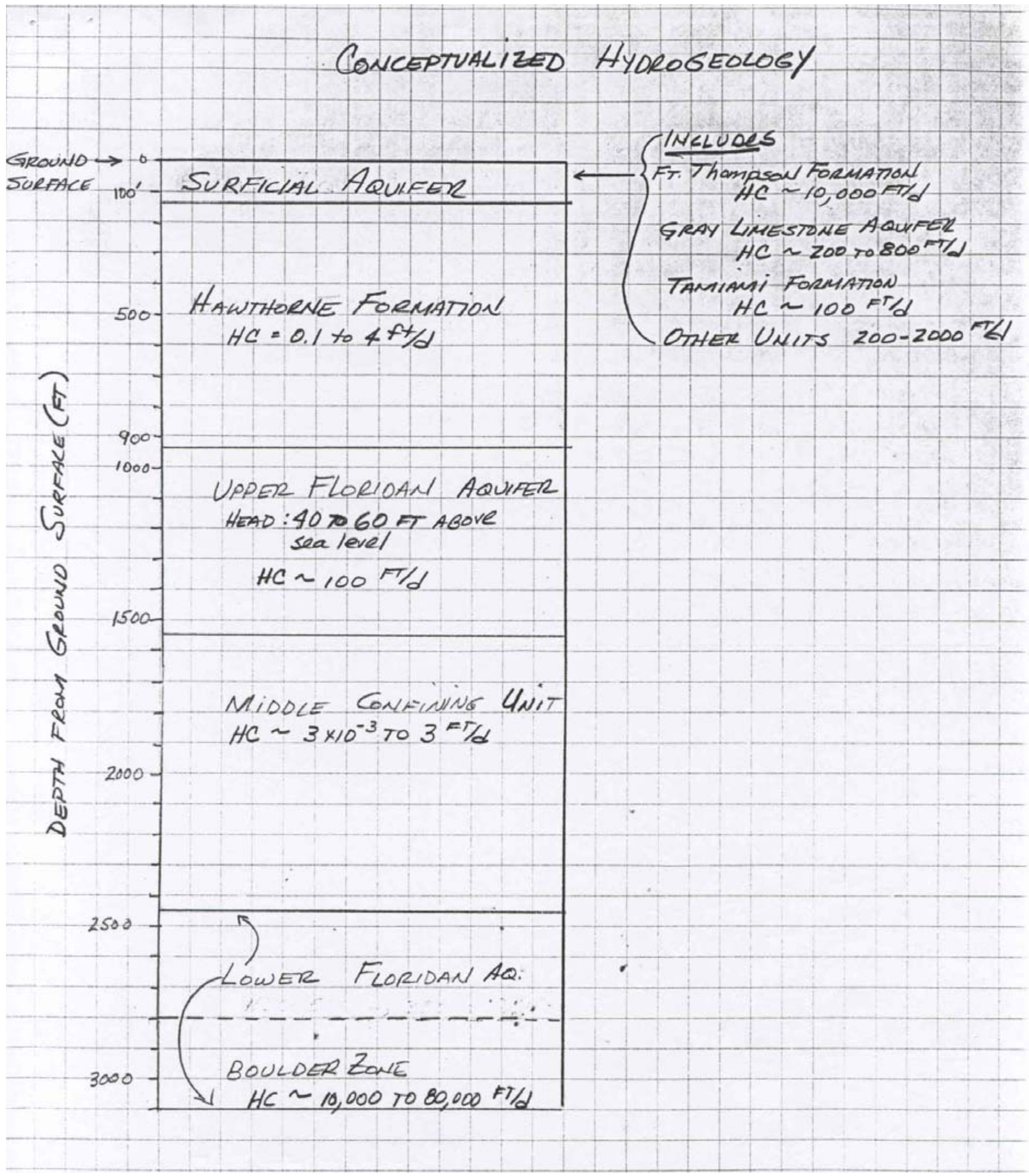


Figure H-1. Conceptual Hydrogeology Diagram of South East Florida

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	South Florida - Core Data													
2	Facility	Latitude	Longitude	Well #	Core	Core	Core	Recover	Lithology	Core	Core	Total	Vertical K	Horiz. K
3					#	Top	Bottom			Top	Bottom	Porosity	cm/sec	cm/sec
4	Fort Laud.	26-05-40	80-07-50	IW4	1	1360	1375	0.44	Limestone	1362.9	1363.5	0.38	0.00082	0.00068
5					2	1685	1705	0.225	Limestone	1687.4	1688.1	0.45	0.00097	0.001
6					3	1897	1920	0.53	Limestone	1916.25	1917	0.42	0.00004	0.000013
7					4	1927	1956	1	Limestone	1952.7	1953.4	0.43	0.0011	0.004
8					5	2165	2185	0.4	Limestone	2167	2167.5	0.26	0.00069	0.00096
9					6	2257	2277	0.15	Limestone	2257.25	2257.75	0.35	0.00066	0.00052
10					7	2286	2306	0.8	Limestone	2293	2293.4	0.36	0.000019	0.00028
11					8	2340	2363	1	Limestone	2345.7	2346.5	0.35	0.00026	0.00031
12					9	2390	2410	0.13	Limestone	NA	NA			
13	Sunrise	26-07-38	80-20-15	IW3	1	1585	1593	0.47	Limestone	1591.5		0.38	0.000058	
14					2	1654	1671	NA	Limestone	NA	NA		0.00026	
15					3	1685	1701	0.94	Limestone	1695.6		0.39	0.00026	
16					4	1755	1770	0.88	Limestone	1766.2	NA	0.39	0.0000066	
17					5	1800	1805	0.29	Limestone	1801.5	NA	0.4	0.000018	
18					6	1835	1840.3	0.31	Limestone	1836.3	NA	0.4	0.000043	
19					7	1865	1876.8	0.69	Limestone	1873.8	NA	0.41	0.0017	
20					8	1895	1906.4	0.67	Limestone	1904.1	NA	0.43	0.00056	
21					9	1940	1953.3	0.78	Limestone	1944.1	NA	0.41	0.0032	
22					10	1970	1983.2	0.78	Limestone	1981	NA	0.38	0.0021	
23					11	2000	2007.5	0.44	Limestone	2005.4	NA	0.36	0.00091	
24					12	2035	2048.1	0.77	Limestone	2046.6	NA	0.35	0.00000084	
25					13	2070	2074.5	0.26	Limestone	2071.8	NA	0.43	0.0014	
26					14	2130	2137.6	0.45	Limestone	2132	NA	0.38	0.00023	
27					15	2205	2217.7	0.75	Limestone	2212	NA	0.38	0.0015	
28					16	2240	2249	0.53	Limestone	2245.6	NA	0.39	0.0002	
29					17	2271	2288	1	DolLime	2275.9	NA	0.05	0.000000017	
30					18	2376	2382.2	0.36	DolLime	2379.5	NA	0.28	0.000084	
31					19	2436	2450.9	0.88	DolLime	2447.5	NA	0.07	4.9E-09	
32					20	2496	2509.1	0.77	DolLime	2502.2	NA	0.22	0.000026	
33					21	2633	2647.2	0.84	LImestone	2638.7	NA	0.21	0.0000036	
34					22	2935	2940	0.29	Limestone	2936.7	NA	0.33	0.000042	
35					23	2963	2977.3	0.84	Limestone	2970.8	NA	0.33	0.00002	
36	Sunrise	26-07-38	80-20-15	MW3	1	1911	1922	0.65						

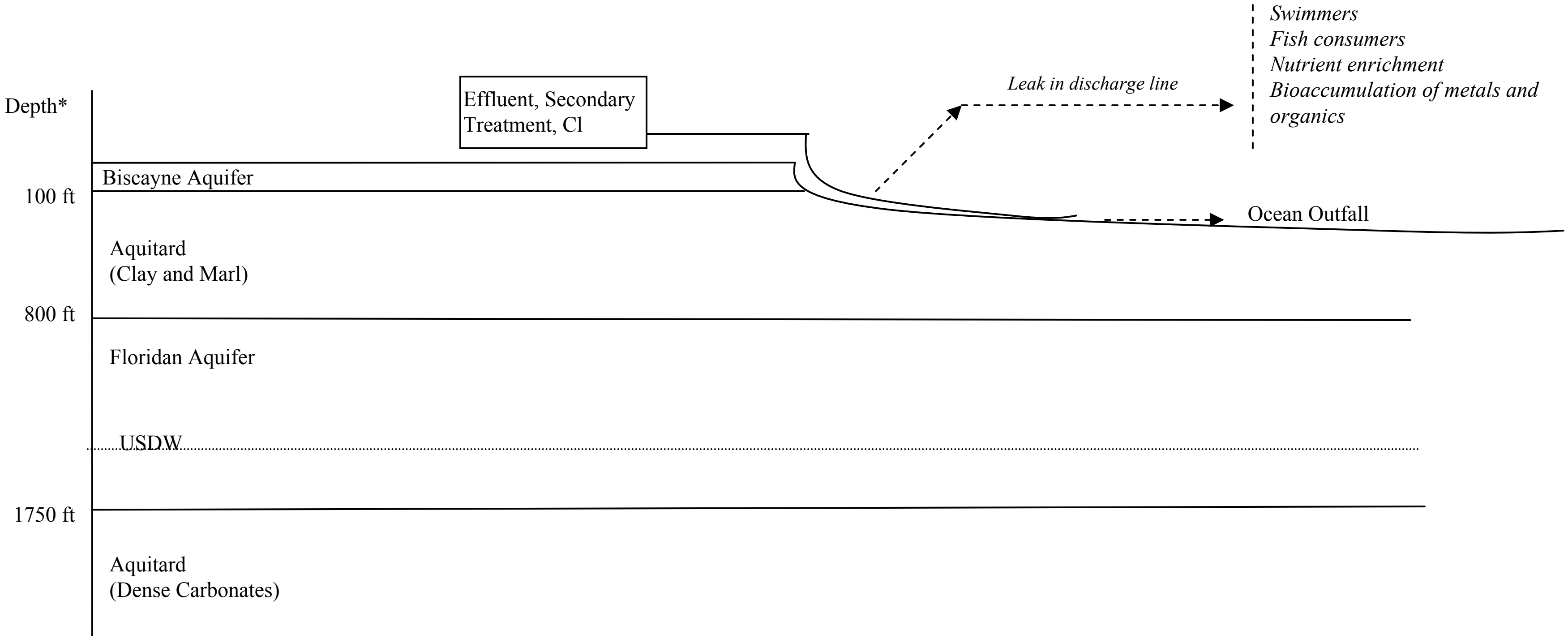
	A	B	C	D	E	F	G	H	I	J	K	L	M	N
37	Broward N	26-15-36	80-09-18	MW4	1	1650	1650.57			1650	1650.57	0.41	0.00025	0.000038
38					2	1650.12	1652.55			1652.12	1652.55	0.34	0.000056	0.000064
39					3	1653.08	1653.76			1653.08	1653.76	0.41	0.000048	0.00014
40					4	1654.66	1655.32			1654.66	1655.32	0.41	0.000082	0.000094
41					5	1658.75	1659.5			1658.75	1659.5	0.4	0.000048	0.00006
42					6	1711	1711.75			1711	1711.55	0.4	0.00035	0.00029
43					7	1712.5	1713			1712.5	1713	0.4	0.000092	0.000079
44					8	1715.9	1716.4			1715.9	1716.4	0.4	0.00035	0.0004
45					9	1717.5	1717.65			1717.5	1717.65	0.39	0.00022	0.00024
46					10	1718.15	1718.65			1718.15	1718.65	0.33	0.00034	0.000075
47					11	1887.9	1888.5			1887.9	1888.5	0.4	0.00034	0.00047
48					12	1889.25	1889.75			1889.25	1889.75	0.4	0.000053	0.00036
49					13	1890.25	1890.85			1890.25	1890.85	0.39	0.00014	0.00012
50					14	1891	1891.5			1891	1891.5	0.4	0.00002	0.000031
51					15	1894.75	1895.4			1891.75	1891.5	0.4	0.0000074	0.000031
52	Plantation	26-07-36	80-16-08	IW1	1	2156.22	2157.12		Limestone	2156.22	2157.12	0.44	0.00082	0.00038
53					2	2166	2166.82		Limestone	2166	2166.82	0.39	0.000082	0.000075
54					3	2307.41	2308.29		Limestone	2307.41	2308.29	0.27	0.000018	0.000089
55					4	2437.65	2438.48		Limestone	2437.65	2438.48	0.33	0.000017	0.000044
56					5	2532.64	2533.39		Dolomite	2532.64	2533.39	0.31	0.000045	0.000099
57					6	2645.75	2646.65		Dolomite	2645.75	2646.65	0.32	0.00028	0.00002
58					7	2812.81	2813.55		Dolomite	2812.81	2813.55	0.42	0.000046	0.000074
59					8	2852.38	2852.83		Limestone	2852.38	2852.83	0.42	0.000074	0.00021
60	Plantation	26-08-22	80-14-13	Reject #	1	2150	2170	0.73		2156.22	2157.12	0.41	0.00082	0.00038
61					2	2166	2166.82			2166	2166.82	0.38	0.000082	0.000075
62					3	2307.41	2308.29			2307.41	2308.29	0.27	0.000018	0.000089
63					4	2437.65	2438.48			2437.65	2438.48	0.3	0.000017	0.000044
64					5	2532.64	2533.39			2532.64	2533.39	0.26	0.000045	0.000099
65					6	2645.75	2646.65			2645.75	2646.65	0.31	0.00028	0.00002
66					7	2691.85	2692.15			2691.85	2692.15	0.32	0.000015	
67					8	2812.81	2813.55			2812.81	2813.55	0.42	0.000046	0.000074
68					9	2852.38	2852.83			2852.38	2852.83	0.39	0.00021	

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
69	Boynton Bch,	26-31-43	80-07-18		1	2130	2147	1	Limestone	2137.5	2138.5	0.26	0.0000079	0.000015
70					2	2200	2214	0.5	Dolomite	2204.1	2204.5	0.29	6.6E-09	2.5E-09
71					3	2351	2365	1	Limestone	2361.8	2362.7	0.29	0.000034	0.000045
72					4	2411	2426	0.8	Limestone	2416.3	2416.9	0.35	0.000026	0.000019
73					5	2441	2456	0.8	Limestone	2448.5	2449	0.32	0.000027	0.000012
74					6	2651	2662	0.23	Dolomite	2653	2653.5	0.09	0.000000046	0.00000012
75	South Dade, MDWASA			FA-10	1	1540	1550			1540	1540.5		0.005	0.0012
76					2	1570	1580			1570	1570.6		0.004	0.003
77						1610	1620			1610	1610.8		0.0025	0.0011
78	West Palm	26-44-21	80-07-32	Test We	1	2503	2510		Limestone	2503	2503.2	0.134	0.000005668	
79					2	2520			Limestone	2520	2520.2	0.403	0.000008809	
80					3	2750			Limestone	2750	2750.2	0.297	0.00000408	
81					4	2957			Limestone	2957	2957.2	0.288	0.00000118	
82	Fort Laud.	26-05-40	80-07-50	IW1	1	2180			Limestone	2180.55	2181.4	0.311	0.0000836	
83					2	2112			Limestone	2112	2112.95	0.304	0.000056	
84					3	2293			Limestone	2293.63	2294.58	0.347	0.000034	
85				IW2	1	2491			Limestone	2491.1	2595	0.324	0.0000083	
86					2	2470			Limestone	2470.55	2471.3	0.361	0.0000144	
87					3	2410			Limestone	2410	2410.8	0.328	0.0000207	
88				IW3	1	2149			Limestone	2149		0.345	0.000325	
89					2	2360			Limestone	2360	23610.8	0.345	0.0000131	
90					3	2369			Limestone	2369	2370	0.381	0.0000165	
91				IW5	3	2543			Limestone	2543.16	2543.92	0.278	0.0000077	
92					5	2757			Limestone	2757.58	2754.42	0.383	0.00012	
93					6	2802			Limestone	2802.84	2803.84	0.329	0.000155	
94					7	2854			Limestone	2854.33	2855.5	0.034	0.0000516	
95					8	2901			Limestone	2901.5	2902	0.314	0.000029	

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
96	Pemb. Pines	25-59-25	80-20-05	IW2	1	2020.6				2020.6		0.348	0.000000949	0.00000985
97					2	2028				2028.8		0.404	0.00000651	0.00000732
98					3	2361			Dolomite	2361.3		0.4	9.66E-10	9.66E-09
99					4	2364			Dolomite	2364		0.4	9.66E-10	9.66E-09
100					5	2567				2567.6		0.215	0.000119	0.000141
101					6	2571				2571.8		0.216	0.000228	0.000428
102					7	2804				2804.7		0.25	0.000108	0.0000698
103					8	2814				2814		0.329	0.00000545	0.00000835
104					9	2808				2808.8		0.28	0.0000152	0.0000121
105					10	2975				2975		0.3	0.0000633	0.0000143
106					11	2993				2993		0.352	0.000034	0.0000388
107	Broward N	26-15-36	80-09-18	IW1	1	2303				2303		0.31	0.00015	0.00072
108					2	2405				2405		0.38	0.000063	0.00046
109					3	2503				2503		0.33	0.000084	0.000051
110					4	2616				2616		0.33	0.00017	0.000017
111					5	2730				2730		0.38	0.00032	0.00025
112	Coral Springs	26-14-30	80-15-30	IW1	1	2015			Limestone	2015	2016.2	0.415	0.000058	
113					2	2111			Limestone	2111.4	2112	0.314	0.000079	
114					3	2357			Limestone	2357.9	2358.4	0.342	0.0000095	
115					4	2704			Dolomite	2704	2705.2	0.081	3.4E-09	
116					5	2892			Limestone	2892	2892.8	0.351	0.000065	

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
117	PB County Solid Waste			IW1	1	2594				2594		0.258	0.00000774	0.00000784
118					2	2588				2588		0.246	0.0000272	0.000204
119					3	2711				2711		0.215	0.000212	0.00000254
120					4	2713				2713		0.24	0.0000296	0.00000337
121					5	2496				2496		0.165	0.00000112	0.00000113
122					6	2355				2355		0.219	0.000000784	0.000000817
123					7	2345				2345		0.165	0.000000604	0.0000083
124					8	2350				2350		0.137	0.0000557	0.000152
125					9	2352				2352		0.083	0.000000459	0.000000214
126					10	2586				2586		0.225	0.00000266	0.00000124
127			IW2		1	2951				2951		0.223	0.00000164	0.000000328
128					2	2952				2952		0.226	0.000000779	0.00000685
129					3	2979				2979		0.243	0.00000146	0.000697
130					4	2970				2970		0.253	0.000022	0.00000106
131					5	2831				2831		0.228	0.0000029	0.000239
132					6	2799				2799		0.25	0.00000332	0.0000329
133					7	2888				2888		0.202	0.000000345	0.000101
134					8	2797				2797		0.231	0.00000809	0.000124
135					9	2922				2922		0.223	0.0000617	0.0000188
136					10	2832				2832		0.217	0.00000626	0.0000024

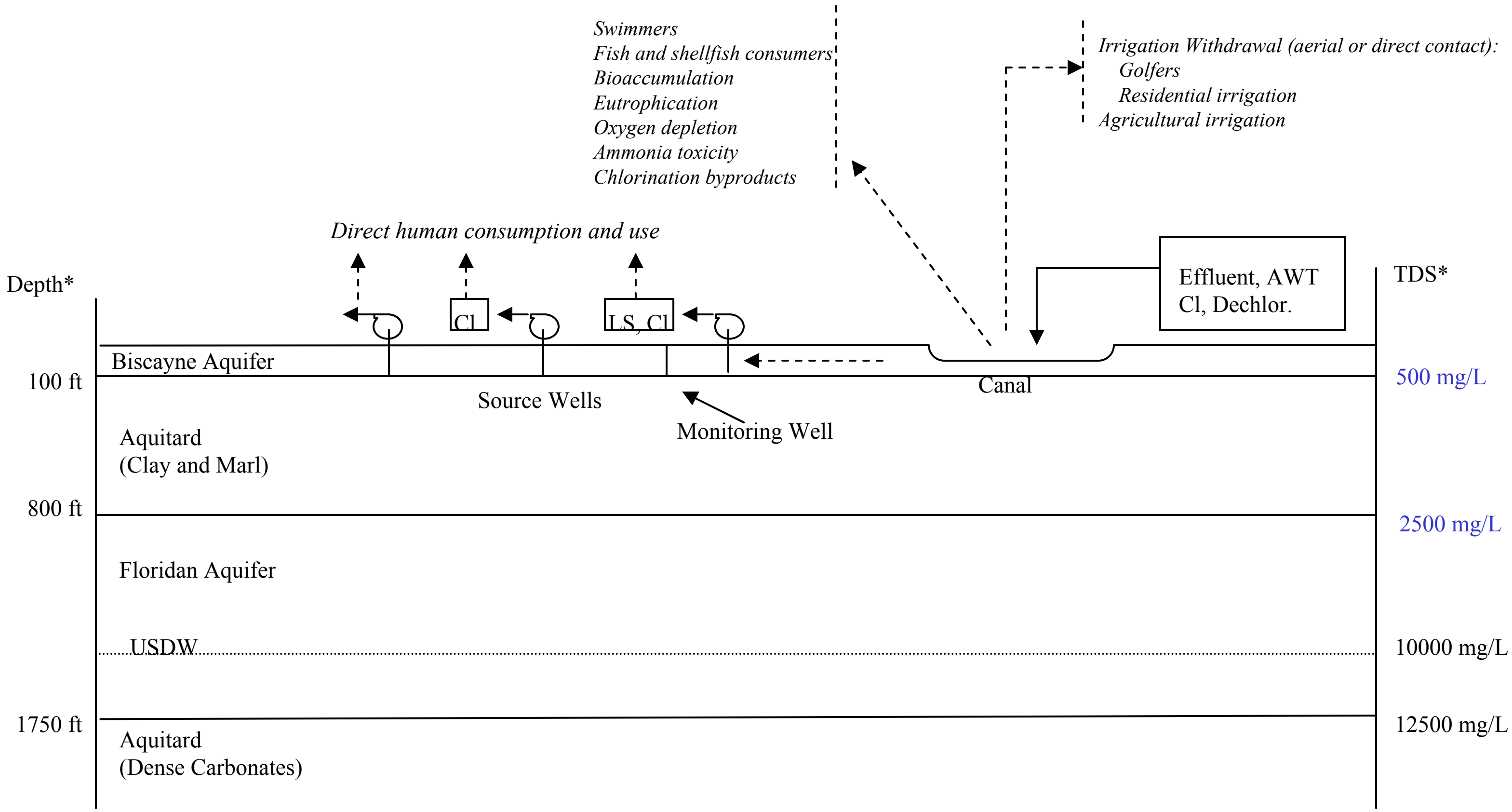
APPENDIX I. SCHEMATIC DIAGRAMS, TREE DIAGRAMS SHOWING POTENTIAL PATHWAYS OF EXPOSURE, AND MODIFIED DIAGRAMS SHOWING NODES HAVING REGULATORY STANDARDS



USDW : Underground Sources of Drinking Water
CL : Chlorination

* Depth and TDS vary widely by location

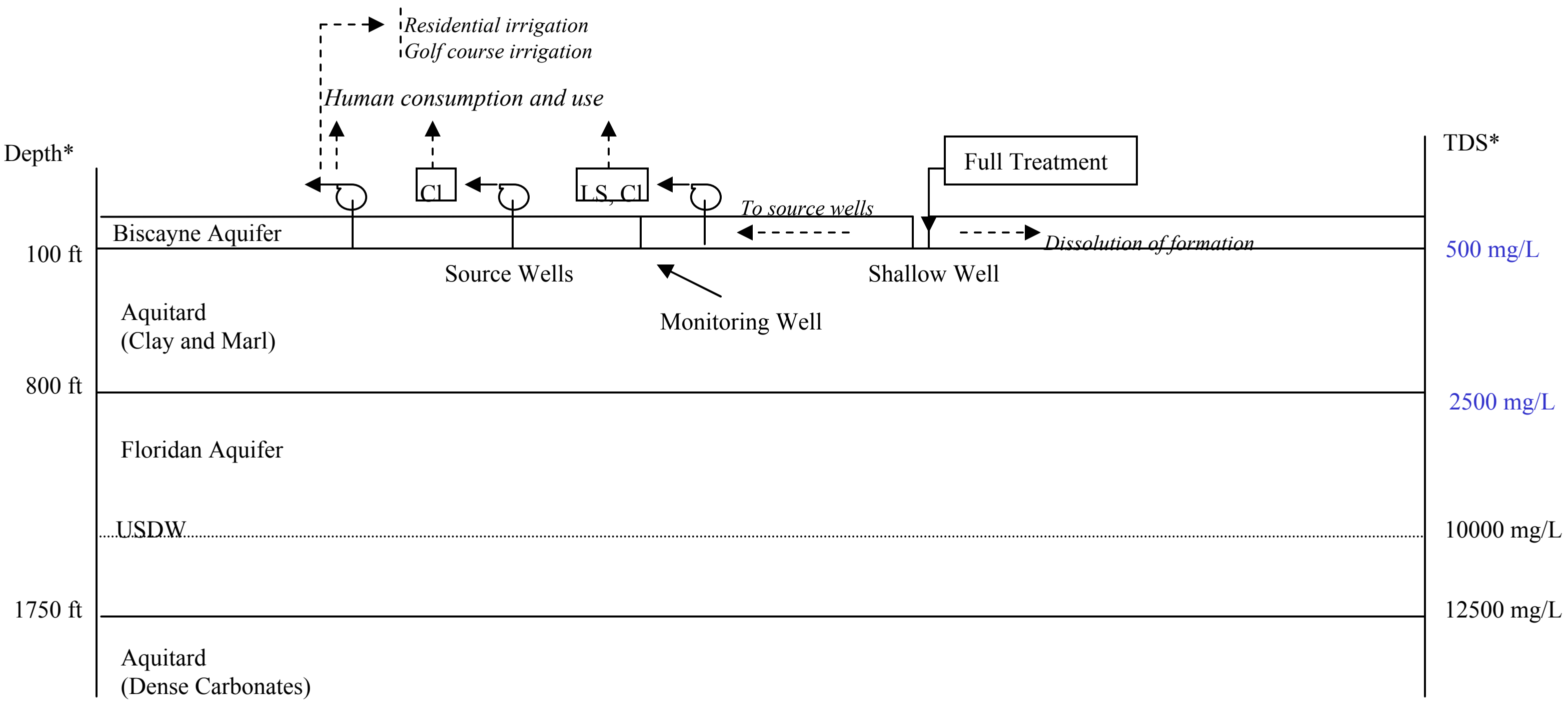
Figure I-1. Ocean Outfall Disposal Method



- •AWT : Advanced Water Treatment
- •F : Filtration
- •LS : Lime Softening
- •RO : Reverse Osmosis
- •Cl : Chlorination
- •TDS : Total Dissolved Solids
- •USDW : Underground Sources of Drinking Water

