Special Publication SJ98-SP11

Central Florida Artificial Recharge Demonstration Program:
Alternative Water Supply Strategies in the St. Johns River Water Management District

by

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St. Johns River Water Management District
Palatka, Florida

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EXECUTIVE SUMMARY

The St. Johns River Water Management District (SJRWMD) in association with its water supply planning effort conducted an Alternative Water Supply Strategy Investigation. As part of that investigation, SJRWMD evaluated the feasibility of increasing the flow of surface water to the Floridan aquifer through drainage wells in Orange and Seminole counties. This evaluation was performed for the District by CH2M HILL pursuant to Contract #95W166A. A summary of this evaluation has been published by the District as Special Publication SJ97-SP14. The publication includes the recommendation that existing regulations should be revised to encourage net improvements in recharge water quality and increased recharge volume using drainage wells. In addition, the publication includes the recommendation that demonstration projects be designed and implemented to demonstrate the effectiveness of the net improvement concept.

This document describes such a recharge demonstration program, the Central Florida Artificial Recharge Demonstration Program. The focus of this program is to quantify the potential for bacterial contamination of the aquifer using lake water or treated stormwater as the source of recharge. The specific issues identified for investigation include

- The fate of bacteria in the Floridan aquifer
- The effectiveness of passive stormwater treatment for reducing bacteria
- The effectiveness and cost feasibility of physically reducing bacteria in lake water recharge.

The Central Florida Artificial Recharge Demonstration Program is designed to be a cooperative effort between central Florida local governments, SJRWMD, Florida Department of Environmental Protection, and the U.S. Environmental Protection Agency.

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PROJECT BACKGROUND

The St. Johns River Water Management District (SJRWMD) previously evaluated the potential impacts of increased ground water withdrawal through the year 2010 (Vergara 1994). Based on this evaluation, SJRWMD identified areas, known as Priority Water Resource Caution Areas (PWRCAs), where water supply problems are now critical or will become critical. Central Florida, including all of Orange and Seminole counties, is included in the PWRCAs. In these areas, future public water supply needs may not be fully met by the increased use of ground water resources without incurring unacceptable environmental impacts. These impacts include wetlands dehydration, reduced springflows, and the increased potential for saltwater intrusion. Thus, new water supply alternatives will be needed to supplement existing supplies if potential problems are to be avoided.

ALTERNATIVE WATER SUPPLY PLANNING

To address these potential problems before they become critical, SJRWMD is investigating the feasibility of several alternative water supply strategies, including artificial recharge of the Floridan aquifer. Other alternatives being considered include the increased use of surface water, the increased use of brackish ground water, additional water conservation measures, and the increased use of reclaimed water for irrigation.

ARTIFICIAL RECHARGE INVESTIGATIONS

Artificial recharge using gravity recharge (drainage) wells is a technically feasible, long established practice in central Florida, particularly in Orange and Seminole counties. Drainage wells in this area were originally constructed to provide urban drainage and lake level control; however, these wells also provide an important aquifer recharge function.

As part of SJRWMD's alternative water supply strategies investigation, CH2M HILL prepared a technical memorandum (TM) reviewing the water resource management aspects of existing central Florida drainage wells, the regulatory framework governing such wells, and the potential for increased recharge using additional wells (CH2M HILL 1997). It was found that artificial recharge through existing aquifer recharge wells is quantitatively important to central

Florida water resources as it helps minimize decreases in the potentiometric surface resulting from water supply withdrawal. Without this existing source of recharge water, aquifer drawdowns would be greater, local springflows would likely be reduced, and the potential for salt water upwelling would increase. Prevention of these adverse impacts is an important water resources management benefit of artificial recharge.

Floridan aquifer artificial recharge rates and associated water resource benefits could be increased significantly by constructing appropriate additional recharge wells. However, under current interpretation of the federal and state Underground Injection Control (UIC) Program mandate, additional recharge wells cannot be constructed unless the recharge water meets all primary and secondary drinking water standards at the wellhead. From a practical standpoint, such recharge water quality criteria are difficult and very costly to meet. Therefore, new artificial recharge wells have not been constructed in central Florida in recent years.

REPORT PURPOSE

The purpose of this report is to identify an artificial recharge demonstration program for central Florida that will answer the questions that have been identified related to the appropriate use of artificial recharge wells, including the efficacy of the current regulatory approach. Demonstration program benefits include development of data on the fate and transport of bacteria in the Upper Floridan aquifer, reduction of aquifer contamination in the demonstration area, and the opportunity for the Florida Department of Environmental Protection (FDEP) and the Environmental Protection Agency (EPA) to help implement important research. It is our hope that FDEP and EPA will provide the needed assistance and regulatory approvals to make the proposed demonstration program a reality.

THE ROLE OF ARTIFICIAL RECHARGE WELLS IN CENTRAL FLORIDA

In central Florida, drainage wells generally connect a surface water feature with the upper Floridan aquifer. Historically, their primary purpose has been to provide surface drainage and to prevent flooding in closed surface basins.

Drainage wells operate by gravity. They are technically feasible in areas where the surface water elevation is greater than the potentiometric elevation of a transmissive receiving aquifer. These conditions exist throughout much of the developed portions of central Florida, including Orlando.

The surface water source for a recharge well can be direct surface runoff, such as street or urban drainage, or indirect surface runoff, such as a lake, stormwater detention pond, or wetland outflow. By far, the most common existing drainage well applications in central Florida are street drainage and lake level control. Figure 1 (Dyer, Riddle, Mills & Precourt 1984) illustrates a typical street or urban area drainage well installation with connecting inlets. In this application, surface runoff is emplaced directly into the aquifer during and immediately after storm events. Figure 2 (Mcbee 1985) illustrates a typical recharge well installed to provide lake level control. In this application, the lake must fill to the weir inlet elevation before water enters the recharge well.

Gravity recharge wells have been used in central Florida for more than 90 years. The first recorded drainage well in the Orlando area was a 2-inch-diameter test well constructed in 1905 in an attempt to correct a flooding problem induced by a clogged sinkhole (Mcbee 1985). This experimental well proved successful because of the significant hydraulic capacity of the highly transmissive upper Floridan aquifer. Additional larger diameter drainage wells were then constructed and, by 1906, six drainage wells 8 inches and 12 inches in diameter had been constructed.

The topography of the Orlando area includes many closed hydrologic basins with no natural surface outflow. This condition, along with the naturally high transmissivity of the Floridan aquifer, made gravity recharge wells an attractive option to address urban drainage and lake level control. In many cases, no other practical option exists. Until the mid-1960s, when construction of drainage wells was halted because of concerns about aquifer contamination, drainage wells were the traditional solution to local drainage problems.