* Depth and TDS vary widely by location

Figure I-2a. Canal Discharge (Aquifer Recharge) Method



- F : Filtration
- LS : Lime Softening
- RO : Reverse Osmosis
- Cl : Chlorination
- TDS : Total Dissolved Solids
- USDW : Underground Sources of Drinking Water

* Depth and TDS vary widely by location

Figure I-2b. Shallow Well Discharge (Aquifer Recharge) Method

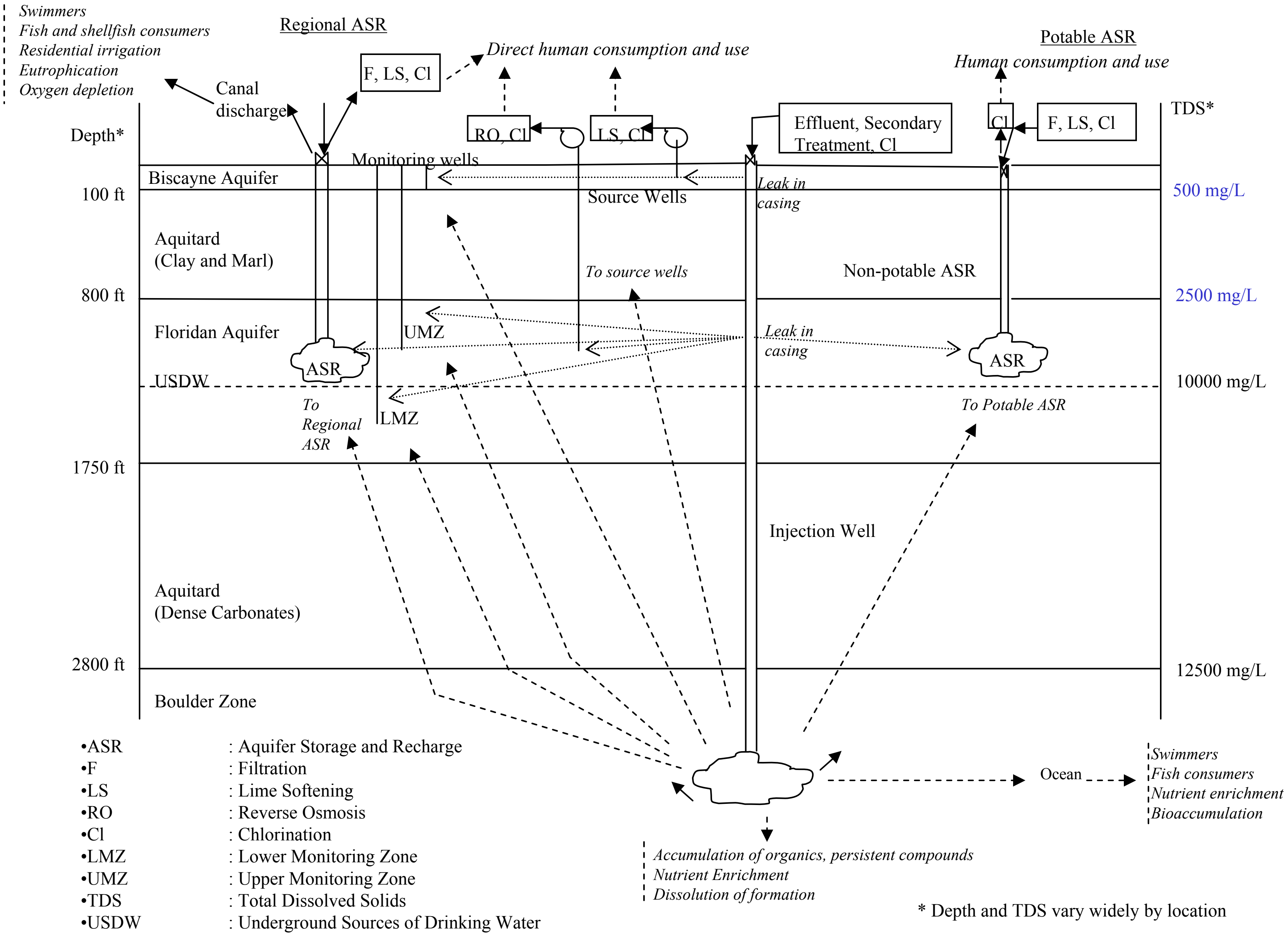


Figure I-3. Deep Well Injection Disposal Method

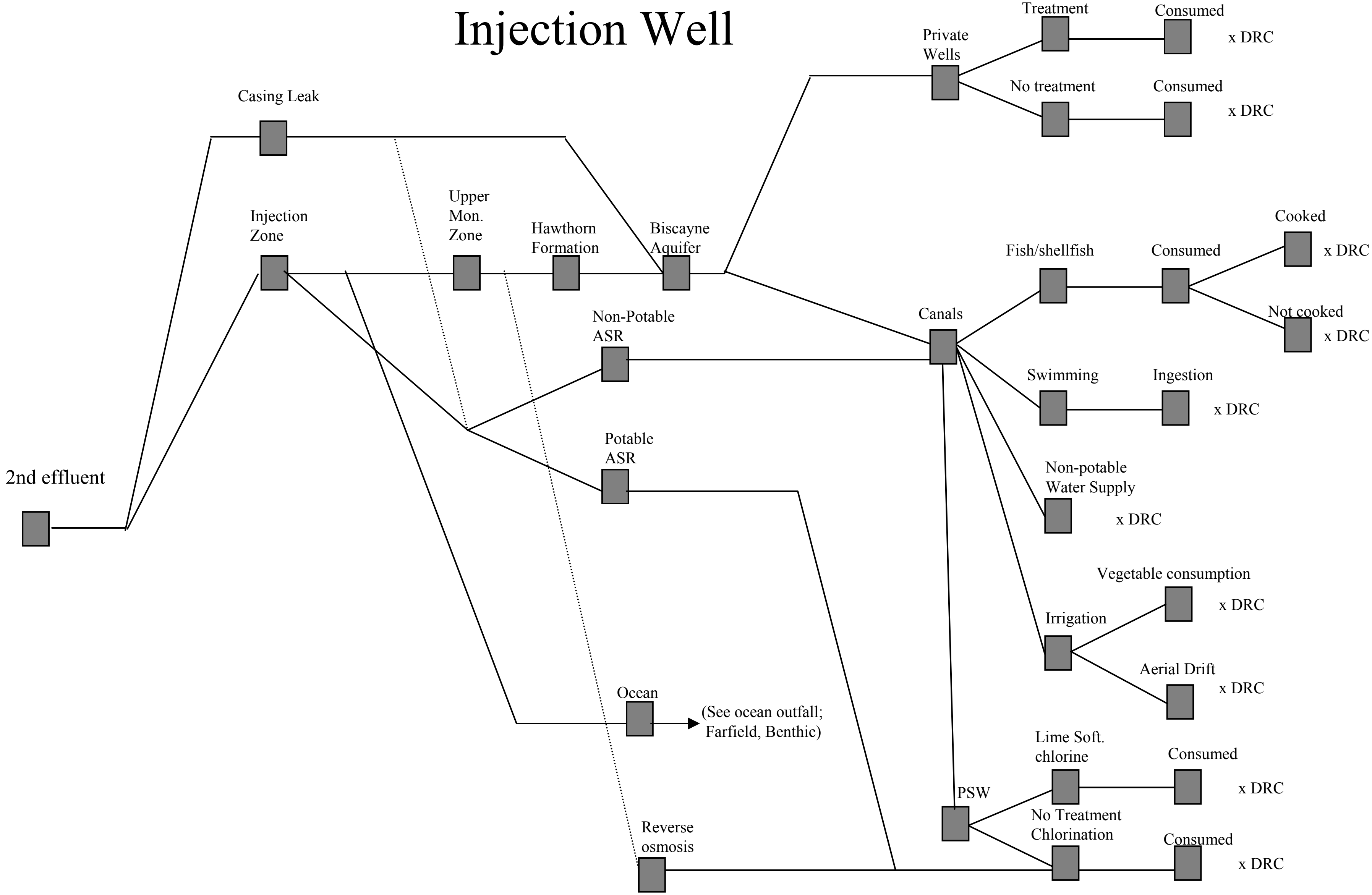


Figure I-4. Deep Well Injection Risk Trees

Ocean Outfall

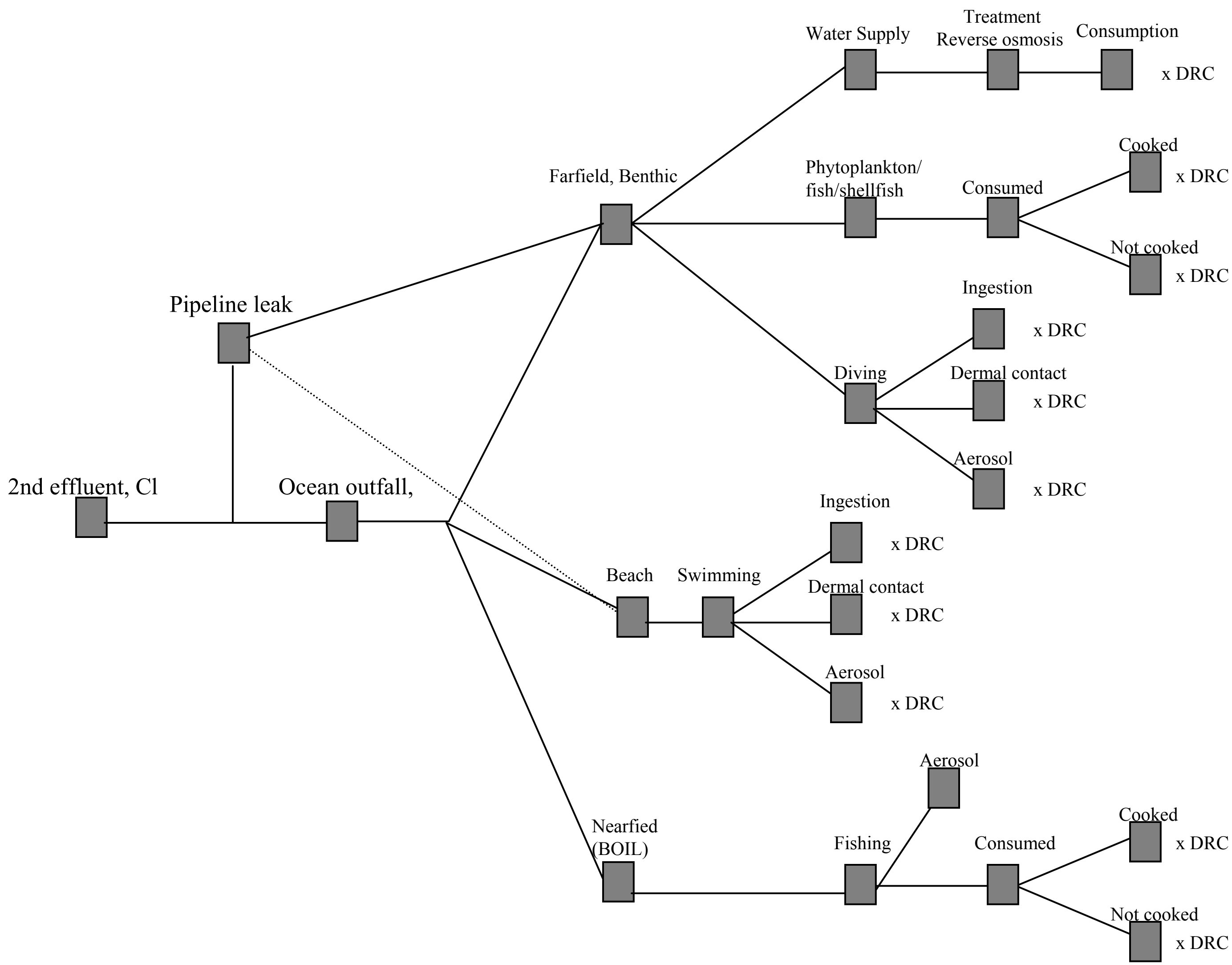


Figure I-5. Ocean Outfall Risk Trees

Surficial Aquifer Recharge

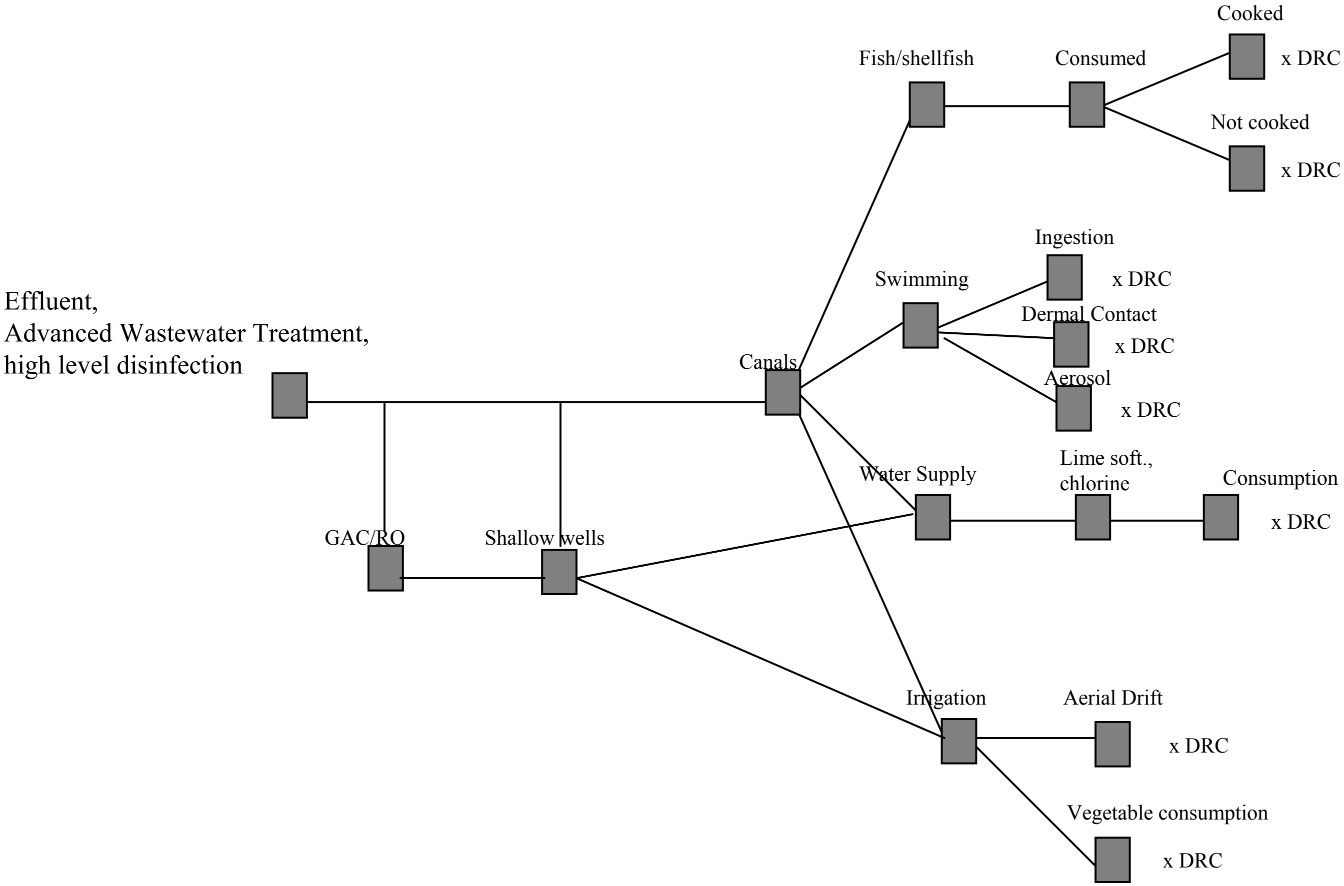


Figure I-6. Surficial Aquifer Recharge Risk Trees

Injection Well

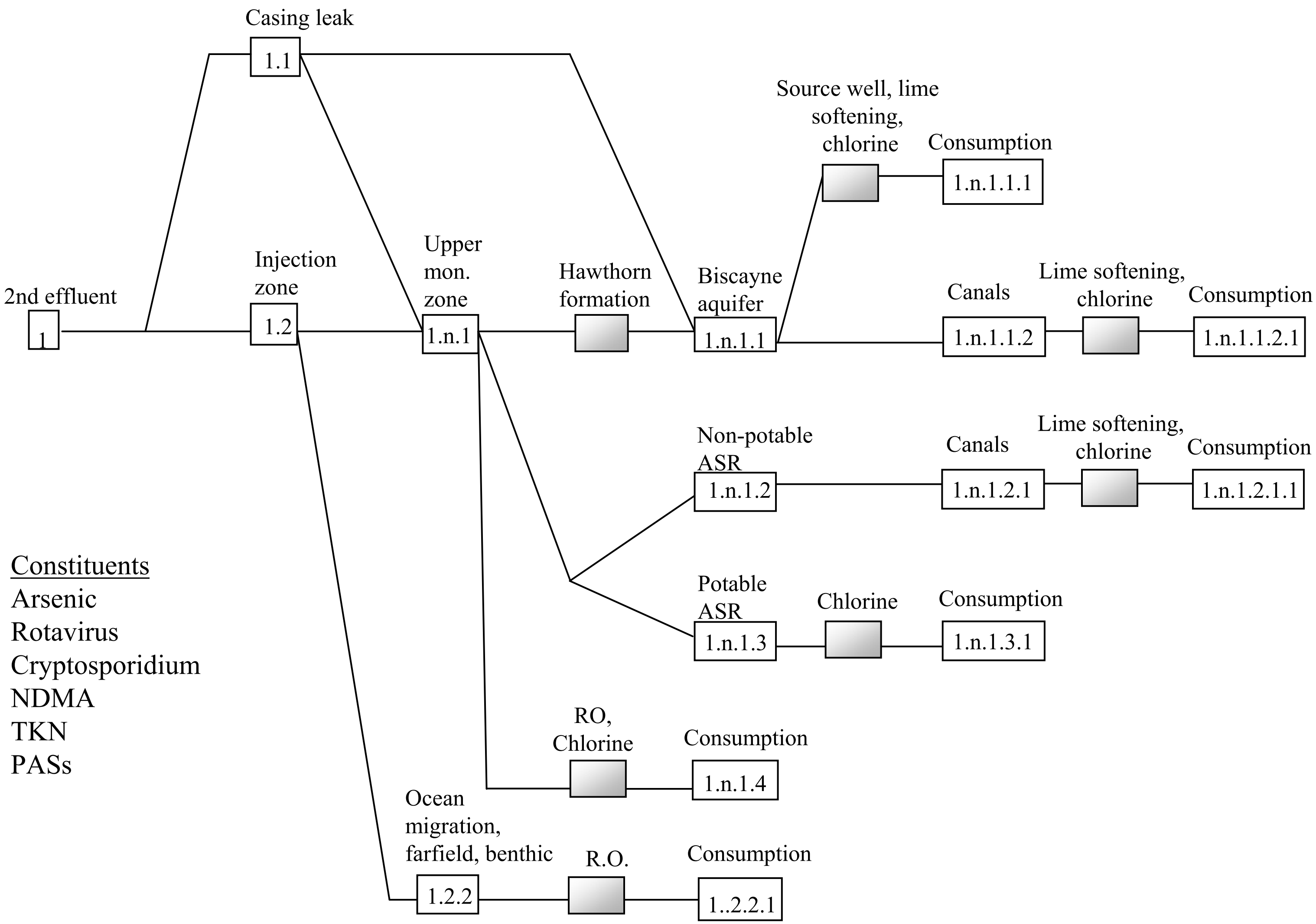
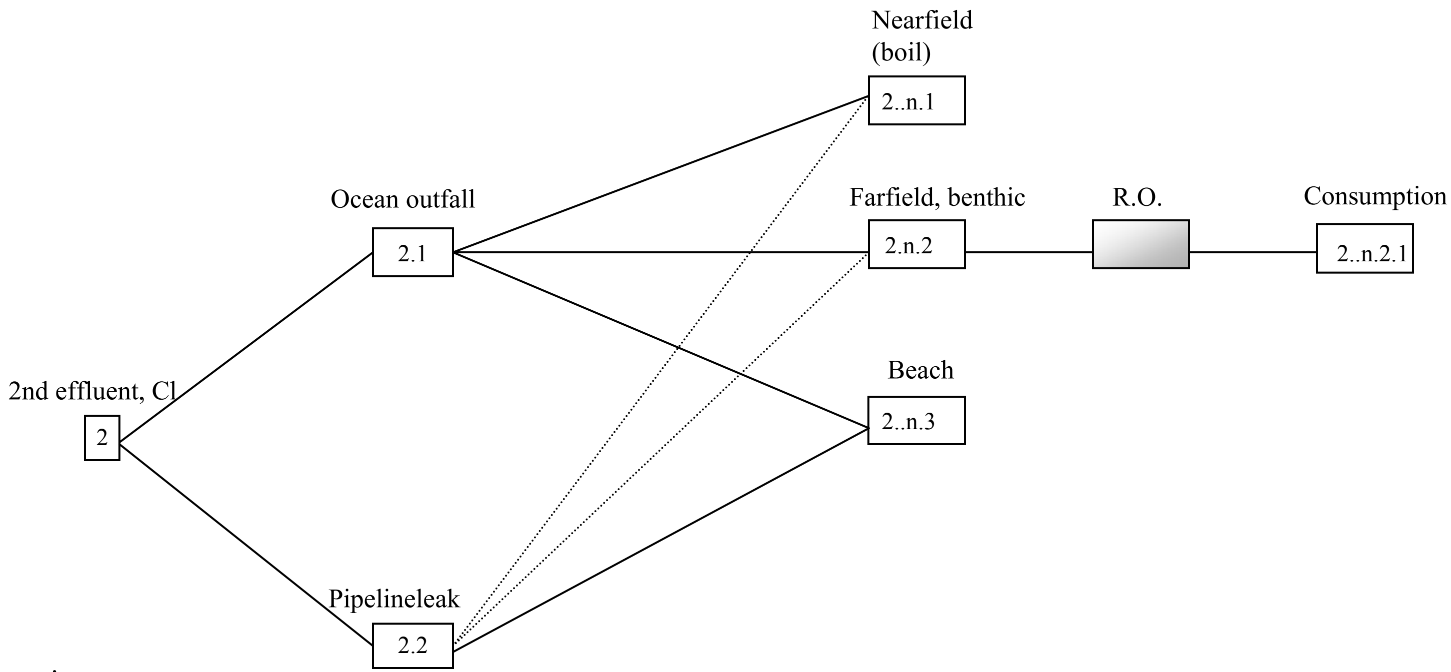


Figure I-7. Deep Well Injection Trees used in Delphi Survey

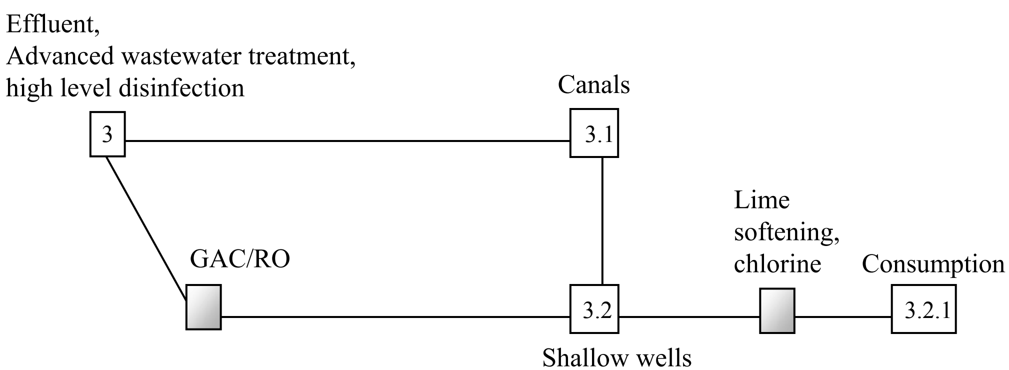
Ocean Outfall



<u>Constituents</u>
Cryptosporidium
Arsenic
NDMA
TKN
PASs

Figure I-8. Ocean Outfall Trees used in Delphi Survey

Surficial Aquifer Recharge



Constituents
Cryptosporidium
Arsenic
NDMA
TKN
PASs

Figure I-8. Surficial Aquifer Recharge Trees used in Delphi Survey

APPENDIX J. MODIFIED DELPHI QUESTIONNAIRE WITH FINAL INDIVIDUAL AND SUMMARIZED RESULTS

Table J-1 FIRST DELPHI SURVEY ITERATION TO ELICIT PROFESSIONAL JUDGMENT: INJECTION WELL EFFLUENT DISPOSAL

QUESTIONS
1. How many times in 30 years will the regulatory standard be exceeded at the receiving node? (One such exceedance event may last any number of days.)
2. What is your confidence in the numbers of exceedance events you entered? Please select low (L), medium (M) or high (H).
3. How many days will exceedence events last (min., mean, max.)?
4. What is your confidence in the event sizes you entered? Please select from low (L), medium (M) or high (H).

NOTES:
1. Please view supporting information by placing your cursor over the cells having a red corner.
2. If part of the text in the yellow comment does not show when you place your cursor over the cell, click on the cell, select "Edit Comment" from the Insert menu,
and drag the lower edge of the yellow comment window down to enlarge it. (This is a Microsoft problem we cannot solve)
3. If you want to change an assumption, please do so and explain in your reasons.
4. If within your area of expertise for the Team, please supply at least (a) a min & max & confidence, or (b) a mean & confidence.
5. Remember that the average number of events over 30 years can be a fraction.

Link From	Link To	Event		No. Exceedance Events Min.	Mean	Max.	nfidence L	M	H	Days per Event Min.	Mean	Max.	nfidence L	M	H	Reg. Stds. & Assumptions		Comments
1.1	1.n.1.1	Exceedence of MCL drinking water stds. in Biscayne Aquifer due to leakage from injection well casing														There are 4 casings in the Biscayne Aquifer, 3 in the Hawthorn (see Figure 2. in supporting information).		
Mmbr 1		For rotavirus	Assume mean of 10 virus/L (range 0.001-1000) in secondary effluent (conservative) based on total virus data of Tanaka, et al. (1998) and Rose and Carnahan (1992)	0	1E-06	0.000001			x	0.05	1	10			x	2E-7 org/L	Standard assumed based on 2L/d drinking water consumption, beta-Poisson rotavirus dose-response (Haas, et al. 1999), and 1E-4 infections/cap-year	
2		For rotavirus		1.00E-12	1E-09	1.00E-06			h	#######	0.01	1.00E-06			h	2E-7 org/L		
3		For rotavirus		0	0.1	1	x			1	2	5	x			2E-7 org/L		
4		For rotavirus		0.001	0.1	1	L			0	10	21	L			2E-7 org/L		
5		For rotavirus		1	6	10		x		5	14	20		x		2E-7 org/L		It is possible that on any given day high level of viruses will be injected based on excretion and casing leakage. To meet the standard 10-10 dilution would be needed. Viruses can survive in groundwater and would not be detected.
Avg					0.00057	0.00631					1.22866	0.46179						
Min				0	1E-09	0.000001				0	0.01	1E-06						
Max				1	6	10				5	14	21						
Wtd geo. Mean					2.9E-05			5			0.912			5				
log of mean					-4.5444													
Mmbr 1		For Arsenic	Mean Arsenic from data for secondary treatment plants is 4.5 ug/L. Two standard deviations = +/- 2.6 ug/L.For AWT, mean is 1.3 ug/L	0	1E-06	0.000001			x	0.05	5	10			x	50 ug/L	MCL regulatory drinking water std.	
2		For Arsenic		1.00E-12	1E-09	1.00E-06			h	#######	0.01	1.00E-06			h	50 ug/L		
3		For Arsenic		0	0.1	1	x			1	2	5	x			50 ug/L		
4				0.001	0.01	0.1	L			0	10	50	L			50 ug/L		
5		For Arsenic		0.001	0.3	0.1	x			2	7	30	x			50 ug/L		It soes not seem possible that arsenic will be increased in the sewage. With the dilution etc, I don't see how this will ever happen.
Avg					0.0002	0.001585					1.47577	0.59568						
Min				0	1E-09	0.000001				0	0.01	1E-06						
Max				0.001	0.3	1				2	10	50						
Wtd Avg.					4.1E-06			4			0.63794			4				
log of mean					-5.3914													
Mmbr 1		For TKN	Mean TKN from data for secondary treatment plants is 9.8 mg/L. Two standard deviations = +/- 12.1 mg/L.	0	1E-06				x	0.05	5	10			x	10 mg/L	Assumed MCL Drinking Water Standard, based on MCL = 10 mg/L nitrate as nitrogen	
2		For TKN		1.00E-12	1E-09	1.00E-06			h	#######	0.01	1.00E-06			h	10 mg/L		
3		For TKN		0	0.1	1	x			1	2	5	x			10 mg/L		
4				0.001	0.01	0.1	L			0	5	21	L			10 mg/L		

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5		For TKN		1	6	10	x			7	10	60	x			10 mg/L		If there is a leak the TKN could be continuously moving into the aquifer and it may take a while to find the leak and correct it.
Avg					0.00036	0.031623					1.37973	0.57527						
Min				0	1E-09	0.000001				0	0.01	1E-06						
Max				1	6	10				7	10	60						
Wtd Avg.					5.7E-06			4			0.6545			4				
log of mean					-5.2469													
Mmbr 1		For NDMA		0	1E-06				x	0.05	1	10			x	0.002 ug/L	State of California Action Level	
2		For NDMA		1.00E-12	1E-09	1.00E-06			h	#######	0.01	1.00E-06			h	0.002 ug/L		
3		For NDMA	Range 0.02 - 14 ug/L in secondary effluent in California. NDMA occurrence may be related to chlorination and to rocket fuel manufacture.	0	0.1	1	x			1	2	5	x			0.002 ug/L		
4				0.001	0.1	1	L			0	5	21	L			0.002 ug/L		
5		For NDMA		1	6	10	x			7	10	60				0.002 ug/L		Once a leak occurs, difficult to detect and may last for a while.
7				0	0.05	3		M		1	3	10		M				
Avg					0.0012	0.124573					1.20094	0.92588						
Min				0	1E-09	0.000001				0	0.01	1E-06						
Max				1	6	10				7	10	60						
Wtd Avg.					3.6E-05			4			0.52858			4				
log of mean					-4.4385													
1.n.1	1.n.1.1	Exceedence of MCL drinking water stds. in Biscayne Aquifer due to upward migration of effluent from upper Floridan through Hawthorn Formation														Assume effluent has penetrated upper Floridan, and must pass 400 ft of Hawthorn clays	Hydraulic conductivity of clay is <0.01 m/d (Chin, 2000)	
Mmbr 1		For rotavirus		0	1E-12	0.00001			x		0.01	10590			x	2E-7 org/L	Standard assumed based on 2L/d drinking water consumption, beta-Poisson rotavirus dose-response (Haas, et al. 1999), and 1E-4 infections/cap-year	
2		For rotavirus		1.00E-12	1E-09	1.00E-06			h		0.01				h	2E-7 org/L		
3		For rotavirus		0	#######	1.00E-12	x			0	1.00E-02		x			2E-7 org/L		
4				0.1	3	30	L			0	50	10950	L			2E-7 org/L		
5		For rotavirus	Assume mean of 10 virus/L (range 0.001-1000) in secondary effluent (conservative) based on total virus data of Tanaka, et al. (1998) and Rose and Carnahan (1992)	15	30	60		x		1	3	7		x		2E-7 org/L		Viruses will easily migrate 400 ft, and there may be small cracks that viruses can get through. It is likely to happen but less likely that the levels will last be very high or last very long.
Avg					6.2E-07	0.262074					0.17188	932.83						
Min				0	1E-12	1E-12				0	0.01	7						
Max				15	30	60				1	50	10950						
Wtd Avg.					7E-08			5			0.07333			5				
log of mean					-7.1569													
Mmbr 1		For Arsenic	Mean Arsenic from data for secondary treatment plants is 4.5 ug/L. Two standard deviations = +/- 2.6 ug/L.For AWT, mean is 1.3 ug/L	0	1E-06	0.00001			x	0.05	1	10			x	50 ug/L	MCL regulatory drinking water std.	
2		For Arsenic		1.00E-12	1E-09	1.00E-06			h		0.01				h	50 ug/L		
3		For Arsenic		0	#######	1.00E-12	x			0	1.00E-02		x			50 ug/L		
4				0.01	0.1	1	L			0	50	500	L			50 ug/L		
5		For Arsenic		0.001	0.01	0.1	x			2	7	30	x			50 ug/L		It seems very unlikly that the arsenic will move, but if it does I suppose it would be persistent.
Avg					1E-06	0.01					0.51146	53.1329						
Min				0	1E-12	1E-12				0	0.01	10						
Max				0.01	0.1	1				2	50	500						
Wtd Avg.					2.2E-07			4			0.2476			4				

log of mean					-6.6667													
Mmbr 1		For TKN	Mean TKN from data for	0	1E-06	0.00001			x	0.05	3	30			x	10 mg/L	Assumed MCL Drinking Water	
2		For TKN	secondary treatment plants is	1.00E-12	1E-09	1.00E-06			h		0.01				h	10 mg/L	Standard, based on MCL = 10	
3		For TKN	9.8 mg/L. Two standard	0	#######	1.00E-12	x			0	1.00E-02		x			10 mg/L	mg/L nitrate as nitrogen	
4			deviations = +/- 12.1 mg/L.	0.001	0.1	1	L			0	50	500	L			10 mg/L		
5		For TKN		10	15	30	x			7	10	30	x			10 mg/L		Could migrate up but dilution would keep it below the standard.
Avg					4.3E-06	0.066943					0.68426	76.6309						
Min				0	1E-12	1E-12				0	0.01	30						
Max				10	15	30				7	50	500						
Wtd Avg.					4.9E-07			4			0.3716			4				
log of mean					-6.3138													
Mmbr 1		For NDMA		0	1E-06	0.00001			x	0.05	30	365			x	0.002 ug/L	State of California Action Level	
2		For NDMA		1.00E-12	1E-09	1.00E-06			h		0.01				h	0.002 ug/L		
3		For NDMA		0	#######	1.00E-12	x			0	1.00E-02	1.00E-12	x			0.002 ug/L		
4			Range 0.02 - 14 ug/L in	0.1	1	10	L			0	50	500	L			0.002 ug/L		
5		For NDMA	secondary effluent in California. NDMA occurrence may be related to chlorination and to rocket fuel manufacture.		15		x				10					0.002 ug/L		Don't really know about the solubility and so my confidence here is less than min.
7					0.1			X		10	30	100		X				
Avg					3.4E-05	3.16E-06					1.88597	0.06536						
Min				0	1E-12	1E-12				0	0.01	1E-12						
Max				0.1	15	10				10	50	500						
Wtd Avg.					5.5E-06			4			1.54706			4				
log of mean					-5.2567													
1.n.1	1.n.1.2	Exceedence of surface water std. in non-potable water stored in ASR due to migration of effluent from upper Floridan.	Class III Surface Water Standards for predominantly fresh water (assumed applicable).													Assume migration of effluent over one mile horizontal distance through Floridan aquifer to ASR (conservative).	Upper Floridan Aquifer. Transmissivities: 10000-60000 ft2/dayApproximate depth: 900-1500 ft100 MGD of effluent (pH=7) discharged for 30 yrs. and equilibrating with native water (pH=8) would dissolve 90,000 lb. of limestone, or ~ 700 ft3. Dissolution might be manifested in larger effective diameters and smoothness within preferential flow paths.	
Mmbr 1		For rotavirus		0	0.001	10		x		0.05	30	60			x	2E-5 org/L	Standard assumed based on	
2		For rotavirus		1.00E-12	1E-09	1.00E-06		m			0.01			m		2E-5 org/L	consumption of 8 L/year,	
3		For rotavirus		0	#######	1.00E-12	x			0	1.00E-02	1.00E-12	x			2E-5 org/L	swimming, golfing, and	
4			Assume mean of 10 virus/L	0.1	1	10	L			0	25	1000	L			2E-5 org/L	consuming irrigated food	
5		For rotavirus	(range 0.001-1000) in secondary effluent (conservative) based on total virus data of Tanaka, et al. (1998) and Rose and Carnahan (1992)	1	3	10		x		1	3	5		x		2E-5 org/L	(Tanaka et al. 1998), beta-Poisson rotavirus dose response (Haas et al. 1999), and 1E-4 infections/cap-year (EPA Surface Water Treatment Rule)	Migration a mile could occur but there would be great dilution, once contamination occurred survival in surface waters is less than ground water.
Avg					2E-05	10					13.1037	66.9433						
Min				0	1E-12	1E-12				0	0.01	1E-12						
Max				1	3	10				1	30	1000						
Wtd Avg.					4.2E-05			3			6.075			4				
log of mean					-4.3807													
Mmbr 1		For Arsenic	Mean Arsenic from data for	0	0.03				x	0.05	30	180			x	50 ug/L	Class III Surface Water	
2		For Arsenic	secondary treatment plants is	1.00E-12	1E-09	1.00E-06		m			0.01			m		50 ug/L	Standards for predominantly	
3		For Arsenic	4.5 ug/L. Two standard	0	#######	1.00E-12	x			0	1.00E-02	1.00E-12	x			50 ug/L	fresh water (assumed	

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4			deviations = +/- 2.6 ug/L.For	0.001	0.01	1	L			0	25	400	L			50 ug/L	applicable).	
5		For Arsenic	AWT, mean is 1.3 ug/L		0.001		x				10					50 ug/L		Unliely that Arsenic could move and not be bound up and would be diluted.
Avg					3.1E-06	1					0.94409	268.328						
Min				0	1E-12	1E-12				0	0.01	1E-12						
Max				0.001	0.03	1				0.05	30	400						
Wtd Avg.					1.1E-05			3			6.75			3				
log of mean					-4.9461													
Mmbr 1		For TKN	Mean TKN from data for	0	0.03	10		x		0.05	30	365			x	3 mg/L	Class III Surface Water	
2		For TKN	secondary treatment plants is	1.00E-12	1E-09	1.00E-06		m			0.01			m		3 mg/L	Standards for predominantly	
3		For TKN	9.8 mg/L. Two standard	0	#######	1.00E-12	x			0	1.00E-02	1.00E-12	x			3 mg/L	fresh water (assumed	
4			deviations = +/- 12.1 mg/L.	0.001	0.1	1	L			0	25	400	L			3 mg/L	applicable).	
5		For TKN			1		x				3		x			3 mg/L		not likely, due to dilution
Avg					2E-05	3.162278					0.74206	382.099						
Min				0	1E-12	1E-12				0	0.01	1E-12						
Max				0.001	1	10				0.05	30	400						
Wtd Avg.					1.4E-05			2			2.025			3				
log of mean					-4.8637													
Mmbr 1		For NDMA	Range 0.02 - 14 ug/L in	0	0.001	10		x		0.05	30	365	x			2 ug/L	Assumed based on State of	
2		For NDMA	secondary effluent in California.	1.00E-12	1E-09	1.00E-06		m			0.01			m		2 ug/L	California Action Level and	
3		For NDMA	NDMA occurrence may be	0	#######	1.00E-12	x			0	1.00E-02	1.00E-12	x			2 ug/L	ratios of consumption of	
4			related to chlorination and to	0.01	0.1	1	L			0	50	500	L			2 ug/L	surface water and drinking	
5		For NDMA	rocket fuel manufacture.		0.3		x				5					2 ug/L	water	
7					0.05			X		100	500	3000		X				
Avg					3.4E-05	5.62E-05					2.68538	0.15297						
Min				0	1E-12	1E-12				0	0.01	1E-12						
Max				0.01	0.3	10				100	500	3000						
Wtd Avg.					3.5E-05			2			3.37125			1				
log of mean					-4.4583													
1.n.1	1.n.1.3	Exceedence of MCL drinking water std. in potable water stored in ASR, due to migration of effluent from upper Floridan to potable ASR														Assume migration of effluent over one mile distance through Floridan aquifer to ASR.	*Upper Floridan Aquifer. Transmissivities: 10000-60000 ft2/day *Approximate depth: 900-1500 ft *100 MGD of effluent (pH=7) discharged for 30 yrs. and equilibrating with native water (pH=8) would dissolve 90,000 lb. of limestone, or ~ 700 ft3. Dissolution might be manifested in larger effective diameters and smoothness within preferential flow paths.	
Mmbr 1		For rotavirus	Assume mean of 10 virus/L	0	0.0001	0.001		x		0.05	30	300		x		2E-7 org/L	Standard assumed based on	
2		For rotavirus	(range 0.001-1000) in	1.00E-06	#######	1.00E+00					0.01					2E-7 org/L	2L/d drinking water	
3		For rotavirus	secondary effluent	0	0.1	1	x			1	2	5	x			2E-7 org/L	consumption, beta-Poisson	
4			(conservative) based on total	0.1	1	10	L			0	25	1000	L			2E-7 org/L	rotavirus dose-response	
5		For rotavirus	virus data of Tanaka, et al. (1998) and Rose and Carnahan	1	3	10		x		3	5	7		x		2E-7 org/L	(Haas, et al. 1999), and 1E-4 infections/cap-year	Survival is greater in ground water.
Avg					0.03129	0.630957					2.37144	56.9243						
Min				0	0.0001	0.001				0	0.01	5						
Max				1	3	10				3	30	1000						
Wtd Avg.					0.02643			2			3.7908			2				
log of mean					-1.578													
Mmbr 1		For Arsenic	Mean Arsenic from data for	0	0.001				x	0.05	30	300			x	50 ug/L	MCL regulatory drinking water	
2		For Arsenic	secondary treatment plants is	1.00E-06	#######	1.00E+00					0.01					50 ug/L	std.	

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3		For Arsenic	4.5 ug/L. Two standard	0	0.1	1	x			1	2	5	x			50 ug/L		
4			deviations = +/- 2.6 ug/L.For	0.001	0.01	1	L			0	25	400	L			50 ug/L		
5		For Arsenic	AWT, mean is 1.3 ug/L		0.001		x				10		x			50 ug/L		
Avg					0.00398	1					2.72407	84.3433						
Min				0	0.001	1				0	0.01	5						
Max				0.001	0.1	1				1	30	400						
Wtd Avg.					0.00268			1			5.406			1				
Mmbr 1		For TKN	Mean TKN from data for	0	0.001	10		x		0.05	30	300		x		10 mg/L	Assumed MCL Drinking Water	
2		For TKN	secondary treatment plants is	1.00E-06	#######	1.00E+00		m			0.01					10 mg/L	Standard, based on MCL = 10	
3		For TKN	9.8 mg/L. Two standard	0	0.1	1	x			1	2	5	x			10 mg/L	mg/L nitrate as nitrogen	
4			deviations = +/- 12.1 mg/L.	0.001	0.1	1	L			0	25	400	L			10 mg/L		
5		For TKN			1		x				3					10 mg/L		
Avg					0.02512	1.778279					2.14113	84.3433						
Min				0	0.001	1				0	0.01	5						
Max				0.001	1	10				1	30	400						
Wtd Avg.					0.01			2			2.8			2				
Mmbr 1		For NDMA	Range 0.02 - 14 ug/L in	0	0.001	10		x		0.05	180	365		x		0.002 ug/L	State of California Action Level	
2		For NDMA	secondary effluent in California.	1.00E-06	#######	1.00E+00					0.01					0.002 ug/L		
3		For NDMA	NDMA occurrence may be	0	0.1	1	x			1	2	5	x			0.002 ug/L		
4			related to chlorination and to	0.01	0.1	1	L			0	50	500	L			0.002 ug/L		
5		For NDMA	rocket fuel manufacture.		1		x				10					0.002 ug/L		
7					0.05			X		100	500	3000		X				
Avg					0.02817	1.778279					9.82593	228.738						
Min				0	0.001	1				0	0.01	5						
Max				0.01	1	10				100	500	3000						
Wtd Avg.					0.01994			1			23.0973			1				
log of mean					-1.7003													
1.n.1	1.n.1.4	Exceedence of MCL drinking water std. in potable water produced by RO treatment of Floridan water (as in Hollywood)														Reverse osmosis membranes have pore sizes capable of removing ions (AWWA, 1999).		
Mmbr 1		For rotavirus		0	1E-06	0.0001			x	0.05	0.01				x	2E-7 org/L	Standard assumed based on	
2		For rotavirus		1.00E-12	1E-09	1.00E-06			H		0.01				H	2E-7 org/L	2L/d drinking water	
3		For rotavirus		0	#######	1.00E-12	x			0	1	2	x			2E-7 org/L	consumption, beta-Poisson	
4				0.001	0.001	0.1	L			0	0.1	2	L			2E-7 org/L	rotavirus dose-response	
5		For rotavirus	Assume mean of 10 virus/L (range 0.001-1000) in secondary effluent (conservative) based on total virus data of Tanaka, et al. (1998) and Rose and Carnahan (1992)	0.3	1	3		x			1			x		2E-7 org/L	(Haas, et al. 1999), and 1E-4 infections/cap-year	Membranes are capable of removal of 3 to 5 logs. If the contamination occurs and removal is on the low end of the average, this could occur but not likely for more than 1 day
Avg					1E-06	0.031072					0.1	2						
Min				0	1E-12	1E-12				0	0.01	2						
Max				0.3	1	3				0.05	1	2						
Wtd Avg.					1E-06			5			0.0398			5				
log of mean					-6													
Mmbr 1		For Arsenic	Mean Arsenic from data for	0	1E-06	0.0001			x	0.05	1	10			x	50 ug/L	MCL regulatory drinking water	
2		For Arsenic	secondary treatment plants is	1.00E-12	1E-09	1.00E-06			H		0.01				H	50 ug/L	std.	
3		For Arsenic	4.5 ug/L. Two standard	0	#######	1.00E-12	x			0	1	2	x			50 ug/L		
4			deviations = +/- 2.6 ug/L.For	0.001	0.001	0.1	L			0	0.1	2	L			50 ug/L		
5		For Arsenic	AWT, mean is 1.3 ug/L		0.001		x				1		x			50 ug/L		
Avg					2.5E-07	0.003162					0.25119	3.41995						
Min				0	1E-12	1E-12				0	0.01	2						
Max				0.001	0.001	0.1				0.05	1	10						
Wtd Avg.					1E-07			4			0.1668			4				
log of mean					-7													

Mmbr 1		For TKN	Mean TKN from data for secondary treatment plants is 9.8 mg/L. Two standard deviations = +/- 12.1 mg/L.	0	1E-06	0.0001			x	0.05	1	10			x	10 mg/L	Assumed MCL Drinking Water Standard, based on MCL = 10 mg/L nitrate as nitrogen	
2		For TKN		1.00E-12	1E-09	1.00E-06			H		0.01				H	10 mg/L		
3		For TKN		0	#######	1.00E-12	x			0	1	2	x			10 mg/L		
4				0.001	0.01	0.1	L			0	0.1	2	L			10 mg/L		
5		For TKN			0.001		x				1		x			10 mg/L		
Avg					4E-07	0.003162					0.25119	3.41995						
Min				0	1E-12	1E-12				0	0.01	2						
Max				0.001	0.01	0.1				0.05	1	10						
Wtd Avg.					1.3E-07			4			0.166			4				
log of mean					-6.8894													
Mmbr 1		For NDMA	Range 0.02 - 14 ug/L in secondary effluent in California. NDMA occurrence may be related to chlorination and to rocket fuel manufacture.	0	1E-06	0.0001			x		0.001	0.05			x	0.002 ug/L	State of California Action Level	
2		For NDMA		1.00E-12	1E-09	1.00E-06			H		0.01				H	0.002 ug/L		
3		For NDMA		0	#######	1.00E-12	x			0	1	2	x			0.002 ug/L		
4				0.001	0.01	0.1	L			0	0.1	2	L			0.002 ug/L		
5		For NDMA			0.001		x				1		x			0.002 ug/L		
7					1.5			X		0	200	1000		X				
Avg					5E-06	1.78E-06					0.24183	3.7606						
Min				0	1E-12	1E-12				0	0.001	0.05						
Max				0.001	1.5	0.1				0	200	1000						
Wtd Avg.					2.5E-06			4			0.09201			4				
log of mean					-5.6043													
1.n.1.1	1.n.1.1.1	Exceedence of MCL drinking water stds. in treated drinking water deriving from source wells in Biscayne Aquifer														Assume lime softening and chlorination.	*Required 4 logs removal of viruses (Surface Water Treatment Rule). *Required 2 logs removal cryptosporidium (Interim Enhanced Surface Water Treatment Rule). *Typical 1 log removal of arsenic, lime softening (AWWA 1999) *Assume no removal of TKN *Assume no removal or formation of NDMA (Tchobanoglous 2000)	
Mmbr 1		For rotavirus		0	1E-08	0.0001			x	0.05	1	10			x	2E-7 org/L	Standard assumed based on 2L/d drinking water consumption, beta-Poisson rotavirus dose-response (Haas, et al. 1999), and 1E-4 infections/cap-year	
2		For rotavirus		1.00E-12	1E-09	1.00E-06			h		0.01				h	2E-7 org/L		
3		For rotavirus		0	#######	0.0001	x			0	1	2	x			2E-7 org/L		
4				0.01	0.1	1	L			0	5	10	L			2E-7 org/L		
5		For rotavirus	Assume mean of 10 virus/L (range 0.001-1000) in secondary effluent (conservative) based on total virus data of Tanaka, et al. (1998) and Rose and Carnahan (1992)	1	3	10	x			3	5	7	x			2E-7 org/L		National surveys show that 10% of the ground water has viable viruses, I would think there will be natural contamination coming from leaking sewers and septic tanks.
Avg					1.2E-06	0.002512					0.75786	6.11691						
Min				0	1E-12	0.000001				0	0.01	2						
Max				1	3	10				3	5	10						
Wtd Avg.					1.9E-07			4			0.308			4				
log of mean					-6.7248													
Mmbr 1		For Arsenic	Mean Arsenic from data for secondary treatment plants is 4.5 ug/L. Two standard deviations = +/- 2.6 ug/L.For AWT, mean is 1.3 ug/L		1E-07				x		365				x	50 ug/L	MCL regulatory drinking water std.	
2		For Arsenic		1.00E-12	1E-09	1.00E-06			h		0.01				h	50 ug/L		
3		For Arsenic		0	#######	0.0001	x			0	1	2	x			50 ug/L		
4				0.001	0.1	1	L			0	5	10	L			50 ug/L		
5		For Arsenic			0.00001						1					50 ug/L		
Avg					1.6E-07	0.000464					1.78753	4.47214						
Min				0	1E-12	0.000001				0	0.01	2						
Max				0.001	0.1	1				0	365	10						

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Wtd Avg.					4.6E-08			4			1.84			4				
log of mean					-7.3335													
Mmbr 1		For TKN	Mean TKN from data for secondary treatment plants is 9.8 mg/L. Two standard deviations = +/- 12.1 mg/L.		1E-07				x		365				x	10 mg/L	Assumed MCL Drinking Water Standard, based on MCL = 10 mg/L nitrate as nitrogen	
2		For TKN		1.00E-12	1E-09	1.00E-06			h		0.01				h	10 mg/L		
3		For TKN		0	#######	0.0001	x			0	1	2	x			10 mg/L		
4				0.001	0.1	1	L			0	5	10	L			10 mg/L		
5		For TKN			0.0001											10 mg/L		
Avg				0.001	2.5E-07	1					2.06688	4.47214						
Min				0	1E-12	0.000001				0	0.01	2						
Max				0.001	0.1	1				0	365	10						
Wtd Avg.					4.6E-08			4			1.987			5				
log of mean					-7.3335													
Mmbr 1		For NDMA	Range 0.02 - 14 ug/L in secondary effluent in California. NDMA occurrence may be related to chlorination and to rocket fuel manufacture.		0.0001				x		180				x	0.002 ug/L	State of California Action Level	
2		For NDMA		1.00E-12	1E-09	1.00E-06			h		0.01				h	0.002 ug/L		
3		For NDMA		0	#######	0.0001	x			0	1	2	x			0.002 ug/L		
4				0.1	1	10	L			0	25	200	L			0.002 ug/L		
5		For NDMA			0.0001		x				1		x			0.002 ug/L		
7				0	0.1	1					100							
Avg					0.00001	0.005623					4.06321	20						
Min				0	1E-12	0.000001				0	0.01	2						
Max				0.1	1	10				0	180	200						
Wtd Avg.					2.5E-06			4			2.60841			4				
log of mean					-5.6													
1.n.1.1	1.n.1.1.2	Exceedence of surface water stds. in canals due to contamination in the Biscayne aquifer by casing leak or migration through Hawthorn	Class III Surface Water Standards for predominantly fresh water													Drainage of Biscayne aquifer water into canals. Assume this drainage happens continually.		
Mmbr 1		For rotavirus			1E-08				x	0.05	1	2			x	2E-5 org/L	Standard assumed based on consumption of 8 L/year, swimming, golfing, and consuming irrigated food (Tanaka et al. 1998), beta-Poisson rotavirus dose response (Haas et al. 1999), and 1E-4 infections/cap-year (EPA Surface Water Treatment Rule)	
2		For rotavirus		1.00E-12	1E-09	0.000001	m							m		2E-5 org/L		
3		For rotavirus		0	#######	0.00001	x			0	1	2	x			2E-5 org/L		
4			Assume mean of 10 virus/L (range 0.001-1000) in secondary effluent (conservative) based on total virus data of Tanaka, et al. (1998) and Rose and Carnahan (1992)	0.01	0.1	1	L			0	25	500	L			2E-5 org/L		
5		For rotavirus		0.1	0.3	1		x		0.5	1	3		x		2E-5 org/L		dilution and die-off greater in surface waters warmer temperatures would also lead to die-off
Avg					0.17321	0.001778					2.23607	8.80112						
Min				0	1E-12	0.000001				0	1	2						
Max				0.1	0.3	1				0.5	25	500						
Wtd Avg.					1.4E-06			3			1.58			4				
log of mean					-5.8665													
Mmbr 1		For Arsenic	Mean Arsenic from data for secondary treatment plants is 4.5 ug/L. Two standard deviations = +/- 2.6 ug/L.For AWT, mean is 1.3 ug/L	0	1E-08	0.0001			x	0.05	30	365			x	50 ug/L	Class III Surface Water Standards for predominantly fresh water (assumed applicable).	
2		For Arsenic		1.00E-12	1E-09	0.000001	m				0.01			m		50 ug/L		
3		For Arsenic		0	#######	0.00001	x			0	1	2	x			50 ug/L		
4				0.001	0.01	0.1	L			0	25	500	L			50 ug/L		
5		For Arsenic			0.001		x				1		x			50 ug/L		don't suppose this would occur, if it did there could be much more persistance, but likely accumulate in the sediments.
Avg					1.6E-07	0.0001					1.49628	71.4657						
Min				0	1E-12	0.000001				0	0.01	2						
Max				0.001	0.01	0.1				0.05	30	500						

Wtd Avg.					7.2E-08			2			1.69			3				
log of mean					-7.1429													
Mmbr 1		For TKN	Mean TKN from data for secondary treatment plants is 9.8 mg/L. Two standard deviations = +/- 12.1 mg/L.	0	1E-08	0.0001			x	0.05	30	365			x	3 mg/L	Class III Surface Water Standards for predominantly fresh water (assumed applicable).	
2		For TKN		1.00E-12	1E-09	0.000001	m				0.01			m		3 mg/L		
3		For TKN		0	#######	0.00001	x			0	1	2	x			3 mg/L		
4				0.001	0.01	0.1	L			0	25	500	L			3 mg/L		
5		For TKN			0.0001		x				1					3 mg/L		dilution likely to keep it low.
Avg					1E-07	0.0001					1.49628	71.4657						
Min				0	1E-12	0.000001				0	0.01	2						
Max				0.001	0.01	0.1				0.05	30	500						
Wtd Avg.					5.2E-08			2			1.69			3				
log of mean					-7.2858													
Mmbr 1		For NDMA		0	0.00001	0.0001			x	0.05	30	365			x	2 ug/L	Assumed based on State of California Action Level and ratios of consumption of surface water and drinking water	
2		For NDMA		1.00E-12	1E-09	0.000001	m				0.01			m		2 ug/L		
3		For NDMA		0	#######	0.00001	x			0	1	2	x			2 ug/L		
4			Range 0.02 - 14 ug/L in secondary effluent in California. NDMA occurrence may be related to chlorination and to rocket fuel manufacture.	0.01	0.1	1	L			0	25	500	L			2 ug/L		
5		For NDMA			0.0001		x				0.5					2 ug/L		don't feel much confidence about the persistence of this compound in surface waters
7				0	0.05	1					100							
Avg					4.1E-06	0.001					2.68538	71.4657						
Min				0	1E-12	0.000001				0	0.01	2						
Max				0.01	0.1	1				0.05	100	500						
Wtd Avg.					5.2E-06			2			4.90947			3				
log of mean					-5.2876													
1.n.1.2	1.n.1.2.1	Exceedence of surface water stds. in canals due to discharge of non-potable ASR water to canals	Class III Surface Water Standards for predominantly fresh water													Non-potable ASR water is discharged directly to canals. Assume no dilution. When ASR monitoring system detects elevated salinity, withdrawals from ASR wells should stop.		
Mmbr 1		For rotavirus	Assume mean of 10 virus/L (range 0.001-1000) in secondary effluent (conservative) based on total virus data of Tanaka, et al. (1998) and Rose and Carnahan (1992)	0	0.0001	10		x		0.05	30	60			x	2E-5 org/L	Standard assumed based on consumption of 8 L/year, swimming, golfing, and consuming irrigated food (Tanaka et al. 1998), beta-Poisson rotavirus dose response (Haas et al. 1999), and 1E-4 infections/cap-year	
2		For rotavirus		0.1	1	10		m		10	24.4949	60		m		2E-5 org/L		
3		For rotavirus		0	0.1	1	x			0	1	2	x			2E-5 org/L		
4				0.01	0.1	1	L			0	25	500	L			2E-5 org/L		
5		For rotavirus		1	10	30		X		1	3	5		X		2E-5 org/L		Much more likely that viruses will be detected, however survival will be lower.
Avg					0.1	4.959344					8.8767	28.2523						
Min				0	0.0001	1				0	1	2						
Max				1	10	30				10	30	500						
Wtd Avg.					0.1			3			11.55			4				
log of mean					-1													
Mmbr 1		For Arsenic	Mean Arsenic from data for secondary treatment plants is 4.5 ug/L. Two standard deviations = +/- 2.6 ug/L.For AWT, mean is 1.3 ug/L	0	0.003				x	0.05	0.1	1			x	50 ug/L	Class III Surface Water Standards for predominantly fresh water (assumed applicable).	
2		For Arsenic		0.1	1	10		m		10	24.4949	60	m			50 ug/L		
3		For Arsenic		0	0.1	1	x			0	1	2	x			50 ug/L		
4				0.001	0.01	0.1	L			0	25	400	L			50 ug/L		
5		For Arsenic			1		x				10		x			50 ug/L		less dilution, more arsenic found in natural waters
Avg					0.0786	1					3.60913	14.8017						
Min				0	0.003	0.1				0	0.1	1						
Max				0.1	1	10				10	25	400						

Wtd Avg.					0.09869			3			1.3			2				
log of mean					-1.0057													
Mmbr 1		For TKN	Mean TKN from data for	0	0.003	10		x		0.05	30	60			x	3 mg/L	Class III Surface Water	
2		For TKN	secondary treatment plants is	0.1	1	10		m		10	24.4949	60	m			3 mg/L	Standards for predominantly	
3		For TKN	9.8 mg/L. Two standard	0	0.1	1	x			0	1	2	x			3 mg/L	fresh water (assumed	
4			deviations = +/- 12.1 mg/L.	0.001	0.01	0.1	L			0	25	400	L			3 mg/L	applicable).	
5		For TKN			3		x				7		x			3 mg/L		
Avg					0.09791	1.778279					10.5159	41.1953						
Min				0	0.003	0.1				0	1	2						
Max				0.1	3	10				10	30	400						
Wtd Avg.					0.09869			2			14.19			2				
log of mean					-1.0057													
Mmbr 1		For NDMA	Range 0.02 - 14 ug/L in	0	0.0001	10		x		0.05	30	300	x			2 ug/L	Assumed based on State of	
2		For NDMA	secondary effluent in California.	0.1	1	10		m		10	24.4949	60	m			2 ug/L	California Action Level and	
3		For NDMA	NDMA occurrence may be	0	0.1	1	x			0	1	2	x			2 ug/L	ratios of consumption of	
4			related to chlorination and to	0.01	0.1	1	L			0	25	400	L			2 ug/L	surface water and drinking	
5		For NDMA	rocket fuel manufacture.		10		x				5		x			2 ug/L	water	
7				0	0.1	1		X			1000			X				
Avg					0.1	2.511886					21.2415	61.6014						
Min				0	0.0001	1				0	1	2						
Max				0.1	10	10				10	1000	400						
Wtd Avg.					0.05995			2			36.8263			1				
log of mean					-1.2222													
1.n.1.1.2	1.n.1.1.2.1	Exceedence of MCL drinking water stds. in treated drinking water deriving from canals in Biscayne Aquifer due to casing leak or upward migration through the Hawthorn														Assume lime softening and chlorination.	*Required 4 logs removal of viruses (Surface Water Treatment Rule). *Required 2 logs removal cryptosporidium (Interim Enhanced Surface Water Treatment Rule). *Typical 1 log removal of arsenic, lime softening (AWWA 1999) *Assume no removal of TKN *Assume no removal or formation of NDMA (Tchobanoglous 2000)	
Mmbr 1		For rotavirus	Assume mean of 10 virus/L	0	1E-09	0.0001			x	0.05	0.1	1			x	2E-7 org/L	Standard assumed based on	
2		For rotavirus	(range 0.001-1000) in	1.00E-12	1E-09	1.00E-06			h		0.01				h	2E-7 org/L	2L/d drinking water	
3		For rotavirus	secondary effluent	0	#######	1.00E-12	x			0	1.00E-02	1.00E-12	x			2E-7 org/L	consumption, beta-Poisson	
4			(conservative) based on total	0.001	0.01	0.1	L			0	7	14	L			2E-7 org/L	rotavirus dose-response	
5		For rotavirus	virus data of Tanaka, et al. (1998) and Rose and Carnahan	0.1	1	10		x		0.5	1	2				2E-7 org/L	(Haas, et al. 1999), and 1E-4 infections/cap-year	if it occurs persistence would be short
Avg					4E-07	0.046416					0.14758	3.03659						
Min				0	1E-12	1E-12				0	0.01	1E-12						
Max				0.1	1	10				0.5	7	14						
Wtd Avg.					1.6E-07			5			0.0744			5				
log of mean					-6.8													
Mmbr 1		For Arsenic	Mean Arsenic from data for	0	1E-09	0.0001			x	0.05	0.1	1			x	50 ug/L	MCL regulatory drinking water	
2		For Arsenic	secondary treatment plants is	1.00E-12	1E-09	1.00E-06			h		0.01				h	50 ug/L	std.	
3		For Arsenic	4.5 ug/L. Two standard	0	#######	1.00E-12	x			0	1.00E-02	1.00E-12	x			50 ug/L		
4			deviations = +/- 2.6 ug/L.For	0.0001	0.001	0.01	L			0	7	14	L			50 ug/L		
5		For Arsenic	AWT, mean is 1.3 ug/L		0.0001		x				1					50 ug/L		
Avg					4E-08	0.001					0.14758	3.74166						
Min				0	1E-12	1E-12				0	0.01	1E-12						
Max				0.0001	0.001	0.01				0.05	7	14						

Wtd Avg.					7.7E-09			4			0.0744			4				
log of mean					-8.1111													
Mmbr 1		For TKN	Mean TKN from data for	0	1E-09	0.0001			x	0.05	30	180			x	10 mg/L	Assumed MCL Drinking Water	
2		For TKN	secondary treatment plants is	1.00E-12	1E-09	1.00E-06			h		0.01				h	10 mg/L	Standard, based on MCL = 10	
3		For TKN	9.8 mg/L. Two standard	0	#######	0	x			0	0.01	0	x			10 mg/L	mg/L nitrate as nitrogen	
4			deviations = +/- 12.1 mg/L.	0.001	0.01	0.1	L			0	7	14	L			10 mg/L		
5		For TKN			0.0001						1		x			10 mg/L		
Avg					6.3E-08	0.003162					0.46179	50.1996						
Min				0	1E-12	0				0	0.01	0						
Max				0.001	0.01	0.1				0.05	30	180						
Wtd Avg.					#######			4			0.498			4				
log of mean					-8													
Mmbr 1		For NDMA	Range 0.02 - 14 ug/L in	0	1E-06	0.0001			x	0.05	30	365		x		0.002 ug/L	State of California Action Level	
2		For NDMA	secondary effluent in California.	1.00E-12	1E-09	1.00E-06			h		0.01				h	0.002 ug/L		
3		For NDMA	NDMA occurrence may be	0	#######		x			0	0.01		x			0.002 ug/L		
4			related to chlorination and to	0.01	0.1	1	L			0	7	14	L			0.002 ug/L		
5		For NDMA	rocket fuel manufacture.		0.0001		x				1		x			0.002 ug/L		
7				0	0.05	1					100							
Avg					2.8E-06	0.003162					1.13163	71.4843						
Min				0	1E-12	0.000001				0	0.01	14						
Max				0.01	0.1	1				0.05	100	365						
Wtd Avg.					4.7E-07			3			0.56948			3				
log of mean					-6.3301													
1.n.1.2.1	1.n.1.2.1.1	Exceedence of MCL drinking water stds. in treated drinking water deriving from canals in Biscayne Aquifer due to non-potable ASR releases to canals														Assume lime softening and chlorination.	*Required 4 logs removal of viruses (Surface Water Treatment Rule). *Required 2 logs removal cryptosporidium (Interim Enhanced Surface Water Treatment Rule). *Typical 1 log removal of arsenic, lime softening (AWWA 1999) *Assume no removal of TKN *Assume no removal or formation of NDMA (Tchobanoglous 2000)	
Mmbr 1		For rotavirus	Assume mean of 10 virus/L	0	1E-06	0.0001			x	0.05	1	2			x	2E-7 org/L	Standard assumed based on	
2		For rotavirus	(range 0.001-1000) in	0.01	0.1	1		m		5	7.07107	10		m		2E-7 org/L	2L/d drinking water	
3		For rotavirus	secondary effluent	0	,1	1	x			0	1	3	x			2E-7 org/L	consumption, beta-Poisson	
4			(conservative) based on total	0.001	0.01	0.1	L			0	7	14	L			2E-7 org/L	rotavirus dose-response	
5		For rotavirus	virus data of Tanaka, et al.	1	10	20	x			1	3	4				2E-7 org/L	(Haas, et al. 1999), and 1E-4	
Avg					0.01	0.182056					2.71857	5.07303						
Min				0	1E-06	0.0001				0	1	2						
Max				1	10	20				5	7.07107	14						
Wtd Avg.					0.00178			3			2.385			3				
log of mean					-2.7496													
Mmbr 1		For Arsenic	Mean Arsenic from data for	0	0.00003	0.0001			x	0.05	0.1	1			x	50 ug/L	MCL regulatory drinking water	
2		For Arsenic	secondary treatment plants is	0.01	0.1	1		m		5	7.07107	10		m		50 ug/L	std.	
3		For Arsenic	4.5 ug/L. Two standard	0	,1	1	x			0	1	3	x			50 ug/L		
4			deviations = +/- 2.6 ug/L.For	0.0001	0.001	0.1	L			0	7	14	L			50 ug/L		
5		For Arsenic	AWT, mean is 1.3 ug/L	0.1	1		x				10					50 ug/L		
Avg					0.0074	0.056234					2.18231	4.52702						
Min				0	0.00003	0.0001				0	0.1	1						
Max				0.1	1	1				5	10	14						
Wtd Avg.					0.00358			3			1.17			3				

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log of mean					-2.4461													
Mmbr 1		For TKN	Mean TKN from data for	0	0.0003	0.0001			x	0.05	30	60			x	10 mg/L	Assumed MCL Drinking Water	
2		For TKN	secondary treatment plants is	0.01	0.1	1		m		5	7.07107	10		m		10 mg/L	Standard, based on MCL = 10	
3		For TKN	9.8 mg/L. Two standard	0	,1	1	x			0	1	3	x			10 mg/L	mg/L nitrate as nitrogen	
4			deviations = +/- 12.1 mg/L.	0.0001	0.001	0.01	L			0	7	14	L			10 mg/L		
5		For TKN		1	3	10	x			3	7	10	x			10 mg/L		
Avg					0.01732	0.1					6.35858	12.0304						
Min				0	0.0003	0.0001				0	1	3						
Max				1	3	10				5	30	60						
Wtd Avg.					0.01299			3			9.5			3				
log of mean					-1.8864													
Mmbr 1		For NDMA	Range 0.02 - 14 ug/L in	0	0.00001	0.0001			x	0.05	30	300			x	0.002 ug/L	State of California Action Level	
2		For NDMA	secondary effluent in California.	0.01	0.1	1		m		5	7.07107	10		m		0.002 ug/L		
3		For NDMA	NDMA occurrence may be	0	,1	1	x			0	1	3	x			0.002 ug/L		
4			related to chlorination and to	0.01	0.1	1	L			0	7	14	L			0.002 ug/L		
5		For NDMA	rocket fuel manufacture.		3		x				7					0.002 ug/L		
7				0	0.25	1					1000							
Avg					0.03758	0.158489					14.7729	18.8405						
Min				0	0.00001	0.0001				0	1	3						
Max				0.01	3	1				5	1000	300						
Wtd Avg.					0.00542			3			15.9324			3				
log of mean					-2.2656													
1.n.1.3	1.n.1.3.1	Exceedence of MCL drinking water standards in water consumed from potable ASR														Assume only chlorination and blending prior to consumption. When ASR monitoring system detects elevated salinity, withdrawals should stop.	*Assume 1 log removal of viruses (based on Rose and Carnahan 1992). *Assume no removal of cryptosporidium (based on Rose and Carnahan 1992). *Assume no removal of Arsenic or TKN *Assume no removal or formation of NDMA (Tchobanoglous 2000)	
Mmbr 1		For rotavirus	Assume mean of 10 virus/L	0	1E-06	0.0001			x	0.05	1	3			x	2E-7 org/L	Standard assumed based on	
2		For rotavirus	(range 0.001-1000) in	1.00E-12	#######	1.00E-06		m			1.00E-02			m		2E-7 org/L	2L/d drinking water	
3		For rotavirus	secondary effluent	0	0.1	1	x			0	1	3	x			2E-7 org/L	consumption, beta-Poisson	
4			(conservative) based on total	0.01	0.1	1	L			0	7	14	L			2E-7 org/L	rotavirus dose-response	
5		For rotavirus	virus data of Tanaka, et al.	1	10	30	x			1	3	7	x			2E-7 org/L	(Haas, et al. 1999), and 1E-4	
Avg					0.00063	0.019744					0.73189	5.44963						
Min				0	1E-09	0.000001				0	0.01	3						
Max				1	10	30				1	7	14						
Wtd Avg.					2.4E-05			3			0.46			3				
log of mean					-4.625													
Mmbr 1		For Arsenic	Mean Arsenic from data for secondary treatment plants is 4.5 ug/L. Two standard deviations = +/- 2.6 ug/L.For AWT, mean is 1.3 ug/L	0	1E-06	0.0001			x	0.05	0.1	1			x	50 ug/L	MCL regulatory drinking water std.	
2		For Arsenic		1.00E-12	#######	1.00E-06		m			1.00E-02			m		50 ug/L		
3		For Arsenic		0	0.1	1	x			0	1	3	x			50 ug/L		
4				0.0001	0.01	0.1	L			0	7	14	L			50 ug/L		
5		For Arsenic			0.0001		x				7		x			50 ug/L		
Avg					4E-05	0.001778					0.54707	3.47603						
Min				0	1E-09	0.000001				0	0.01	1						
Max				0.0001	0.1	1				0.05	7	14						
Wtd Avg.					4.2E-06			3			0.122			3				

log of mean					-5.375													
Mmbr 1		For TKN	Mean TKN from data for	0	0.001				x	0.05	30	60			x	10 mg/L	Assumed MCL Drinking Water	
2		For TKN	secondary treatment plants is	1.00E-12	#######	1.00E-06		m			1.00E-02			m		10 mg/L	Standard, based on MCL = 10	
3		For TKN	9.8 mg/L. Two standard	0	0.1	1	x			0	1	3	x			10 mg/L	mg/L nitrate as nitrogen	
4			deviations = +/- 12.1 mg/L.	0.001	0.1	1	L			0	7	14	L			10 mg/L		
5		For TKN			0.001		x				2		x			10 mg/L		
Avg					0.0004	0.01					1.33245	13.6082						
Min				0	1E-09	0.000001				0	0.01	3						
Max				0.001	0.1	1				0.05	30	60						
Wtd Avg.					0.0001			3			1.58			3				
log of mean					-4													
Mmbr 1		For NDMA	Range 0.02 - 14 ug/L in	0	1E-06	0.0001			x	0.05	30	180	x			0.002 ug/L	State of California Action Level	
2		For NDMA	secondary effluent in California.	1.00E-12	#######	1.00E-06		m			1.00E-02			m		0.002 ug/L		
3		For NDMA	NDMA occurrence may be	0	0.1	1	x			0	1	3	x			0.002 ug/L		
4			related to chlorination and to	0.01	0.1	1	L			0	7	14	L			0.002 ug/L		
5		For NDMA	rocket fuel manufacture.		0.001		x				5					0.002 ug/L		
7					0.15						5000							
Avg					0.00034	0.003162					6.11918	19.6264						
Min				0	1E-09	0.000001				0	0.01	3						
Max				0.01	0.15	1				0.05	5000	180						
Wtd Avg.					2.3E-05			3			2.44678			1				
log of mean					-4.6471													
1.2	1.2.2	Exceedance of ocean discharge std. due to migration from deep well to ocean	Class III Surface Water Standards for predominantly marine waters													Assume migration of wastewater to Atlantic via vents @ 2000+ ft. depth		
Mmbr 1		For Cryptosporidium	Assume mean of 10 oocysts/L	0	0.0001	0.0001			x	0.05	3	30			x	6E-3 oocysts/L	Standard assumed based on	
2		For Cryptosporidium	(range of mean from 0.1-100) in	1.00E-12	#######	1.00E-06			h		1.00E-02				h	6E-5 oocysts/L	consumption of 4 L/year from	
3		For Cryptosporidium	secondary effluent based on	0	#######	1.00E-12	x			0	1.00E-02		x			6E-3 oocysts/L	swimming (Tanaka et al. 1998)	
4			National Research Council	0.0001	0.001	0.01	L			0	500	10950	L			6E-3 oocysts/L	and 3E-5 oocysts/L in 2x365	
5		For Cryptosporidium	(1998) and Rose and Carnahan (1992).	0.01	0.1	1	x			1	10	60		x		6E-3 oocysts/L	L/year drinking water (Haas et al. 1996)	
Avg					1.6E-06	0.01					1.08447	270.123						
Min				0	1E-12	1E-12				0	0.01	30						
Max				0.01	0.1	1				1	500	10950						
Wtd Avg.					3.6E-08			4			1.03			5				
log of mean					-7.4444													
Mmbr 1		For Arsenic	Mean Arsenic from data for	0	1E-06	0.0001			x	0.05	1	3			x	50 ug/L	Class III Surface Water	
2		For Arsenic	secondary treatment plants is	1.00E-12	#######	1.00E-06			h		1.00E-02				h	50 ug/L	Standards for predominantly	
3		For Arsenic	4.5 ug/L. Two standard	0	#######	1.00E-12	x			0	1.00E-02		x			50 ug/L	marine waters.	
4			deviations = +/- 2.6 ug/L.For	0.0001	0.001	0.01	L			0	1	50	L			50 ug/L		
5		For Arsenic	AWT, mean is 1.3 ug/L		0.0001						5					50 ug/L		
Avg					1.6E-07	0.001					0.21867	12.2474						
Min				0	1E-12	1E-12				0	0.01	3						
Max				0.0001	0.001	0.01				0.05	5	50						
Wtd Avg.					1E-06			4			0.154			4				
log of mean					-6													
Mmbr 1		For TKN	Mean TKN from data for	0	1E-06	0.0001			x	0.05	30	60			x	10 mg/L	Class III Surface Water	
2		For TKN	secondary treatment plants is	1.00E-12	#######	1.00E-06			h		1.00E-02				h	10 mg/L	Standards for predominantly	
3		For TKN	9.8 mg/L. Two standard	0	#######	0	x			0	1.00E-02		x			10 mg/L	marine waters.	
4			deviations = +/- 12.1 mg/L.	0.0001	0.001	0.01	L			0	1	50	L			10 mg/L		
5		For TKN			0.0001						3					10 mg/L		
Avg					1.6E-07	0.001					0.38981	54.7723						
Min				0	1E-12	0				0	0.01	50						
Max				0.0001	0.001	0.01				0.05	30	60						

Wtd Avg.					1E-06			4			0.453			4				
log of mean					-6													
Mmbr 1		For NDMA	Range 0.02 - 14 ug/L in	0	0.01				x	0.05	30	300			x	2 ug/L	Assumed based on State of	
2		For NDMA	secondary effluent in California.	1.00E-12	#######	1.00E-06			h		1.00E-02				h	2 ug/L	California Action Level and	
3		For NDMA	NDMA occurrence may be	0	#######		x			0	1.00E-02		x			2 ug/L	ratios of consumption of	
4			related to chlorination and to	0.001	0.01	0.1	L			0	500	10980				2 ug/L	surface water (swimming only)	
5		For NDMA	rocket fuel manufacture.		0.0001						5					2 ug/L	and drinking water	
7					1E-07						5							
Avg					1E-06	0.000316					1.82953	1814.94						
Min				0	1E-12	0.000001				0	0.01	300						
Max				0.001	0.01	0.1				0.05	500	10980						
Wtd Avg.					1.6E-06			4			1.12935			4				
log of mean					-5.8													
1.2.2	1.2.2.1	Exceedence of MCL drinking water stds. in R.O.-treated drinking water deriving from ocean water														Assume reverse osmosis treatment.		
Mmbr 1		For Cryptosporidium	Assume mean of 10 oocysts/L	0	1E-10	0.0001			x	0.0005	0.01	0.05			x	3E-5 oocycsts/L	Standard assumed (Haas et al.	
2		For Cryptosporidium	(range of mean from 0.1-100) in	1.00E-12	#######	1.00E-06			h		1.00E-02				h	3E-5 oocycsts/L	1996)	
3		For Cryptosporidium	secondary effluent based on	0	#######	1.00E-12	x			0	1.00E-02		x			3E-5 oocycsts/L		
4			National Research Council	0.00001	0.0001	0.001	L			0	7	14	L			3E-5 oocycsts/L		
5		For Cryptosporidium	(1998) and Rose and Carnahan (1992).	0.001	0.01	1	x			0.5	1	2		x		3E-5 oocycsts/L		Would likely be gross disruption of memebranes to
Avg					4E-08	0.004642					0.09311	1.11869						
Min				0	1E-12	1E-12				0	0.01	0.05						
Max				0.001	0.01	1				0.5	7	14						
Wtd Avg.					4.6E-09			4			0.035			4				
log of mean					-8.3333													
Mmbr 1		For Arsenic	Mean Arsenic from data for	0	1E-12	0.0001			x	0.05	0.1	1			x	50 ug/L	MCL regulatory drinking water	
2		For Arsenic	secondary treatment plants is	1.00E-12	#######	1.00E-06			h		1.00E-02				h	50 ug/L	std.	
3		For Arsenic	4.5 ug/L. Two standard	0	#######	1.00E-12	x				1.00E-02		x			50 ug/L		
4			deviations = +/- 2.6 ug/L.For	0.00001	0.0001	0.001	L			0	7	14	L			50 ug/L		
5		For Arsenic	AWT, mean is 1.3 ug/L		1E-06		x				1		x			50 ug/L		
Avg					2.5E-09	0.000316					0.14758	3.74166						
Min				0	1E-12	1E-12				0	0.01	1						
Max				0.00001	0.0001	0.001				0.05	7	14						
Wtd Avg.					3.6E-10			4			0.0744			4				
log of mean					-9.4449													
Mmbr 1		For TKN	Mean TKN from data for	0	1E-12	0.0001			x	0.05	0.1	1			x	10 mg/L	Assumed MCL Drinking Water	
2		For TKN	secondary treatment plants is	1.00E-12	#######	1.00E-06			h		1.00E-02				h	10 mg/L	Standard, based on MCL = 10	
3		For TKN	9.8 mg/L. Two standard	0	#######	1.00E-12	x			0	1.00E-02		x			10 mg/L	mg/L nitrate as nitrogen	
4			deviations = +/- 12.1 mg/L.	1.E-05	0.0001	0.01				0	7	14				10 mg/L		
5		For TKN			1E-06		x				1		x			10 mg/L		
Avg					2.5E-09	0.001					0.14758	3.74166						
Min				0	1E-12	1E-12				0	0.01	1						
Max				0.00001	0.0001	0.01				0.05	7	14						
Wtd Avg.					3.6E-10			4			0.0744			4				
log of mean					-9.4449													
Mmbr 1		For NDMA	Range 0.02 - 14 ug/L in	0	1E-08	0.0001			x	0.0005	0.001	0.05			x	0.002 ug/L	State of California Action Level	
2		For NDMA	secondary effluent in California.	1.00E-12	#######	1.00E-06			h		1.00E-02				h	0.002 ug/L		
3		For NDMA	NDMA occurrence may be	0	#######	0	x				1.00E-02		x			0.002 ug/L		
4			related to chlorination and to	0.0001	0.001	0.01	L			0	7	14	L			0.002 ug/L		
5		For NDMA	rocket fuel manufacture.		0.0001		x						x			0.002 ug/L		
7																		
Avg					6.3E-08	0.001					0.02893	0.83666						

Min				0	1E-12	0				0	0.001	0.05						
Max				0.0001	0.001	0.01				0.0005	7	14						
Wtd Avg.					1.7E-08			4			0.00956			4				
log of mean					-7.7778													

Table J-2 *FIRST DELPHI SURVEY ITERATION TO ELICIT PROFESSIONAL JUDGMENT: OCEAN OUTFALL EFFLUENT DISPOSAL*

QUESTIONS
1. How many times in 30 years will the regulatory standard be exceeded at the receiving node? (One such exceedance event may last any number of days.)
2. What is your confidence in the numbers of exceedance events you entered? Please select low (L), medium (M) or high (H).
3. How many days will exceedence events last (min., mean, max.)?
4. What is your confidence in the event sizes you entered? Please select from low (L), medium (M) or high (H).

NOTES:
1. Please view supporting information by placing your cursor over the cells having a red corner.
2. If part of the text in the yellow comment does not show when you place your cursor over the cell, click on the cell, select "Edit Comment" from the Insert menu, and drag the lower edge of the yellow comment window down to enlarge it. (This is a Microsoft problem we cannot solve)
3. If you want to change an assumption, please do so and explain in your reasons.
4. If within your area of expertise for the Team, please supply at least (a) a min & max & confidence, or (b) a mean & confidence.
5. Remember that the average number of events over 30 years can be a fraction.

Link From	Link To	Event		No. Exceedance Events						Days per Event						Reg. Std. & Assumptions	Comments	
				Min.	Mean	Max.	Confidence			Min.	Mean	Max.	Confidence					
							L	M	H				L	M	H			
2	2.1	Exceedance of ocean discharge stds. at the ocean outfall terminus	Class III Surface Water Standards for predominantly marine waters.													Assume discharged effluent receives secondary treatment and chlorination		
Mmbr 1		For Cryptosporidium	Assume mean of 10	0	365	10590		x		1	7	10590		x		6E-3 oocysts/L	Standard assumed based on	
2		For Cryptosporidium	oocysts/L (range of mean													6E-5 oocysts/L	consumption of 4 L/year from	
3		For Cryptosporidium	from 0.1-100) in secondary	1	15	30	x			1	7	14	x			6E-3 oocysts/L	swimming (Tanaka et al. 1998),	
4		For Cryptosporidium	effluent based on National	1	1	2	L			10800	1000	10950	L			6E-3 oocysts/L	and 3E-5 oocysts/L in 2x365	
6		For Cryptosporidium	Research Council (1998) and	n/d	n/d	n/d				n/d	n/d	n/d				6E-3 oocysts/L	L/year drinking water (Haas et al.	No data available
5		For Cryptosporidium	Rose and Carnahan (1992).	10	30	60		x		1	7	60		x		6E-3 oocysts/L	1996)	
	Avg			2.154	20.13	78.58				10.19	24.2	558.7						
	Min			0	1	2				1	7	14						
	Max			10	365	10590				10800	1000	10950						
	Wtd Avg.				35.94			3			18.88			3				
log of mean					1.556													
Mmbr 1		For Arsenic	Mean Arsenic from data for	0	1	2			x	0.05	10	30			x	50 ug/L	Class III Surface Water Standards	
2		For Arsenic	secondary treatment plants													50 ug/L	for predominantly marine waters.	
3		For Arsenic	is 4.5 ug/L. Two standard	1	15	30	x			1	7	14	x			50 ug/L		
4		For Arsenic	deviations = +/- 2.6 ug/L.For	0.01	0.1	1	L			0	0.1	1	L			50 ug/L		
6		For Arsenic	AWT, mean is 1.3 ug/L	*	1	2			h	0.5	3	4				50 ug/L		Standards are met in plant
5		For Arsenic		,1	1	10		x			7		x			50 ug/L		
	Avg			0.1	1.084	4.129				0.224	7.884	7.489						
	Min			0	0.1	1				0	0.1	1						
	Max			1	15	30				1	10	30						
	Wtd Avg.				1.046			4			3.939			2				
log of mean					0.02													
Mmbr 1		For TKN	Mean TKN from data for	0	365	10590		x			7	10950		x		10 mg/L	Class III Surface Water Standards	
2		For TKN	secondary treatment plants													10 mg/L	for predominantly marine waters.	
3		For TKN	is 9.8 mg/L. Two standard	1	15	30	x			1	7	14	x			10 mg/L		
4		For TKN	deviations = +/- 12.1 mg/L.	50	500	5000	L			2	10	20	L			10 mg/L		
6		For TKN		*	2	5			h	*	*	*				10 mg/L		Standards are met in plant
5		For TKN		1	60	120	x			1	3	5	x			10 mg/L		
	Avg			3.684	50.5	248.8				1.26	6.192	62.57						
	Min			0	2	5				1	3	5						
	Max			50	500	10590				2	10	10950						
	Wtd Avg.				28.85			2			6.346			2				

log of mean					1.46													
Mmbr 1		For NDMA	Range 0.02 - 14 ug/L in	0	1000	10590	x			0.05	30	10590		x		2 ug/L	Assumed based on State of	
2		For NDMA	secondary effluent in													2 ug/L	California Action Level and ratios	
3		For NDMA	California. NDMA	1	15	30	x			1	7	14	x			2 ug/L	of consumption of surface water	
4		For NDMA	occurrence may be related to	10	500	10800				1	2	5	L			2 ug/L	(swimming only) and drinking	
6		For NDMA	chlorination and to rocket	n/d	5	n/d			h	n/d	n/d	n/d				2 ug/L	water	No data available
5		For NDMA	fuel manufacture.	1	10	30	x				7		x			2 ug/L		
7					0.5				H		30				H			
	Avg				23.92	566.4					9.752	90.5						
	Min			0	0.5	30				0.05	2	5						
	Max			10	1000	10800				1	30	10590						
	Wtd Avg.				8.07			1			14.86			2				
log of mean					0.907													
2.1	2.n.1	Less than 20:1 dilution in the boil on more than 9 days out of 90 due to ocean outfall discharge	Ocean discharge std., 301 H Technical Support Documet for Ocean Outfall Waivers (U.S. EPA 2000)													20:1 min. dilution in boil more than 9 days in 90. Violations may be related to movement of the Gulfstream current.	The dilution is calculated using the 10th percentile current velocity. Dilution factors for each outfall from SEFLOE could be used as a reference value. These values are given in Tables 2-5.	
Mmbr 1				0	2	10			x	0.05	1	2		x				
2																		
3				3	30	60	x											
4				5	50	40	L			1	1	5	L					
6				0	0.5	3		X		0	0.5	2		X				SEFLOE data show 20:1 dilution
5																		
	Avg			3.873	6.223	16.38				0.224	0.794	2.714						
	Min			0	0.5	3				0	0.5	2						
	Max			5	50	60				1	1	5						
	Wtd Avg.				3.139			4			0.758			3				
log of mean					0.497													
2.2	2.n.1	Less than 20:1 dilution in the boil on more than 9 days out of 90 due to pipeline leak	Ocean discharge std., 301 H Technical Support Documet for Ocean Outfall Waivers (U.S. EPA 2000)													20:1 min. dilution in boil more than 9 days in 90. Assume minimal current, pipeline break not within the Gulfstream.		
Mmbr 1				0	1	2	x			30	90	180			x			
2																		
3				0	2	5	x											
4				0.001	0.1	1	L			0	7	14	L					
6				0	0.6	1		X		5	10	15		X				Pipeline break would reduce flow at
5																		
	Avg			0.001	0.585	2.154				30	25.1	50.2						
	Min			0	0.1	1				0	7	14						
	Max			0.001	2	5				30	90	180						
	Wtd Avg.				0.591			2			28.27			4				
log of mean					-0.229													
2.1	2.n.2	Exceedance of surface water std. in the farfield and benthic zones	Class III Surface Water Standards for predominantly marine waters.													Dilution factors from SEFLOE study could be used in answering.	Please refer to Figure 1	
Mmbr 1		For Cryptosporidium	Assume mean of 10	0	0.001	0.1		x		1	5	30		x		6E-3 oocysts/L	Standard assumed based on	
2		For Cryptosporidium	oocysts/L (range of mean													6E-5 oocysts/L	consumption of 4 L/year from	
3		For Cryptosporidium	from 0.1-100) in secondary	0	5	10	x			1	7	14	x			6E-3 oocysts/L	swimming (Tanaka et al. 1998).	

4		For Cryptosporidium	effluent based on National	0	0.1	10950	L			1	5	50	L			6E-3 oocysts/L	and 3E-5 oocysts/L in 2x365	
6		For Cryptosporidium	Research Council (1998) and	0.1	0.5	1	l			0.5	8	15	l			6E-3 oocysts/L	L/year drinking water (Haas et al.	No data available
5		For Cryptosporidium	Rose and Carnahan (1992).	0.1	1	10		x		5	10	60		x		6E-3 oocysts/L	1996)	
	Avg			0.1	0.19	10.18				1.201	6.749	28.53						
	Min			0	0.001	0.1				0.5	5	14						
	Max			0.1	5	10950				5	10	60						
	Wtd Avg.				0.103			3			6.625			3				
log of mean					-0.986													
Mmbr 1		For Arsenic	Mean Arsenic from data for	0	1E-06				x	0.05	0.05	0.1			x	50 ug/L	Class III Surface Water Standards	
2		For Arsenic	secondary treatment plants													50 ug/L	for predominantly marine waters.	
3		For Arsenic	is 4.5 ug/L. Two standard	0	5	10	x			1	7	14	x			50 ug/L		
4		For Arsenic	deviations = +/- 2.6 ug/L.For	0.001	0.01	1	L			0	0.1	20	L			50 ug/L		
6		For Arsenic	AWT, mean is 1.3 ug/L	1E-04	0.005	0.02			h	*	1.5	*			h	50 ug/L		Standards are met in plant
5		For Arsenic			0.01		x				7		x			50 ug/L		
	Avg			0.001	0.005	0.585				0.224	1.348	3.037						
	Min			0	1E-06	0.02				0	0.05	0.1						
	Max			0.001	5	10				1	7	20						
	Wtd Avg.				7E-04			2			0.503			2				
log of mean					-3.134													
Mmbr 1		For TKN	Mean TKN from data for	0	0.1	1			x	0.05	1	2		x		10 mg/L	Class III Surface Water Standards	
2		For TKN	secondary treatment plants													10 mg/L	for predominantly marine waters.	
3		For TKN	is 9.8 mg/L. Two standard	0	5	10	x			1	7	14	x			10 mg/L		
4		For TKN	deviations = +/- 12.1 mg/L.	0.001	1	10	L			0	0.1	20	L			10 mg/L		
6		For TKN		*	*	*				*	*	*				10 mg/L		Standards are met in plant
5		For TKN			0.1		x				3		x			10 mg/L		
	Avg			0.001	0.473	4.642				0.224	2.646	8.243						
	Min			0	0.1	1				0	0.1	2						
	Max			0.001	5	10				1	7	20						
	Wtd Avg.				0.282			2			1.16			2				
log of mean					-0.55													
Mmbr 1		For NDMA	Range 0.02 - 14 ug/L in	0	0.1	1			x	0.05	1	2		x		2 ug/L	Assumed based on State of	
2		For NDMA	secondary effluent in													2 ug/L	California Action Level and ratios	
3		For NDMA	California. NDMA	0	5	10	x			1	7	14	x			2 ug/L	of consumption of surface water	
4		For NDMA	occurrence may be related to	0.1	1	10	L			0	0.1	10	L			2 ug/L	(swimming only) and drinking	
6		For NDMA	chlorination and to rocket	n/d	n/d	n/d				n/d	n/d	n/d				2 ug/L	water	No data available
5		For NDMA	fuel manufacture.		0.1		x				5		x			2 ug/L		
7					0.1			X			30			X				
	Avg				0.347	4.642					2.537	6.542						
	Min			0	0.1	1				0	0.1	2						
	Max			0.1	5	10				1	30	14						
	Wtd Avg.				0.217			2			3.161			2				
log of mean					-0.663													
2.2	2.n.2	Exceedence of surface water std. in the farfield and benthic zones	Class III Surface Water Standards for predominantly marine waters.													Dilution factors from SEFLOE study could be used in estimating parameters.	Please refer to Figure 1	
Mmbr 1		For Cryptosporidium	Assume mean of 10		30			x			2			x		6E-3 oocysts/L	Standard assumed based on	
2		For Cryptosporidium	oocysts/L (range of mean													6E-5 oocysts/L	consumption of 4 L/year from	
3		For Cryptosporidium	from 0.1-100) in secondary	0	1	2	x			1	7	14	x			6E-3 oocysts/L	swimming (Tanaka et al. 1998),	
4		For Cryptosporidium	effluent based on National	0	0.1	10950	L			1	5	50	L			6E-3 oocysts/L	and 3E-5 oocysts/L in 2x365	
6		For Cryptosporidium	Research Council (1998) and	0.01	3	9	l			2	6	15	l			6E-3 oocysts/L	L/year drinking water (Haas et al.	No data available
5		For Cryptosporidium	Rose and Carnahan (1992).	0.01	0.5	1	x			2	6	30	x			6E-3 oocysts/L	1996)	
	Avg			0.01	1.351	21.07				1.414	4.789	23.69						

	Min			0	0.1	1				1	2	14						
	Max			0.01	30	10950				2	7	50						
	Wtd Avg.				2.265			2			4.366			3				
log of mean					0.355													
Mmbr 1		For Arsenic	Mean Arsenic from data for		0.001				x		1				x	50 ug/L	Class III Surface Water Standards	
2		For Arsenic	secondary treatment plants													50 ug/L	for predominantly marine waters.	
3		For Arsenic	is 4.5 ug/L. Two standard	0	1	2	x			1	7	14	x			50 ug/L		
4		For Arsenic	deviations = +/- 2.6 ug/L.For	0.001	0.01	1	L			0	7	14	L			50 ug/L		
6		For Arsenic	AWT, mean is 1.3 ug/L	0.001	0.5	1			h	1	5	12			h	50 ug/L		Standards are met in plant
5		For Arsenic			0.01		x				5		x			50 ug/L		
	Avg			0.001	0.035	1.26				1	4.146	13.3						
	Min			0	0.001	1				0	1	12						
	Max			0.001	1	2				1	7	14						
	Wtd Avg.				0.029			2			3.151			2				
log of mean					-1.545													
Mmbr 1		For TKN	Mean TKN from data for		3				x		1				x	10 mg/L	Class III Surface Water Standards	
2		For TKN	secondary treatment plants													10 mg/L	for predominantly marine waters.	
3		For TKN	is 9.8 mg/L. Two standard	0	1	2	x			1	7	14	x			10 mg/L		
4		For TKN	deviations = +/- 12.1 mg/L.	0.001	0.01	1	L			0	0.1	14	L			10 mg/L		
6		For TKN		*	0.1	*		m		1	6	10				10 mg/L		Standards are met in plant
5		For TKN			0.1		x				5		x			10 mg/L		
	Avg			0.001	0.197	1.414				1	5.916	12.51						
	Min			0	0.01	1				0	0.1	10						
	Max			0.001	3	2				1	7	14						
	Wtd Avg.				0.358			2			1.545			2				
log of mean					-0.446													
Mmbr 1		For NDMA	Range 0.02 - 14 ug/L in		1		x				7		x			2 ug/L	Assumed based on State of	
2		For NDMA	secondary effluent in													2 ug/L	California Action Level and ratios	
3		For NDMA	California. NDMA	0	1	2	x			1	7	14	x			2 ug/L	of consumption of surface water	
4		For NDMA	occurrence may be related to	0.001	1	1	L			0	0.1	14	L			2 ug/L	(swimming only) and drinking	
6		For NDMA	chlorination and to rocket	n/d	0.05	n/d				1	6	10				2 ug/L	water	No data available
5		For NDMA	fuel manufacture.		0.01		x				5		x			2 ug/L		
7					0.01				H		14							
	Avg				0.131	1.414					3.566	12.51						
	Min			0	0.01	1				0	0.1	10						
	Max			0.001	1	2				1	14	14						
	Wtd Avg.				0.047			1			3.117			1				
log of mean					-1.329													
2.n.2	2.n.2.1	Exceedence of MCL in R.O. treated drinking water derived from farfield ocean water														R.O. membranes capable of removing ions (AWWA 1999)		
Mmbr 1		For Cryptosporidium	Assume mean of 10	0	1E-06	1E-04			x	0.05	1	2			x	3E-5 oocycts/L	Standard assumed (Haas et al. 1996)	
2		For Cryptosporidium	oocysts/L (range of mean													3E-5 oocycts/L		
3		For Cryptosporidium	from 0.1-100) in secondary	0	1E-12		x			0	0.01	0.01	x			3E-5 oocycts/L		
4		For Cryptosporidium	effluent based on National	0.001	0.01	2	L			0	0.1	10	L			3E-5 oocycts/L		
6		For Cryptosporidium	Research Council (1998) and	n/d	n/d	n/d				n/d	n/d	n/d				3E-5 oocycts/L		No data available
5		For Cryptosporidium	Rose and Carnahan (1992).	0.001	0.005	0.1	x				1		x			3E-5 oocycts/L		
	Avg			0.001	4E-04	0.027				0.05	1	4.472						
	Min			0	1E-12	1E-04				0	0.01	0.01						
	Max			0.001	0.01	2				0.05	1	10						

	Wtd Avg.				2E-06			2			0.316			2				
log of mean					-5.717													
Mmbr 1		For Arsenic	Mean Arsenic from data for	0	1E-09	1E-04			x	0.05	1	2			x	50 ug/L	MCL regulatory drinking water std.	
2		For Arsenic	secondary treatment plants													50 ug/L		
3		For Arsenic	is 4.5 ug/L. Two standard	0	1E-12		x			0	0.01	0.01	x			50 ug/L		
4		For Arsenic	deviations = +/- 2.6 ug/L.For	0.001	0.001	0.1	L			0	0.1	2	L			50 ug/L		
6		For Arsenic	AWT, mean is 1.3 ug/L	*	*	*				*	*	*				50 ug/L		Standards are met in plant
5		For Arsenic			0.001		x				1		x			50 ug/L		
	Avg			0.001	1E-05	0.003				0.05	1	2						
	Min			0	1E-12	1E-04				0	0.01	0.01						
	Max			0.001	0.001	0.1				0.05	1	2						
	Wtd Avg.				3E-08			2			0.316			2				
log of mean					-7.5													
Mmbr 1		For TKN	Mean TKN from data for	0	3E-06	1E-04			x	0.05	1	2			x	10 mg/L	Assumed MCL Drinking Water	
2		For TKN	secondary treatment plants													10 mg/L	Standard, based on MCL = 10	
3		For TKN	is 9.8 mg/L. Two standard	0	1E-12	1E-12	x			0	0.01	0.01	x			10 mg/L	mg/L nitrate as nitrogen	
4		For TKN	deviations = +/- 12.1 mg/L.	0.001	0.1	0.1	L			0	0.1	2	L			10 mg/L		
6		For TKN		*	*	*				*	*	*				10 mg/L		Standards are met in plant
5		For TKN			0.3		x				1		x			10 mg/L		
	Avg			0.001	0.004	0.003				0.05	1	2						
	Min			0	1E-12	1E-12				0	0.01	0.01						
	Max			0.001	0.3	0.1				0.05	1	2						
	Wtd Avg.				1E-05			2			0.316			2				
log of mean					-5.015													
Mmbr 1		For NDMA	Range 0.02 - 14 ug/L in	0	1E-05	1E-04		x		0.05	1	2		x		0.002 ug/L	State of California Action Level	
2		For NDMA	secondary effluent in													0.002 ug/L		
3		For NDMA	California. NDMA	0	1E-12		x			0	0.01		x			0.002 ug/L		
4		For NDMA	occurrence may be related to	0.001	0.1		L			0	0.1	2	L			0.002 ug/L		
6		For NDMA	chlorination and to rocket	n/d	n/d	n/d				n/d	n/d	n/d				0.002 ug/L		No data available
5		For NDMA	fuel manufacture.		0.001		x				1		x			0.002 ug/L		
7				0	0.01	100					30							
	Avg				3E-05	0.1					0.496	2						
	Min			0	1E-12	1E-04				0	0.01	2						
	Max			0.001	0.1	100				0.05	30	2						
	Wtd Avg.				3E-05			2			0.416			2				
log of mean					-4.5													
2.1	2.n.3	Exceedence of surface water stds. in beach waters due to ocean outfall discharge	Class III Surface Water Standards for predominantly marine waters.															
Mmbr 1		For Cryptosporidium	Assume mean of 10	0	0.001	0.01			x	0.05	1	5		x		6E-3 oocysts/L	Standard assumed based on	
2		For Cryptosporidium	oocysts/L (range of mean													6E-5 oocysts/L	consumption of 4 L/year from	
3		For Cryptosporidium	from 0.1-100) in secondary	0	2	5	x			1	3	7	x			6E-3 oocysts/L	swimming (Tanaka et al. 1998),	
4		For Cryptosporidium	effluent based on National	0	0.1	20	L			0	7	14	L			6E-3 oocysts/L	and 3E-5 oocysts/L in 2x365	
6		For Cryptosporidium	Research Council (1998) and	n/d	0.1	n/d	l			n/d	3	n/d	l			6E-3 oocysts/L	L/year drinking water (Haas et al.	No data available
5		For Cryptosporidium	Rose and Carnahan (1992).	1E-04	0.01	0.1	x			1	3	7				6E-3 oocysts/L	1996)	
	Avg			1E-04	0.046	0.562				0.368	2.853	7.653						
	Min			0	0.001	0.01				0	1	5						
	Max			1E-04	2	20				1	7	14						
	Wtd Avg.				0.015			2			2.396			2				
log of mean					-1.814													

Mmbr 1		For Arsenic	Mean Arsenic from data for	0	1E-05	1E-04			x		0.05				x	50 ug/L	Class III Surface Water Standards	
2		For Arsenic	secondary treatment plants	0.001	0.004	0.005			h		0.7	1				50 ug/L	for predominantly marine waters.	
3		For Arsenic	is 4.5 ug/L. Two standard	0	2	5	x			1	3	7	x			50 ug/L		
4		For Arsenic	deviations = +/- 2.6 ug/L.For	0.001	0.01	0.1	L			0	0.1	14	L			50 ug/L		
6		For Arsenic	AWT, mean is 1.3 ug/L	*	*	*				*	*	*				50 ug/L		Standards are met in plant
5		For Arsenic			0.001		x				3		x			50 ug/L		
	Avg			0.001	0.004	0.022				1	0.766	4.61						
	Min			0	1E-05	1E-04				0	0.05	1						
	Max			0.001	2	5				1	3	14						
	Wtd Avg.				0.001			2			0.259			2				
log of mean					-2.988													
Mmbr 1		For TKN	Mean TKN from data for	0	0.1	1			x	0.05	1	2		x		10 mg/L	Class III Surface Water Standards	
2		For TKN	secondary treatment plants													10 mg/L	for predominantly marine waters.	
3		For TKN	is 9.8 mg/L. Two standard	0	2	5	x			1	3	7	x			10 mg/L		
4		For TKN	deviations = +/- 12.1 mg/L.	0.001	0.01	0.1	L			0	0.1	14	L			10 mg/L		
6		For TKN		*	*	*				*	*	*				10 mg/L		Standards are met in plant
5		For TKN			0.001		x				1		x			10 mg/L		
	Avg			0.001	0.038	0.794				0.224	1.442	5.809						
	Min			0	0.001	0.1				0	0.1	2						
	Max			0.001	2	5				1	3	14						
	Wtd Avg.				0.052			2			0.786			2				
log of mean					-1.283													
Mmbr 1		For NDMA	Range 0.02 - 14 ug/L in	0	0.1	1	x			0.05	1	2	x			2 ug/L	Assumed based on State of	
2		For NDMA	secondary effluent in													2 ug/L	California Action Level and ratios	
3		For NDMA	California. NDMA	0	2	5	x			1	3	7	x			2 ug/L	of consumption of surface water	
4		For NDMA	occurrence may be related to	0.001	0.01	0.1	L			0	0.1	14	L			2 ug/L	(swimming only) and drinking	
6		For NDMA	chlorination and to rocket	n/d	n/d	n/d				n/d	n/d	n/d				2 ug/L	water	No data available
5		For NDMA	fuel manufacture.		0.001		x				1		x			2 ug/L		
7					30					0	1.5	2						
	Avg				0.143	0.794					0.852	4.45						
	Min			0	0.001	0.1				0	0.1	2						
	Max			0.001	30	5				1	3	14						
	Wtd Avg.				0.143			1			0.852			1				
log of mean					-0.844													
2.2	2.n.3	Exceedence of surface water stds. in beach waters due to outfall pipeline leak	Class III Surface Water Standards for predominantly marine waters.													Assume minimal current, pipeline break not within the Gulfstream.		
Mmbr 1		For Cryptosporidium	Assume mean of 10	0	1	2	x			10	30	90			x	6E-3 oocysts/L	Standard assumed based on	
2		For Cryptosporidium	oocysts/L (range of mean													6E-5 oocysts/L	consumption of 4 L/year from	
3		For Cryptosporidium	from 0.1-100) in secondary	1	3	5	x			1	3	7	x			6E-3 oocysts/L	swimming (Tanaka et al. 1998),	
4		For Cryptosporidium	effluent based on National	0.001	0.1	3	L			0	7	14	L			6E-3 oocysts/L	and 3E-5 oocysts/L in 2x365	
6		For Cryptosporidium	Research Council (1998) and	1	2	4	l			5	8	15				6E-3 oocysts/L	L/year drinking water (Haas et al.	No data available
5		For Cryptosporidium	Rose and Carnahan (1992).	1	3	6	x			1	3	5		x		6E-3 oocysts/L	1996)	
	Avg			0.1	1.125	3.728				2.154	6.853	14.59						
	Min			0	0.1	2				0	3	5						
	Max			1	3	6				10	30	90						
	Wtd Avg.				1.125			1			8.941			4				
log of mean					0.051													
Mmbr 1		For Arsenic	Mean Arsenic from data for	0	1E-04	1	x			0.05	1	2	x			50 ug/L	Class III Surface Water Standards	
2		For Arsenic	secondary treatment plants													50 ug/L	for predominantly marine waters.	
3		For Arsenic	is 4.5 ug/L. Two standard	1	3	5	x			1	3	7	x			50 ug/L		
4		For Arsenic	deviations = +/- 2.6 ug/L.For	0.001	0.01	0.1	L			0	0.1	14	L			50 ug/L		

6		For Arsenic	AWT, mean is 1.3 ug/L	*	0.3	0.5			h	*	1	5				50 ug/L		Standards are met in plant
5		For Arsenic			1		X				1		X			50 ug/L		
	Avg			0.032	0.062	0.707				0.224	1.442	5.595						
	Min			0	1E-04	0.1				0	0.1	2						
	Max			1	3	5				1	3	14						
	Wtd Avg.				0.097			1			0.786			1				
log of mean					-1.013													
Mmbr 1		For TKN	Mean TKN from data for	0	3	5	x			1	3	10			x	10 mg/L	Class III Surface Water Standards	
2		For TKN	secondary treatment plants													10 mg/L	for predominantly marine waters.	
3		For TKN	is 9.8 mg/L. Two standard	1	3	5	x			1	3	7	x			10 mg/L		
4		For TKN	deviations = +/- 12.1 mg/L.	0.001	0.01	0.1	L			0	0.1	14	L			10 mg/L		
6		For TKN		*	0.5	2		m		*	5	20		m		10 mg/L		Standards are met in plant
5		For TKN		1	3	6	X				1		X			10 mg/L		
	Avg			1	0.67	1.974				1	2.08	11.83						
	Min			0	0.01	0.1				0	0.1	7						
	Max			1	3	6				1	5	20						
	Wtd Avg.				0.638			1			1.942			2				
log of mean					-0.195													
Mmbr 1		For NDMA	Range 0.02 - 14 ug/L in	0	1	2	x			10	30	90			x	2 ug/L	Assumed based on State of	
2		For NDMA	secondary effluent in													2 ug/L	California Action Level and ratios	
3		For NDMA	California. NDMA	1	3	5	x			1	3	7	x			2 ug/L	of consumption of surface water	
4		For NDMA	occurrence may be related to	0.001	0.01	0.1	L			0	0.1	14	L			2 ug/L	(swimming only) and drinking	
6		For NDMA	chlorination and to rocket	n/d	n/d	n/d				n/d	n/d	n/d				2 ug/L	water	No data available
5		For NDMA	fuel manufacture.		1		X				1		X			2 ug/L		
7				1	3	5					3							
	Avg			0.1	0.618	1.495					1.933	20.66						
	Min			0	0.01	0.1				0	0.1	7						
	Max			1	3	5				10	30	90						
	Wtd Avg.				0.618			1			4.232			1				
log of mean					-0.209													

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Table J-3 FIRST DELPHI SURVEY ITERATION TO ELICIT PROFESSIONAL JUDGMENT: SURFICIAL AQUIFER RECHARGE

QUESTIONS
1. How many times in 30 years will the regulatory standard be exceeded at the receiving node? (One such exceedance event may last any number of days.)
2. What is your confidence in the numbers of exceedance events you entered? Please select low (L), medium (M) or high (H).
3. How many days will exceedence events last (min., mean, max.)?
4. What is your confidence in the event sizes you entered? Please select from low (L), medium (M) or high (H).

NOTES:
1. Please view supporting information by placing your cursor over the cells having a red corner.
2. If part of the text in the yellow comment does not show when you place your cursor over the cell, click on the cell, select "Edit Comment" from the Insert menu,
   and drag the lower edge of the yellow comment window down to enlarge it. (This is a Microsoft problem we cannot solve)
3. If you want to change an assumption, please do so and explain in your reasons.
4. If within your area of expertise for the Team, please supply at least (a) a min & max & confidence, or (b) a mean & confidence.
5. Remember that the average number of events over 30 years can be a fraction.

Link From	Link To	Event		No. Exceedance Events Min.	Mean	Max.	nfidence L	M	H	Days per Event Min.	Mean	Max.	nfidence L	M	H	Reg. Stds. & Assumptions	Comments	
3	3.1	Exceedance of surface water stds. in canals due to discharge of AWT water														Assume no dilution (canal filled with effluent)		
Mmbr 1		For Cryptosporidium	Assume mean of 10 oocysts/L (range of mean from 0.1-100) in secondary effluent based on National Research Council (1998) and Rose and Carnahan (1992).		30			x			3			x		3E-3 oocysts/L	Standard assumed based on consumption of 8 L/year, swimming, golfing, and consuming irrigated food (Tanaka et al. 1998), and 3E-5 oocysts/L in 2x365 L/year drinking water (Haas et al. 1996)	
2		For Cryptosporidium				5	l					5	l			3E-3 oocysts/L		
3		For Cryptosporidium		1	3	5	x			1	3	5	x			3E-3 oocysts/L		
4		For Cryptosporidium		1	10	1050	L			10	1000	10950	L			3E-3 oocysts/L		
5		For Cryptosporidium		10	30	90		X		4	10	60		X		3E-3 oocysts/L		AWT does not take crypto below 1/100L, thus if there is not much dilution in the canals this could be exceeded easily
7				5	10	30			X	2	4	7			X			Based on potential plant upsets
	Avg				12.198	37.162					12.92	40.94						
	Min			1	3	5				1	3	5						
	Max			10	30	1050				10	1000	10950						
	Wtd Avg.				14.255			3			8.228			3				
log of mean					1.154						0.915							
Mmbr 1		For Arsenic	Mean Arsenic from data for secondary treatment plants is 4.5 ug/L. Two standard deviations = +/- 2.6 ug/L.For AWT, mean is 1.3 ug/L	0	0.001	5			x	0.05	1	2		x		50 ug/L	Class III Surface Water Standards for predominantly fresh water (assumed applicable).	
2		For Arsenic				5	l					5	l			50 ug/L		
3		For Arsenic		1	3	5	x			1	3	5	x			50 ug/L		
4		For Arsenic		0	0.1	5	L			0	7		L			50 ug/L		
5		For Arsenic		0.001	0.01	0.1	x				1					50 ug/L		
7				0	1.5	6			X	1	2	3		M				
	Avg				0.0852	2.6854					2.112	3.5						
	Min			0	0.001	0.1				0	1	2						
	Max			1	3	6				1	7	5						
	Wtd Avg.				0.06			2			1.883			2				
log of mean					-1.222													
Mmbr 1		For TKN	Mean TKN from data for	0	30	365		x		0.05	10	30		x		3 mg/L	Class III Surface Water	

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2		For TKN	secondary treatment			5	I					5	I			3 mg/L	Standards for	
3		For TKN	plants is 9.8 mg/L. Two	1	3	5	x			1	3	5	x			3 mg/L	predominantly fresh water	
4		For TKN	standard deviations = +/-	1	5	500	L			20	2000	10800	L			3 mg/L	(assumed applicable).	
5		For TKN	12.1 mg/L.	10	30	90	x				7					3 mg/L		
7				15	40	120			H	1	3	5		X				Exceedance 1/3 months (maybe high), not nec. detected
	Avg				14.011	60.549					16.6	33.23						
	Min			0	3	5				0.05	3	5						
	Max			15	40	500				20	2000	10800						
	Wtd Avg.				20.031			2			12.09			2				
log of mean					1.3017													
Mmbr 1		For NDMA	Range 0.02 - 14 ug/L in	0	60	10590	x			0.05	30	10590	x			2 ug/L	Assumed based on State	
2		For NDMA	secondary effluent in			5	I					5	I			2 ug/L	of California Action Level	
3		For NDMA	California. NDMA	1	3	5	x			1	3	5	x			2 ug/L	and ratios of consumption	
4		For NDMA	occurrence may be	100	500	10800	L			0.2	5	30	L			2 ug/L	of surface water and	
5		For NDMA	related to chlorination	75	150	1000	x				5					2 ug/L	drinking water	
7					1				X		10950				H			If effluent chlorinated, and if amines present from backwash of residential ion exchange systems, may have formation
	Avg				26.673	309.92					30.08	53.09						
	Min			0	1	5				0.05	3	5						
	Max			100	500	10800				1	10950	10590						
	Wtd Avg.				10.438			1			162.2			1				
log of mean					1.0186													
3.1	3.2	Exceedance of MCL drinking water std. in Biscayne aquifer well water due to leakage from canals to well														Canal level higher than GW table. Assume that this is not the typical condition (Bloetscher 2000).		
Mmbr 1		For Cryptosporidium	Assume mean of 10	0	0.0001	0.001			x	0.05	1	2		x		3E-5 oocycts/L	Standard assumed based	
2		For Cryptosporidium	oocysts/L (range of			5	I					5	I			3E-5 oocycts/L	on consumption of 8	
3		For Cryptosporidium	mean from 0.1-100) in	0.0001	0.001	0.01	x			1	3	5	x			3E-5 oocycts/L	L/year, swimming, golfing,	
4		For Cryptosporidium	secondary effluent	1	1	10	L			1090	1000	10950	L			3E-5 oocycts/L	and consuming irrigated	
5		For Cryptosporidium	based on National	1	3	6	x			10	30	60		x		3E-5 oocycts/L	food (Tanaka et al. 1998),	
7				4	10	20		X		1	2	3		X				
	Avg				0.0786	0.6257					11.25	21.49						
	Min			0	0.0001	0.001				0.05	1	2						
	Max			4	10	20				1090	1000	10950						
	Wtd Avg.				0.0272			2			7.571			3				
log of mean					-1.565													
Mmbr 1		For Arsenic	Mean Arsenic from data	0	0.0001	0.001			x	0.05	1	2			x	50 ug/L	MCL regulatory drinking	
2		For Arsenic	for secondary treatment			5	I					5	I			50 ug/L	water std.	
3		For Arsenic	plants is 4.5 ug/L. Two	0.0001	0.001	0.01	x			1	3	5	x			50 ug/L		
4		For Arsenic	standard deviations = +/-	0.001	0.05	0.1	L			0.001	7		L			50 ug/L		
5		For Arsenic	2.6 ug/L.For AWT,		0.01		x				5					50 ug/L		
7				0	1	5		X		1	1.5	2		X				
	Avg				0.0087	0.1201					2.751	3.162						

	Min			0	0.0001	0.001				0.001	1	2						
	Max			0.001	1	5				1	7	5						
	Wtd Avg.				0.0052			2			1.98			2				
log of mean					-2.288													
Mmbr 1		For TKN	Mean TKN from data for	0	3	10	x			0.05	30	90		x		10 mg/L	Assumed MCL Drinking	
2		For TKN	secondary treatment			5	I					5	I			10 mg/L	Water Standard, based on	
3		For TKN	plants is 9.8 mg/L. Two	0.0001	0.001	0.01	x			1	3	5	x			10 mg/L	MCL = 10 mg/L nitrate as	
4		For TKN	standard deviations = +/-	1	3	100	L			0.2	2	20	L			10 mg/L	nitrogen	
5		For TKN	12.1 mg/L.		3		x				5		x			10 mg/L		Treatment in canal bank assumed
7				5	10	30		X		1	2	4		X				
	Avg				0.7696	4.3174					4.478	11.25						
	Min			0	0.001	0.01				0.05	2	4						
	Max			5	10	100				1	30	90						
	Wtd Avg.				1.18			1			3.915			2				
log of mean					0.0719													
Mmbr 1		For NDMA	Range 0.02 - 14 ug/L in	0	10	10590	x			0.05	30	10590	x			0.002 ug/L	State of California Action	
2		For NDMA	secondary effluent in				I					5	I			0.002 ug/L	Level	
3		For NDMA	California. NDMA	0.0001	0.001	0.01	x			1	3	5	x			0.002 ug/L		
4		For NDMA	occurrence may be	1	50	100	L			0.5	5	50	L			0.002 ug/L		
5		For NDMA	related to chlorination		10		x				5		x			0.002 ug/L		
7					1				H		10950				X			Not much removal at all
	Avg				1.3797	21.96					30.08	60.32						
	Min			0	0.001	0.01				0.05	3	5						
	Max			1	50	10590				1	10950	10590						
	Wtd Avg.				1.2585			1			162.2			1				
log of mean					0.0999													
3.2	3.2.1	Exceedance of MCL drinking water stds. in treated potable water derived from Biscayne aquifer wells														Assume lime softening and chlorination	*Required 4 logs removal of viruses (Surface Water Treatment Rule). *Required 2 logs removal cryptosporidium (Interim Enhanced Surface Water Treatment Rule). *Typical 1 log removal of arsenic in lime softening (AWWA 1999) *Assume no removal of TKN	
Mmbr 1		For Cryptosporidium	Assume mean of 10	0	0.0003	0.001			x	0.05	1	5			x	3E-5 oocycts/L	Standard assumed based	
2		For Cryptosporidium	oocysts/L (range of			1	I					5	II			3E-5 oocycts/L	on consumption of 8	
3		For Cryptosporidium	mean from 0.1-100) in	0	0.0001	0.001	x			1	2	5	x			3E-5 oocycts/L	L/year, swimming, golfing,	
4		For Cryptosporidium	secondary effluent	1	1	2	L			50	100	10950	L			3E-5 oocycts/L	and consuming irrigated	
5		For Cryptosporidium	based on National	0.1	1	3	x			10	30	60		x		3E-5 oocycts/L	food (Tanaka et al. 1998),	
7				0	0.5	3			H	0	1	2			X		and 3E-5 oocysts/L in	Assuming filtration
	Avg				0.0272	0.1619					5.697	23.4						
	Min			0	0.0001	0.001				0	1	2						
	Max			1	1	3				50	100	10950						

	Wtd Avg.				0.0191			2			3.354			2				
log of mean					-1.719													
Mmbr 1		For Arsenic	Mean Arsenic from data	0	0.0001	0.0001			x	0.05	1	2			x	50 ug/L	MCL regulatory drinking	
2		For Arsenic	for secondary treatment			1	I					5	II			50 ug/L	water std.	
3		For Arsenic	plants is 4.5 ug/L. Two	0	0.0001	0.001	x			1	2	5	x			50 ug/L		
4		For Arsenic	standard deviations = +/-	0.0001	0.01		L			0	7		L			50 ug/L		
5		For Arsenic	2.6 ug/L.For AWT,		0.001		x				5		x			50 ug/L		
7				0	0.1	1			X	0	1	2			X			upset
	Avg				0.0016	0.0178					2.339	3.162						
	Min			0	0.0001	0.0001				0	1	2						
	Max			0.0001	0.1	1				1	7	5						
	Wtd Avg.				0.0022			2			1.603			2				
log of mean					-2.667													
Mmbr 1		For TKN	Mean TKN from data for	0	0.001	0.01			x	0.05	1	2			x	10 mg/L	Assumed MCL Drinking	
2		For TKN	secondary treatment			1	I					5	II			10 mg/L	Water Standard, based on	
3		For TKN	plants is 9.8 mg/L. Two	0	0.0001	0.001	x			1	2	5	x			10 mg/L	MCL = 10 mg/L nitrate as	
4		For TKN	standard deviations = +/-	1	1	100	L			0.2	2	20	L			10 mg/L	nitrogen	
5		For TKN	12.1 mg/L.		1		x				3		x			10 mg/L		
7				0	1	30			X	1	1.5	2			X			
	Avg				0.0398	0.4959					1.783	4.573						
	Min			0	0.0001	0.001				0.05	1	2						
	Max			1	1	100				1	3	20						
	Wtd Avg.				0.0359			2			1.509			2				
log of mean					-1.444													
Mmbr 1		For NDMA	Range 0.02 - 14 ug/L in	0	10	10590	x			0.05	30	10590	x			0.002 ug/L	State of California Action	
2		For NDMA	secondary effluent in			1	I					5	II			0.002 ug/L	Level	
3		For NDMA	California. NDMA	0	0.0001	0.001	x			1	2	5	x			0.002 ug/L		
4		For NDMA	occurrence may be	0	3	50	L			0	5	4500	L			0.002 ug/L		
5		For NDMA	related to chlorination		1		x				7		x			0.002 ug/L		
7					1			X			8000			X				
	Avg				0.3129	4.797					27.87	185.8						
	Min			0	0.0001	0.001				0	2	5						
	Max			0	10	10590				1	8000	10590						
	Wtd Avg.				0.3798			1			71.57			1				
log of mean					-0.42													

APPENDIX K. SUPPORTING INFORMATION PROVIDED TO TEAM MEMBERS WITH THE MODIFIED DELPHI QUESTIONNAIRE

SUPPORTING INFORMATION FOR THE MODIFIED DELPHI SURVEY
Sinem Gokgoz

CONSTITUENTS

Cryptosprodium is a protozoon. Protozoa are single celled organisms lacking a cell wall. They are larger in size than bacteria and viruses, and can form a protective coat, which makes them resistant to treatment and environmental decay.

To date, *Cryptosprodium parvum* is the only *Cryptosporidium* species known to cause disease in humans. It causes gastrointestinal disorders. There have been some waterborne disease outbreaks related to *Cryptosprodium parvum.* The illness may become chronic and severe in people with weakened immune systems. A human feeding study using health volunteers showed that 132 oocysts would infect 50% of the population (DuPont, et. al., 1995).

Cryptosprodium parvum oocysts are from 4 to 6 µm in size, and resistant to disinfection with chlorine. Filtration has been found to be effective in removing the protozoan (AWWA, 1999).

The average number of oocysts per 100 liters from seven different references has been reported (National Research Council, 1998). These numbers are shown in Table K-1 below:

Table K-1. Reported Levels of Total Coliform Microorganisms and *Cryptosprodium parvum* oocysts in Untreated Wastewater

Reference	Total Coliforms	*Cryptosprodium* oocysts
Occoquan, Virginia	2.4×10^7	1484
St. Petersburg, FL	8.2×10^7	1500
South Africa	2.46×10^5	NT
Tampa, FL	NT	30
California	NT	NT
San Diego	NT	2×10^2
Denver	8×10^5	100
NT: Not tested		
Source: National Research Council, 1998.		

Table K-2 shows the results of a study by Rose and Carnahan (1992). The numbers represent the arithmetic means of *Cryptosprodium parvum* oocysts in different treated waters. This study was performed at the Northeast Reclamation Facility in St. Petersburg, Florida (Rose and Carnahan, 1992).

Table K-2. Average values of *Cryptosprodium* oocysts

Type of Water	Arithmetic mean of organisms (cycts/100L)
Raw Water	1.5×10^3
Secondary Treatment	1.0×10^2
Secondary treatment with filtration	2.1
Reclaimed water with disinfection	0.82
Reclaimed water from storage tank	0.75
Source: Rose and Carnahan, 1992.	

Haas *et al*. (1996) estimated a maximum safe daily intake of *Cryptosprodium* of 3×10^{-5} organisms /L based on dose-response information developed from human exposure to *Cryptosprodium* oocycts, and assuming 2 L/day drinking water consumption (National Academy of Sciences, 1977). This intake was assumed as the drinking water standard not to be exceeded in the receiving media. The assumed standards for fresh and marine surface waters were adjusted to account for the reduced consumption of surface water relative to drinking water. Consumption of fresh surface water was found as 7.75 L/year assuming swimming, irrigated crop consumption, and golfing, using the exposure assumptions in Table K-3. Consumption of marine surface water was found as 4 L/year similarly, assuming consumption only during swimming. Assumed maximum concentrations are shown in the survey questionnaire.

Table K-3. Exposure to Microorganisms

Application	Receptor	Exposure Frequency	Amount of water ingestion in each exposure
Golf Course Irrigation	Golfer	Twice a week	1 ml
Crop Irrigation	Consumer	Everyday	10 ml
Recreational Impoundment	Swimmer	40 days a year (summer season only)	100 ml
Source: Tanaka, et.al. 1992			

Viruses are a large group of small infectious agents. Viruses range in size from 0.02 to 0.3 μm. Viruses depend totally on living organisms for reproduction.

Rotaviruses cause acute gastroenteritis. rotavirus infections in children are especially severe, and are the cause of many infant deaths in developing countries (AWWA, 1999). Rotaviruses spread by fecal-oral transmission and have been found in municipal wastewater, lakes, rivers, groundwater and tap water (Gerba et. al., 1996).

Safe concentrations of rotavirus in drinking water were calculated assuming a maximum of 10^{-4} infections/cap-year, and the beta-Poisson dose response function of Haas et al. (1999). Water consumption for drinking water, fresh surface water, and marine surface water were calculated as for cryptosporidium. Assumed maximum concentrations are shown in the survey questionnaire.

Arsenic (As) is a trace dietary requirement and present in a variety of food products. Surveys suggest that daily adult intakes of arsenic is about 50 μg/L (AWWA, 1999). However, in excessive amounts, arsenic causes acute gastrointestinal and cardiac damage. Extrapolations from animal studies, the safe daily intake has been calculated to be between 12 to 40 μg/L (Uthus, 1994). Arsenic in drinking water has also been found to cause skin, bladder and lung cancer (AWWA, 1999). USEPA has classified arsenic as a human carcinogen (EPA, 1985). The MCL for arsenic has been determined to be 50 μg/L. the MCLG (maximum contaminant level goal) is 0 to 23 μg/L (Pontius *et. al.* 1994).

Total Kjeldahl Nitrogen (TKN) has been selected as one of the constituents because it includes ammonia nitrogen, nitrate, and nitrite, and has been analyzed for.

N-Nitrosodimethylamine (NDMA) has attracted attention as a wastewater constituent recently. NDMA is identified as a carcinogen under California's Health and Safety Code Section 25249.5 and as a probable human carcinogen by the U.S. EPA.

N-Nitrosodimethylamine is a volatile, yellow, oily liquid of low viscosity. It is soluble in water, alcohol, ether and other organic solvents and lipids. The compound is sensitive to light, especially ultraviolet light and undergoes relatively rapid photolytic degradation. Nitrosodimethylamine is combustible and when heated to decomposition, it emits toxic fumes of nitrogen oxides. It is incompatible with strong oxidizers and strong bases (NTP, 1998).

NDMA is used primarily in research, but has had prior use in the production of 1,1-dimethylhydrazine for liquid rocket fuel, and as a nematocide, a plasticizer for rubber, an ingredient in polymers and copolymers, a component of batteries, a solvent, an antioxidant, and a lubricant additive. NDMA was reported to be present in a variety of foods, beverages, and drugs, and in tobacco smoke; it has been detected as an air pollutant, and in treated industrial wastewater, treated sewage in proximity to a 1,1-dimethylhydrazine manufacturing facility, deionized water, high nitrate well water, and chlorinated drinking water (NTP, 1998).

Analytical methods able to detect NDMA at very low levels are not readily available; only a few laboratories are capable of detecting NDMA at very low concentrations. Further, certain aspects of collection, holding and preservation of samples may influence NDMA analyses. This, too, adds uncertainties to the interpretation of analytical results at very low NDMA concentrations. DHS is working with laboratories to improve the reliability and reproducibility of analytical results for NDMA at these low levels (NTP, 1998).

Pharmaceutically active substances (PAS) are another emerging consituent of concern in water and wastewater. For example, endocrine disrupters have recently been the focus of active research to identify active substances and their toxicity. The Florida DEP is planning to conduct tests of the occurrence of PASs in wastewater effluent.

OCEAN OUTFALLS

Initial dilution factors in the four Southeast Florida outfalls are tabulated below, taken from the SEFLOE report (Hazen and Sawyer, 1994). Initial dilution values represent the ratio of ocean water to effluent in the surfacing boil.

Table K-4. Summary of Initial Dilution Parameters - Broward Outfall

No	Date	Time	Dilution Factor	Flow (m^3/s)	Current Velocity (cm/s)
1	12/09/91	11:30	56.8	1.84	34.5
2	01/22/92	12:00	33.0	1.63	16.1
3	01/30/92	11:56	14.8	2.12	8.9
4	03/24/92	11:50	31.0	1.46	9.4
5	04/13/92	12:20	25.0	1.87	8.4
6	04/22/92	10:45	22.5	1.61	16.6
7	02/11/92	18:39	84.0	2.06	25.5
8	02/12/92	00:16	67.8	1.83	25.5
9	02/12/92	06:59	32.0	2.05	14.5
10	02/12/92	11:29	58.9	1.52	11.4
Note: No.1 to No.6 are from salinity studies; No.7 to No.10 are from dye studies. Current speeds were measured at a depth of 13.7 m for No. 2 and 3, and 17.1m for the rest.					

Table K-5. Summary of Initial Dilution Parameters - Hollywood Outfall

No	Date	Time	Dilution Factor	Flow (m^3/s)	Current Velocity (cm/s)
1	11/07/91	10:40	24.5	1.71	24.6
2	12/10/91	10:20	27.2	1.53	27.0
3	12/12/91	10:30	45.2	1.36	40.1
4	01/29/92	10:40	15.1	1.45	8.5
5	06/02/92	09:45	16.7	1.36	10.2
6	06/09/92	10:10	15.9	1.05	9.8
7	07/09/92	09:40	31.4	1.75	24.6
8	09/24/91	11:37	36.5	1.93	23.4
9	09/24/91	18:07	31.6	1.66	31.4
10	02/09/92	11:34	35.2	1.42	16.6
11	02/09/92	13:02	26.2	1.47	19.9
12	02/09/92	16:25	19.3	1.42	15.0
13	02/09/92	19:43	30.1	1.45	14.5
14	02/09/92	21:08	36.7	1.40	15.5
15	02/09/92	23:56	54.8	1.31	17.7
16	02/10/92	03:11	63.3	1.14	16.6
17	02/10/92	04:14	67.8	0.96	17.7
18	02/10/92	05:59	63.0	0.88	17.7
19	02/10/92	06:54	55.0	1.15	17.7
Note: No.1 to No.7 are from salinity studies; No.8 to No.19 are from dye studies. Current speeds were measured at a depth of 13.2 m for No. 1-3, 6.5 m for No. 8 and 9, and 16.5m for the rest.					

Table K-6. Summary of Initial Dilution Parameters - Dade - North Outfall

No	Date	Time	Dilution Factor	Flow (m^3/s)	Current Velocity (cm/s)
1	09/04/91	12:40	51.7	4.47	44.7
2	09/06/91	11:10	31.1	4.31	23.5
3	01/15/91	13:50	49.1	3.90	12.6
4	05/27/92	11:56	47.7	3.80	12.3
5	09/18/91	10:52	49.3	5.03	15.7
6	09/18/91	11:31	44.1	5.06	15.9
7	09/18/91	16:15	22.9	4.83	7.7
8	09/18/91	16:59	19.0	4.91	7.7
9	09/18/91	20:34	27.5	5.16	8.3
10	09/18/91	21:30	28.0	4.89	10.6
11	09/19/91	01:34	27.5	3.82	9.7
12	09/19/91	02:21	32.8	3.31	9.7
13	02/03/92	11:39	54.6	4.56	12.5
14	02/03/92	13:15	54.6	3.88	11.7
15	02/03/92	15:17	49.7	3.94	10.8
16	02/03/92	16:49	46.7	3.94	11.3
17	02/03/92	19:28	72.0	4.25	10.7
18	02/03/92	21:51	60.0	3.99	9.8
19	02/04/92	01:42	65.5	2.83	10.7
20	02/04/92	03:08	72.0	2.33	10.7
21	02/04/92	05:24	65.5	2.50	10.7
22	02/04/92	08:19	31.7	4.50	8.9
23	02/04/92	09:55	47.5	4.29	9.8
Note: No.1 to No.4 are from salinity studies; No.5 to No.23 are from dye studies. Current speeds were measured at a depth of 6.5 m for No. 1,2 and 5-12, 13.6 m for No. 3 and 13-23, and 17.1m for No. 4					

Table K-7. Summary of Initial Dilution Parameters - Dade - Central Outfall

No	Date	Time	Dilution Factor	Flow (m^3/s)	Current Velocity (cm/s)
1	12/04/91	13:20	24.4	5.97	14.3
2	01/21/92	12:20	20.9	6.42	19.4
3	05/05/92	11:00	29.3	5.70	16.4
4	05/21/92	11:30	44.7	5.04	28.1
5	06/03/92	11:30	13.7	6.81	7.2
6	06/18/92	11:20	42.0	6.44	52.5
7	07/07/92	12:00	18.6	6.29	30.8
8	07/28/92	11:00	18.1	6.32	6.8
9	02/07/92	10:13	30.0	6.21	16.6
10	02/07/92	11:11	25.8	6.52	18.7
11	02/07/92	13:55	39.3	6.92	18.7
12	02/07/92	14:55	15.5	6.61	18.9
13	02/07/92	18:08	19.0	6.19	21.0
14	02/07/92	19:17	24.7	6.05	20.0
15	02/07/92	22:59	20.0	6.10	20.5
16	02/07/92	23:55	29.7	6.05	21.0
17	02/08/92	03:01	29.7	4.53	18.7
18	02/08/92	04:37	43.1	4.68	15.5
19	02/08/92	07:18	25.3	4.64	14.5
20	02/08/92	08:40	19.0	5.69	13.5
Note: No.1 to No.8 are from salinity studies; No.9 to No.20 are from dye studies. Current speeds were measured at a depth of 16.8 m					

Chronic water parameters such as chlorine and certain metal concentrations are based on 4-day average concentration exposure. For chronic exposure the dilution factors in Table K-6 might be used. Table 8 has been adopted from SEFLOE report (Hazen and Sawyer, 1994).

Table K-8. Flux-Averaged Initial Dilution

Outfall	Flow (m^3/s)	4-day avg. current velocity (cm/s)	Flux-avg. Initial Dilution
Broward	2.89	15.7	43.3:1
Hollywood	2.37	13.7	28.4:1
Dade-North	5.52	13.2	50.1:1
Dade-Central	7.89	13.6	28.3:1

For subsequent dilution in the farfield, the plot from SEFLOE report shown below might be used.

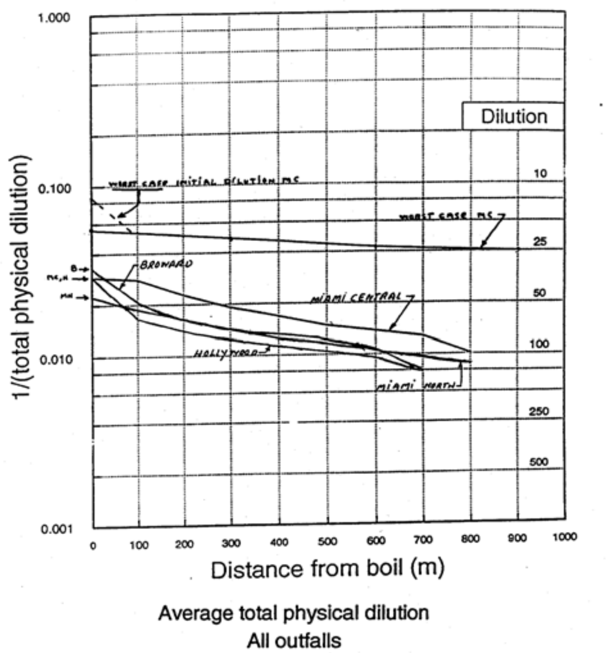

Figure K-1. Average Total Physical Dilution At All Outfalls

INJECTION WELLS

Information about the aquifer systems in Southeast Florida has been adapted from the presentation of Mr. Vince Amy.

Upper Floridan Aquifer:

Permeable Zones in the Tampa, Suwanee and Ocala Limestones and in the upper part of the Avon Park Formation. Formed by limestone; permeability has been enhanced by dissolution. Transmissivity estimated to range from 10,000 to 60,000 feet squared per day (74,800 to 448,00 gallons per day per foot). Approximate depth: 900 to 1500 feet. (General) Contains brackish water under pressure; wells flow naturally. Salinity increases with depth. Confined by clay and silt beds present in the overlying Hawthorn Formation. Ground-water flow is towards the coast to offshore discharge areas at depths of +/- 1000 feet.

Floridan Aquifer System - Middle Confining Unit

Formed by the lower part of the Avon Park Formation and, locally, parts of the upper Oldsmar Formation. Generally occurs between 1500 and 3000 feet +/- in the study area. The term "confining unit" is to a degree a misnomer; as it contains units that have low and relatively high permeability. In general it has an overall lower permeability than the overlying upper Floridan and the underlying lower unit. Composed of limestone and dolomite; the dolomite is a secondary feature created by the alteration of the original limestone. Salinity of the ground water ranges from brackish in the upper portion of the unit to saline (seawater composition) and occurs at a depth of 1700 to 2000 feet (approx). Regionally, the nature of this unit has the greatest amount of information available, as it is the unit forming the confining sequence for the underlying injection zone. Permits for construction and testing on injection wells include specific requirements for identifying a "confining bed" (sequence is a more meaningful term) and collecting information on the permeability of these units.

Floridan Aquifer - Middle Confining Unit - Properties

Depth covered: 1360 to 2993 feet
Information vertical and horizontal permeability and porosity.
Vertical permeability: (values in cm/sec.)
- Mean: 0.000283
- Median: 0.000046
- Standard Deviation: 0.0007146
- Minimum: 9.66E-10
- Maximum: 0.005

Porosity: (values as decimal fraction of 1)
- Mean: 0.317
- Median: 0.33
- Standard Deviation: 0.091
- Minimum: 0.034
- Maximum: 0.45

Horizontal Permeability: (values in cm/sec)
- Mean: 0.000256
- Median: 0.000074
- Standard Deviation: 0.000582
- Minimum: 2.5E-09
- Maximum: 0.004

Floridan Aquifer System - Lower Unit

Formed by the lower part of the Oldsmar Formation. Consists primarily of massive to cavernous, highly permeable dolomite (secondary). This system is present throughout southern peninsular Florida; known as the Boulder Zone. Cavities range from inches to feet in size; system is interconnected, giving rise to high transmissivity. Forms the disposal zone for treated sewage effluent because of its high transmissivity. Water present in the Boulder Zone has the same chemical composition as seawater. The water is cold (comparatively); near the coast temperatures of 50 degrees F have been observed. The water warms with increasing distance inland. Water levels in wells tapping the zone are influenced by tidal fluctuations; at West Palm Beach changes of approximately 0.8 occur. Tidal influences mask pressure effects from injection making it difficult to determine accurate transmissivity values for the zone. Transmissivity values from 3.2 to 24.6 million gallons per sq. ft/day have been calculated. Ground-water flow in the Boulder Zone is towards the west, with a northerly component. Age dating of the water using measurements of uranium isotopes show that Boulder Zone water inland is older than that present at the coast. The flow of ground water in the Boulder Zone is best described as conduit or fracture flow because of the cavernous nature of the Zone.

The casings in an injection well have been shown in Figure K-2.

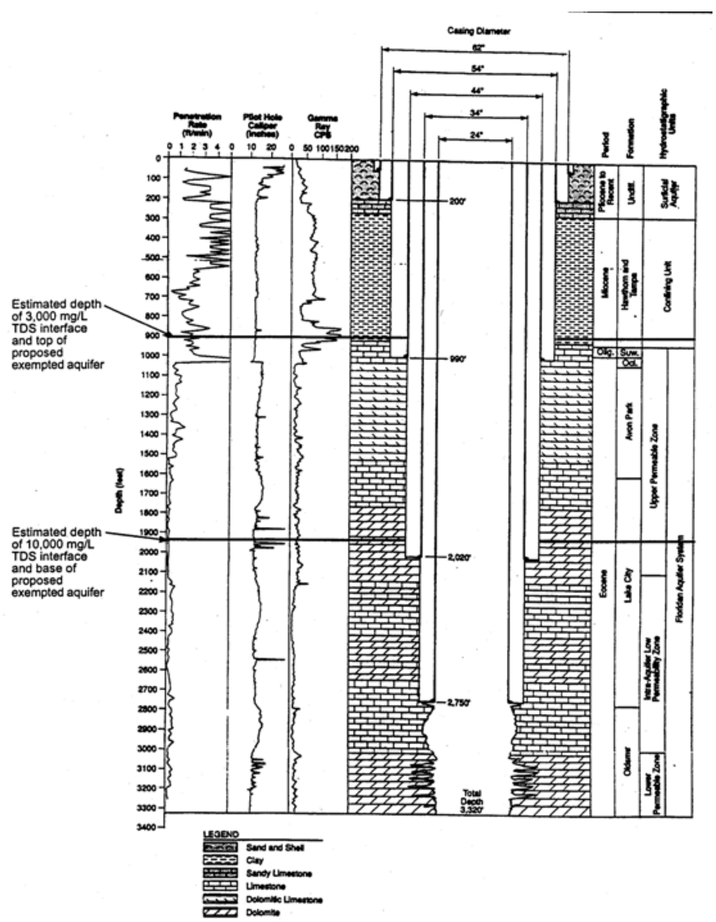

Figure K-2. Well Profile (Seacoast Injection Well)

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APPENDIX L. SUMMARY OF MODIFIED DELPHI RESULTS, ASSESSED BELIEVED PROBABILITIES, AND FULL BELIEVED PROBABILITY DISTRIBUTIONS

Table L-1. Input and Results of the Predictive Bayesian Compound Poisson Risk Assessment

	Constituent	Total Believed Violation Days (Predictive Bayesian Assessment)						Number of Events in 30 Years		Duration of Events		Number of Events in 30 Years		Duration of Events	
		Mean	St. Dev.	Max.	Min.	Median	95% Exceed-ance level	Delphi	Believed	Delphi	Believed	Delphi	Believed	Delphi	Believed
Deep Well Injection								1.n.1.2.1.1							
	Arsenic	1.0286	65.3732	7953	0	0	0	0.00358	0.0262	1.17	27.9021				
	Microbial	0.1014	10.3027	1434	0	0	0	0.00178	0.0099	2.385	24.0464				
	NDMA	0.4581	24.7593	2548	0	0	0	0.00542	0.0372	15.9324	28.114				
								1.n.1.2.1							
	TKN (canal)	10.6672	194.341	9098	0	0	1.7955	0.09869	0.5403	14.19	48.0708				
								1.1 to 1.n.1.1				1.n.1 to 1.n.1.1			
	TKN (Biscayne)	0.000013	0.0013	0.1322	0	0	0	5.7E-6	0.0001	0.6545	11.4352	4.9E-7	0	0.37	7.5657
Ocean Outfall								2.1 to 2.n.3				2.2 to 2.n.3			
	Arsenic	13.2365	234.934	8736	0	0	1.6584	0.001	0	0.2593	3.0091	0.097	0.6123	0.7860	15.9274
	Microbial	50.2852	487.0291	9884	0	0.2259	36.4245	0.0153	0.0817	2.3956	44.4526	1.1247	6.66736	8.9406	58.5455
	NDMA	27.4743	315.151	9495	0	0	18.7566	0.1431	0.7941	0.8524	15.2301	0.6178	3.453	4.2317	40.0536
								2.1 to 2.n.2				2.2 to 2.n.2			
	TKN	40.5736	390.0292	9505	0	0.1093	34.6846	0.2817	1.5818	1.16	19.9891	0.358	2.06	1.5449	54.9021
								2.1 to 2.n.3				2.2 to 2.n.3			
	TKN (cont)							0.0521	0.2819	0.786	17.481	0.6381	3.8787	1.9422	30.8669
Surficial Aquifer Recharge								3.2.1							
	Arsenic	0.2886	27.4651	3234	0	0	0	0.0022	0.0015	1.6030	50.1563				
	Microbial	4.9487	138.9557	9397	0	0	0.2346	0.0191	0.1069	3.354	47.4834				
	NDMA	35.4112	370.6057	9972	0	0	13.2833	0.3798	1.0829	71.57	94.0215				
								3.1							
	TKN (canal)	144.6415	689.4461	9991	0	5.7259	507.4601	20.031	113.8345	12.09	47.453				
								3.2							
	TKN (shallow wells)	134.2676	684.2778	9992	0	4.3425	426.6599	1.18	86.4711	3.915	49.6224				

Deep Well Injection
Human Consumption Arsenic

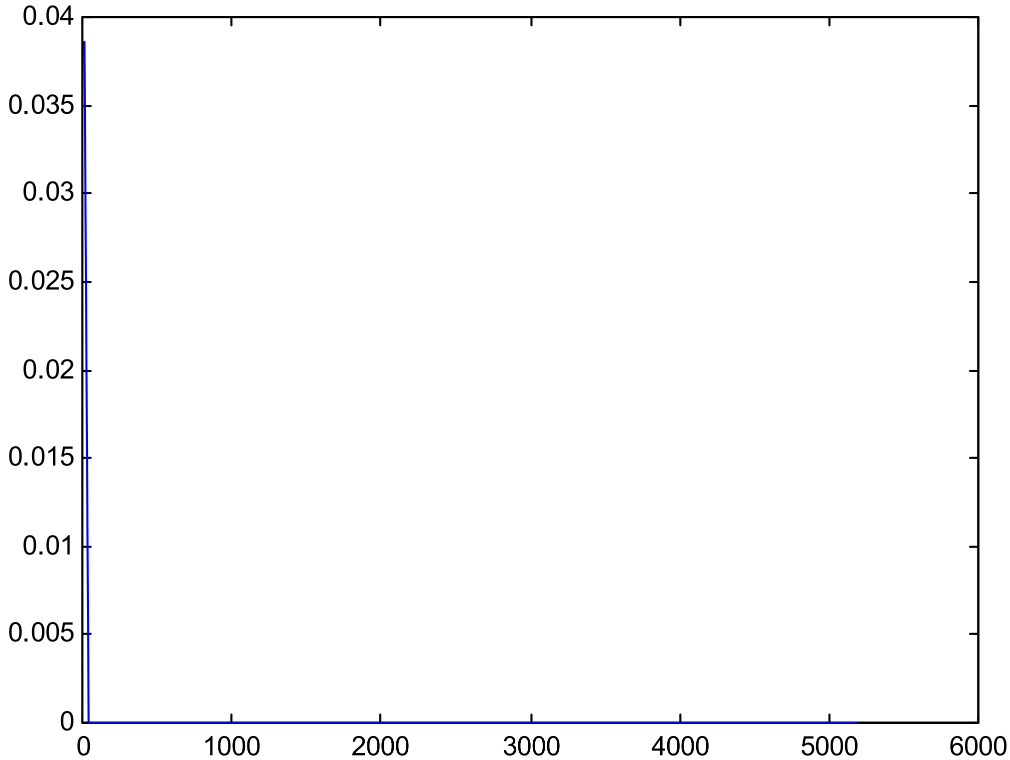

Figure L-1. PDF of Deep Well Injection Human Consumption Risk for Arsenic

<u>Distribution Parameters</u>

Mean = 1.0286
Standard Deviation = 65.3732
Maximum = 7.9529e+003
Minimum = 0
Median = 0
95 % = 0

Deep Well Injection
Human Consumption Microbial

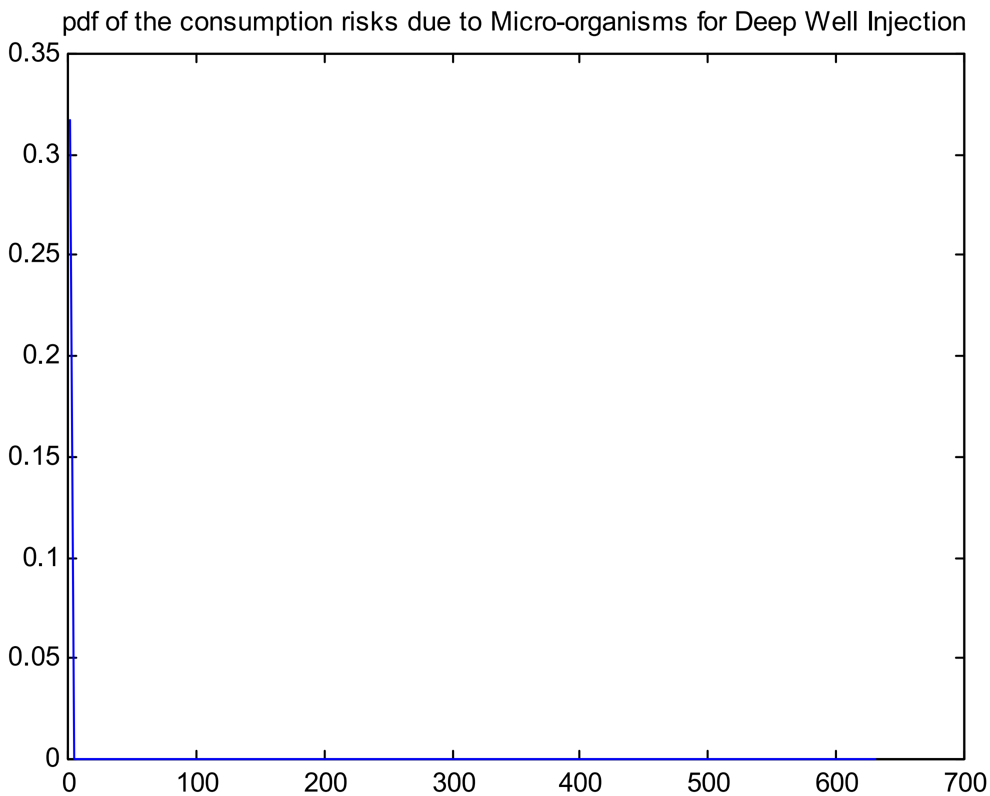

Figure L-2. PDF of Deep Well Injection Human Consumption Risk for Microbes

Distribution Parameters

Mean = 0.1014
Standard Deviation = 10.3027
Maximum = 1.4341e+003
Minimum = 0
Median = 0
95 % = 0

Deep Well Injection
Human Consumption NDMA

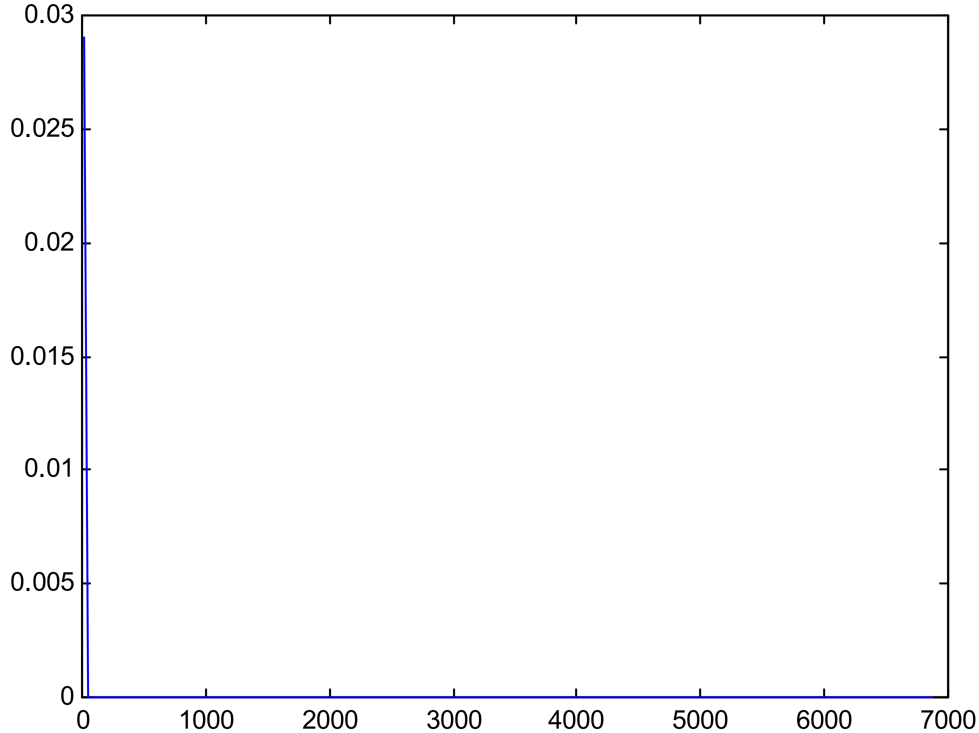

Figure L-3. PDF of Deep Well Injection Human Consumption Risk for NDMA

Distribution Parameters

Mean = 0.4581
Standard Deviation = 24.7593
Maximum = 2.4577e+003
Minimum = 0
Median = 0
95 % = 0

Deep Well Injection
Ecological Canals TKN

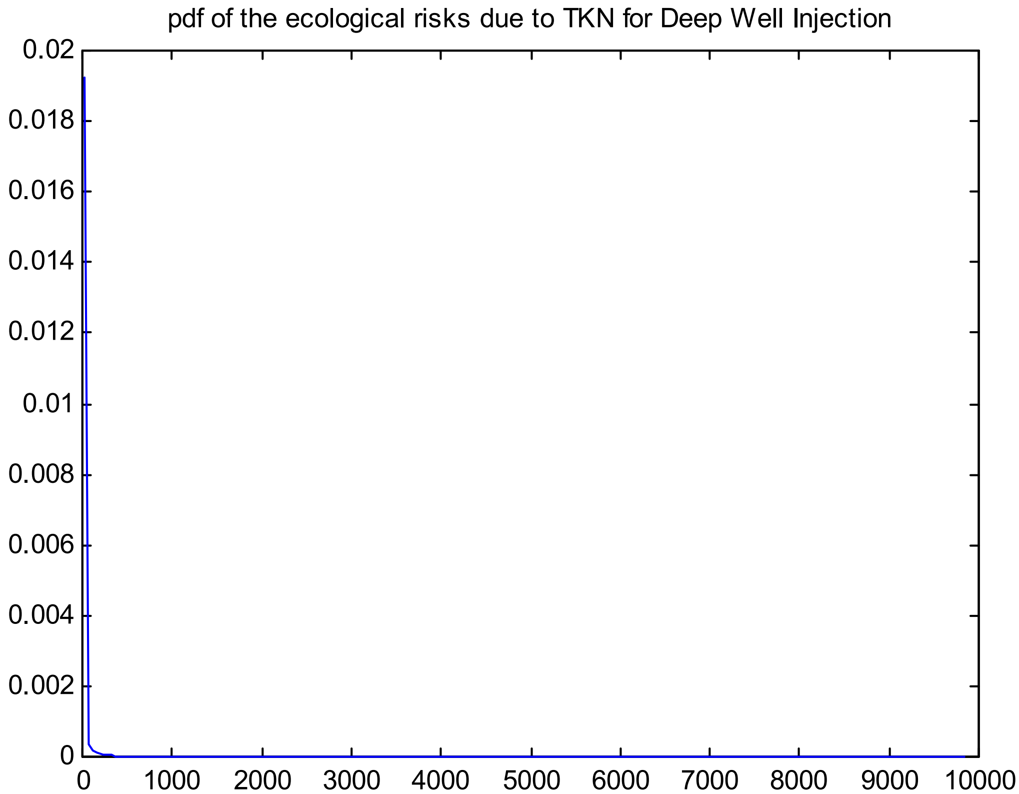

Figure L-4. PDF of Deep Well Injection Ecological Risk for TKN

Distribution Parameters

Mean = 10.6672
Standard Deviation = 194.3410
Maximum = 9.0978e+003
Minimum = 0
Median = 0
95 % =1.7955

Deep Well Injection
Ecological Biscayne Aquifer TKN

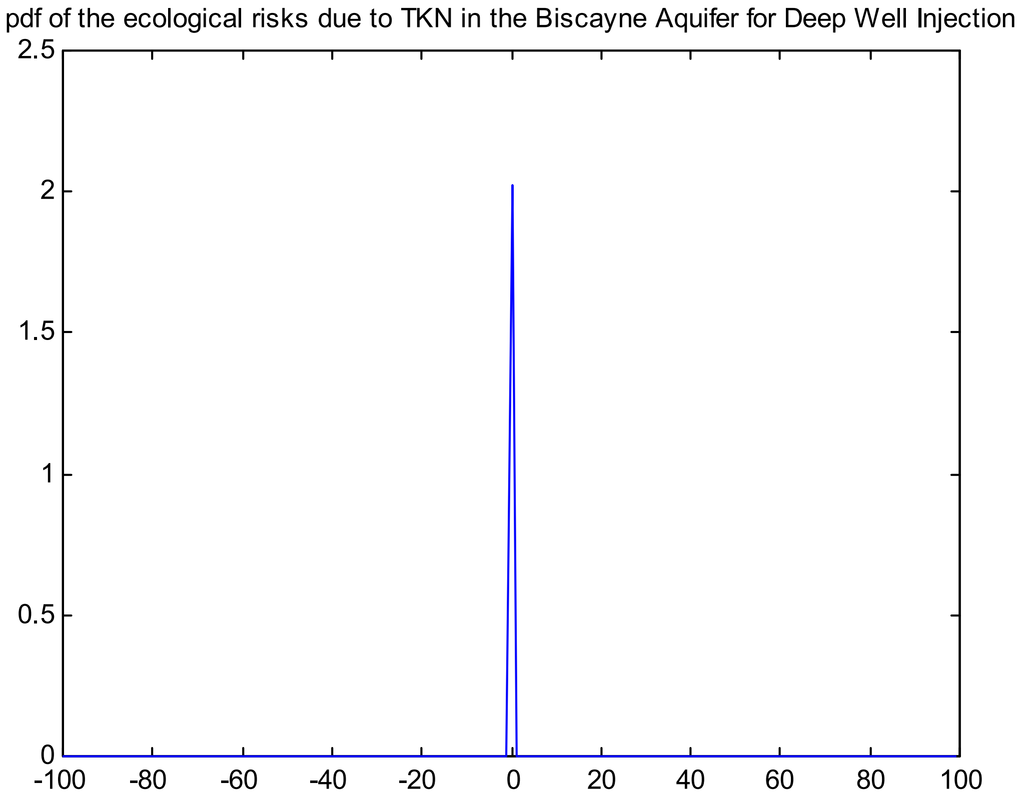

Figure L-5. PDF of Deep Well Injection Ecological Risk for TKN at Biscayne Aquifer

Distribution Parameters

Mean = 0
Standard Deviation = 0
Maximum = 0
Minimum = 0
Median = 0
95 % = 0

Ocean outfall
Human Consumption Arsenic

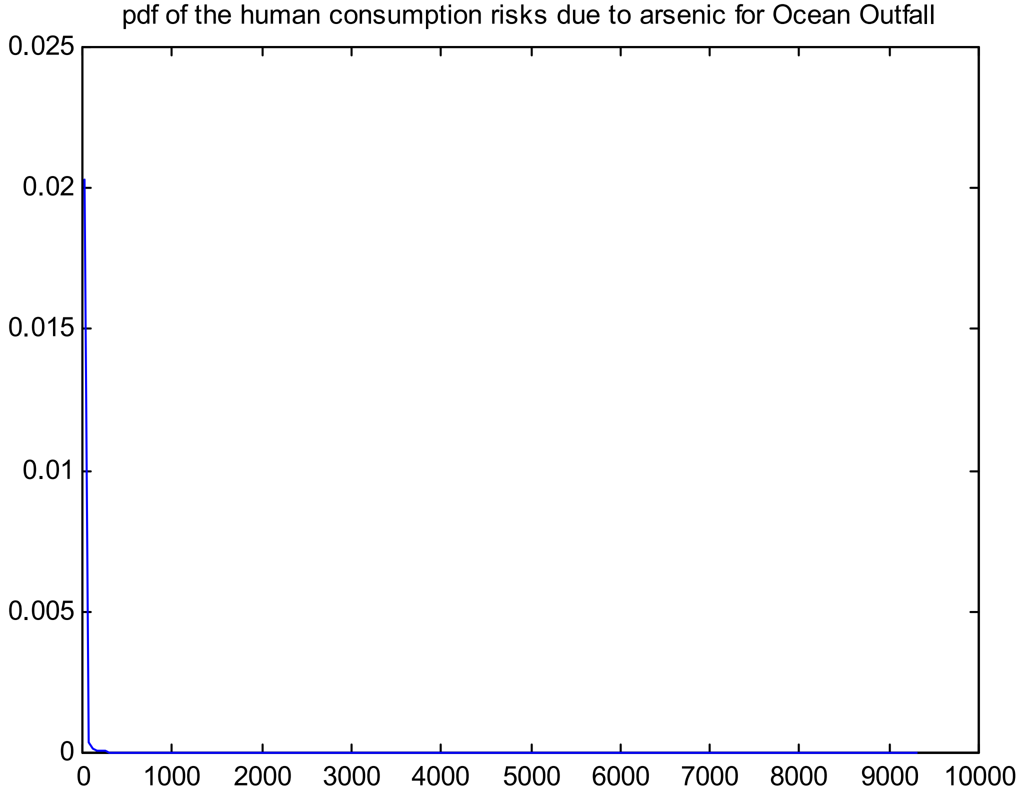

Figure L-6. Ocean Outfall Human Consumption Risk for Arsenic

Distribution Parameters

Mean = 13.2365
Standard Deviation = 234.9340
Maximum = 8.7361e+003
Minimum = 0
Median = 0
95 % = 1.6584

Ocean outfall
Human Consumption Microbial

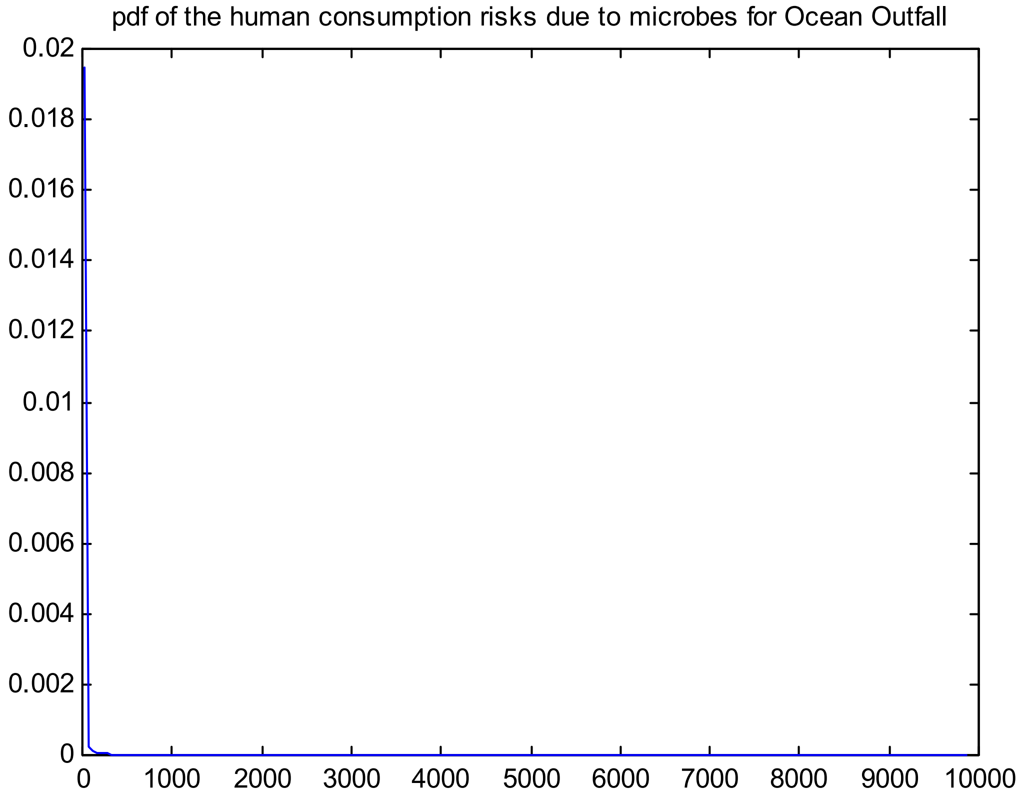

Figure L-7. Ocean Outfall Human Consumption Risk for Microbes

<u>Distribution Parameters</u>

Mean = 50.2852
Standard Deviation = 487.0291
Maximum = 9.8837e+003
Minimum = 0
Median = 0.2259
95 % = 36.4145

Ocean outfall
Human Consumption NDMA

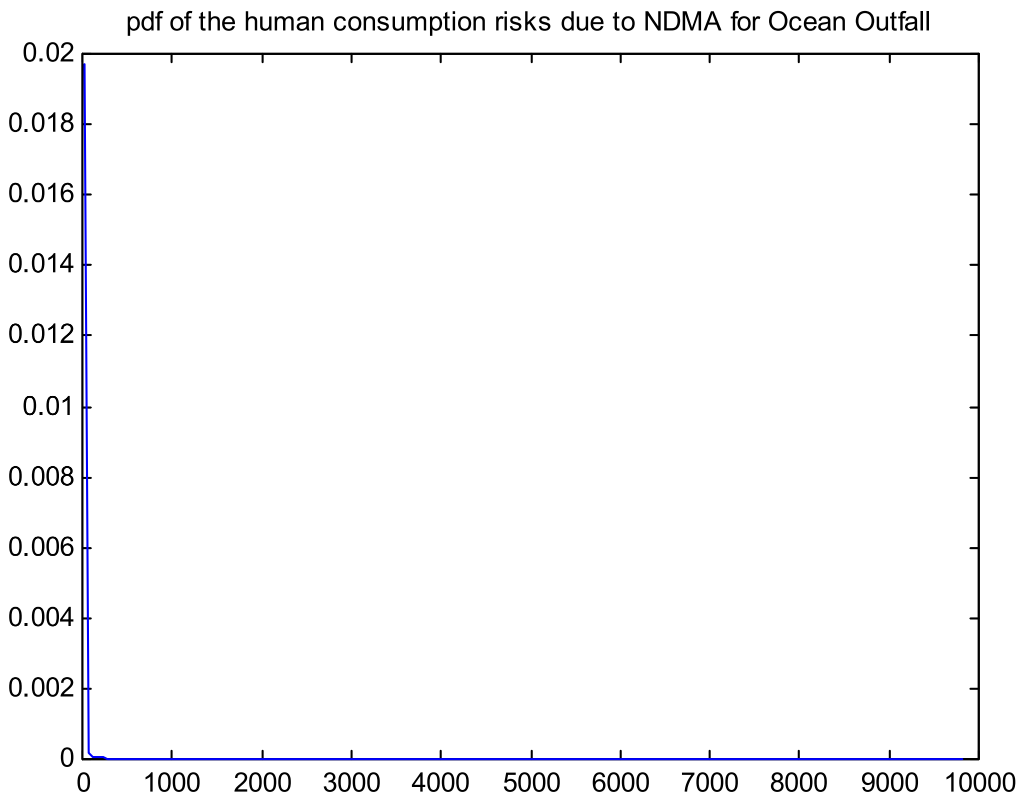

Figure L-8. Ocean Outfall Human Consumption Risk for NDMA

Distribution Parameters

Mean = 27.4743
Standard Deviation = 315.1510
Maximum = 9.4950e+003
Minimum = 0
Median = 0
95 % = 18.7566

Ocean outfall
Ecological TKN

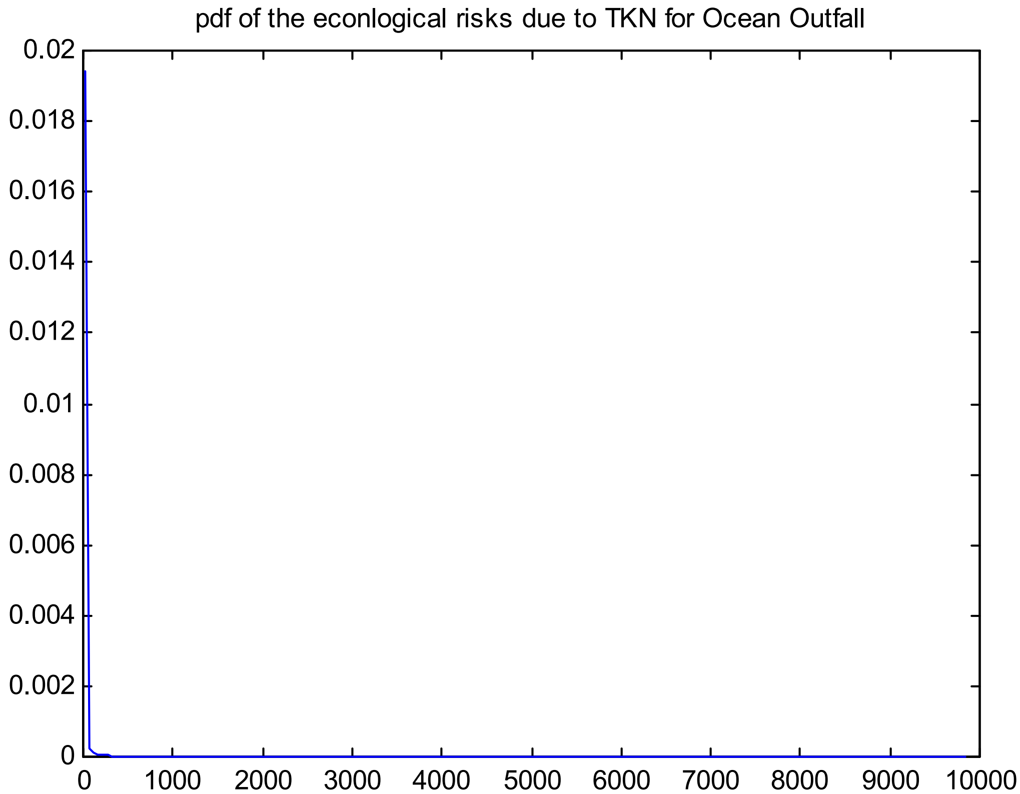

Figure L-9. Ocean Outfall Ecological Risk for TKN

<u>Distribution Parameters</u>

Mean = 40.5736
Standard Deviation = 390.0292
Maximum = 9.5053e+003
Minimum = 0
Median = 0
95 % = 34.6846

Surficial Aquifer recharge
Human Consumption Arsenic

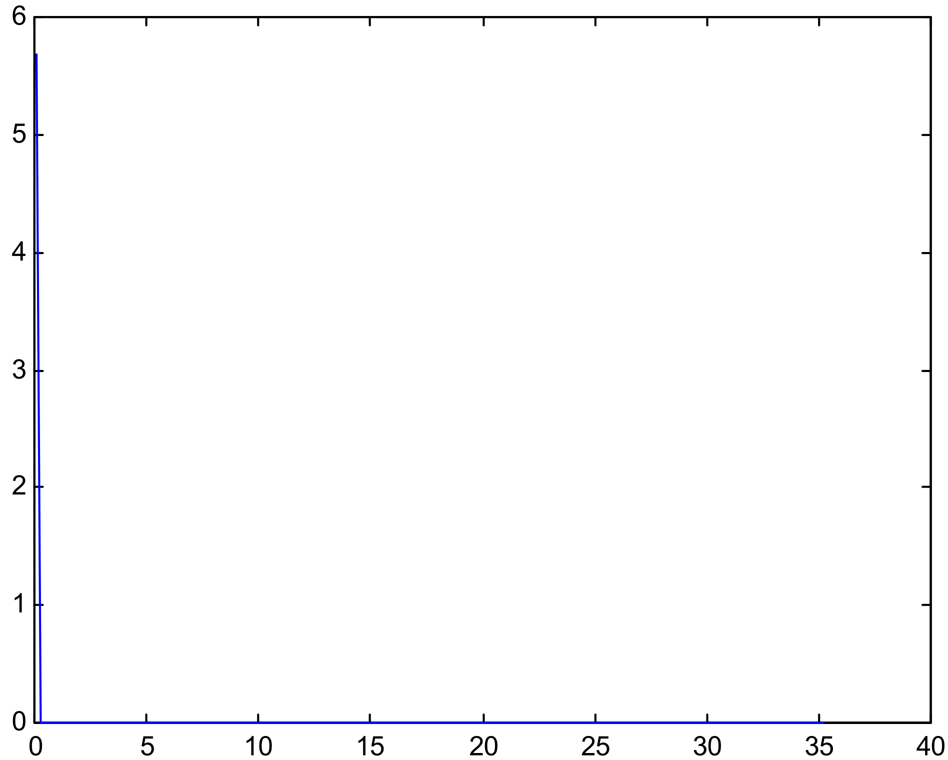

Figure L-10. PDF of Surficial Aquifer recharge Human Consumption for Arsenic

Distribution Parameters

Mean31 = 0.2886
Standard Deviation31 = 27.4651
Maximum31 = 3.2336e+003
Minimum31 = 0
Median = 0
95 % = 0

Surficial Aquifer recharge
Human Consumption Microbial

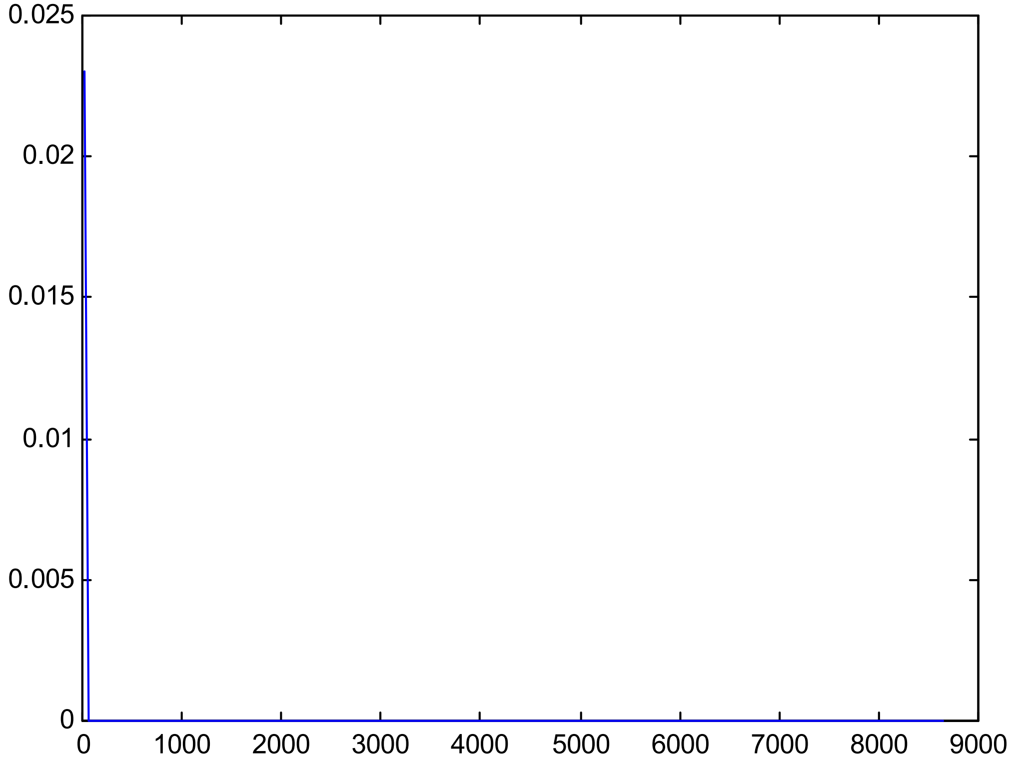

Figure L-11. PDF of Surficial Aquifer recharge Human Consumption for Microbes

Distribution Parameters

Mean31 = 4.9487
Standard Deviation31 = 138.9557
Maximum31 = 9.3968e+003
Minimum31 = 0
Median = 0
95 % = 0.246

Surficial Aquifer recharge
Human Consumption NDMA

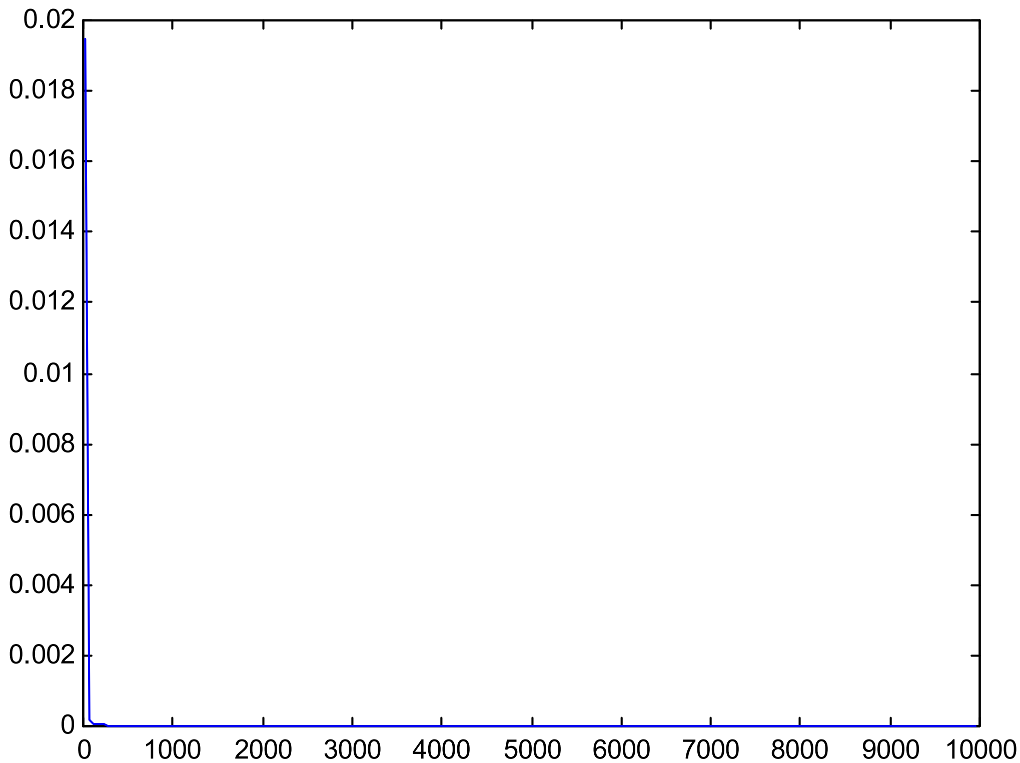

Figure L-12. PDF of Surficial Aquifer recharge Human Consumption for NDMA

Distribution Parameters

Mean31 = 35.4112
Standard Deviation31 = 370.6057
Maximum31 = 9.9721e+003
Minimum31 = 0
Median = 0
95 % =13.2833

Surficial Aquifer recharge
Ecological Canals TKN

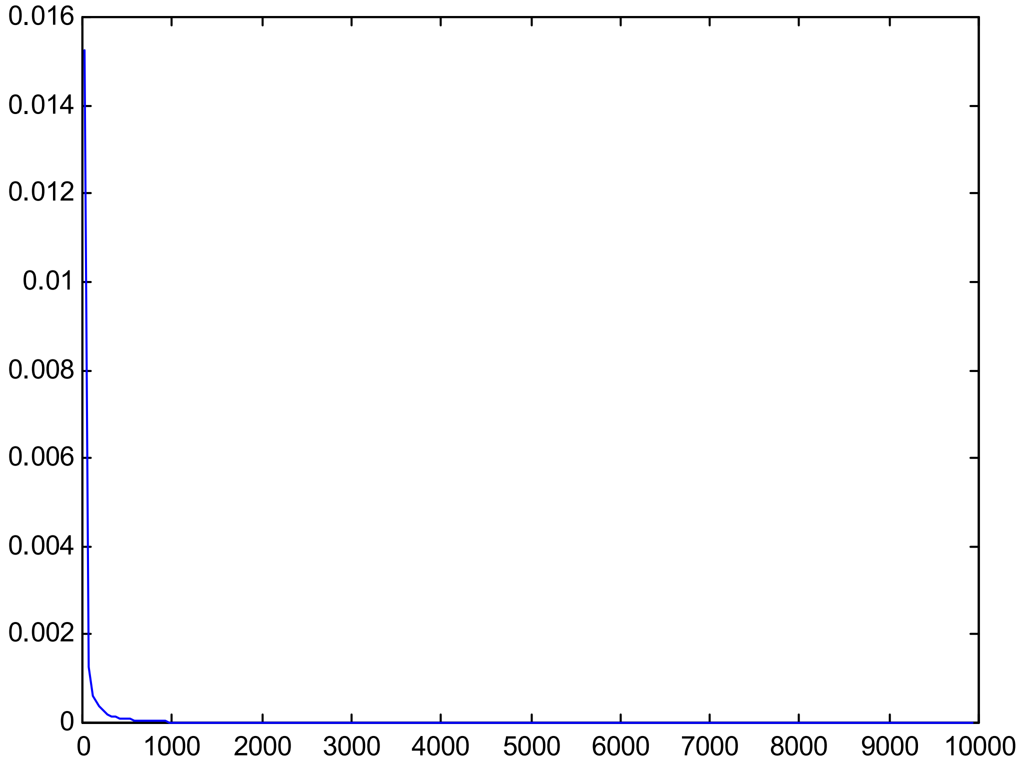

Figure L-13. PDF of Surficial Aquifer recharge Ecological Risk in Canals for TKN

Distribution Parameters

Mean11 =144.6415
Standard Deviation11 = 689.4461
Maximum11 = 9.9910e+003
Minimum11 = 0
Median = 5.7259
95 % = 507.4601

Surficial Aquifer recharge
Ecological Shallow Wells TKN

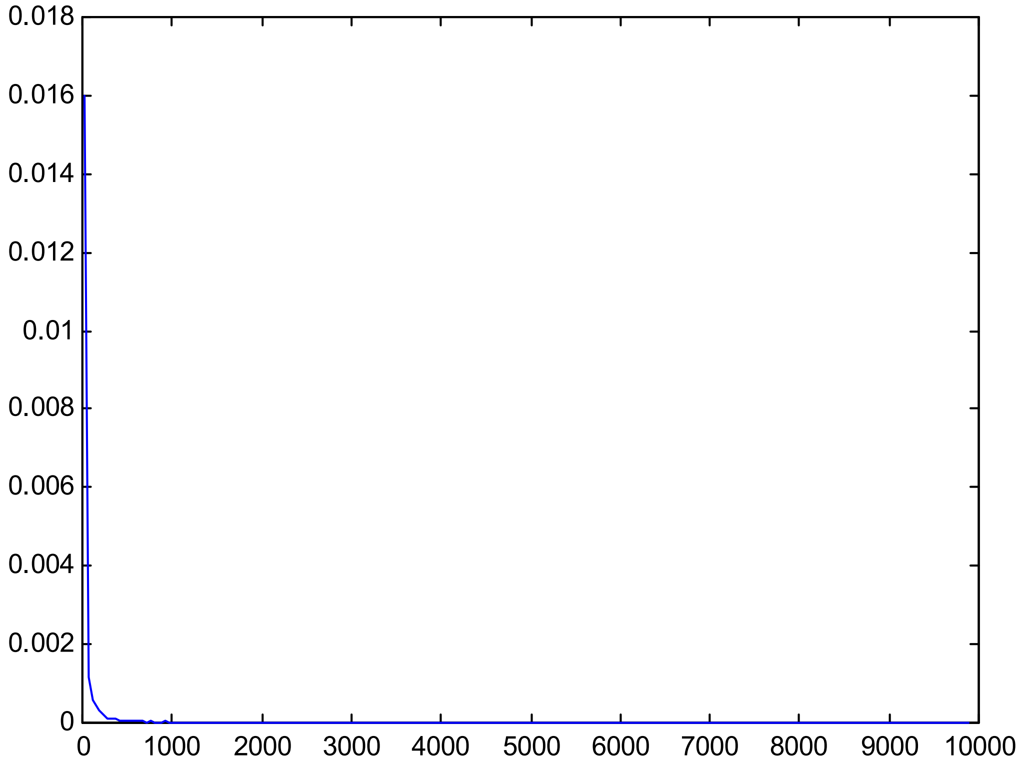

Figure L-14. PDF of Surficial Aquifer recharge Ecological Risk in Shallow Wells for TKN

<u>Distribution Parameters</u>

Mean21 =134.2676
Standard Deviation21 = 684.2778
Maximum21 = 9.9920e+003
Minimum21 = 0
Median = 4.3425
95 % = 426.6599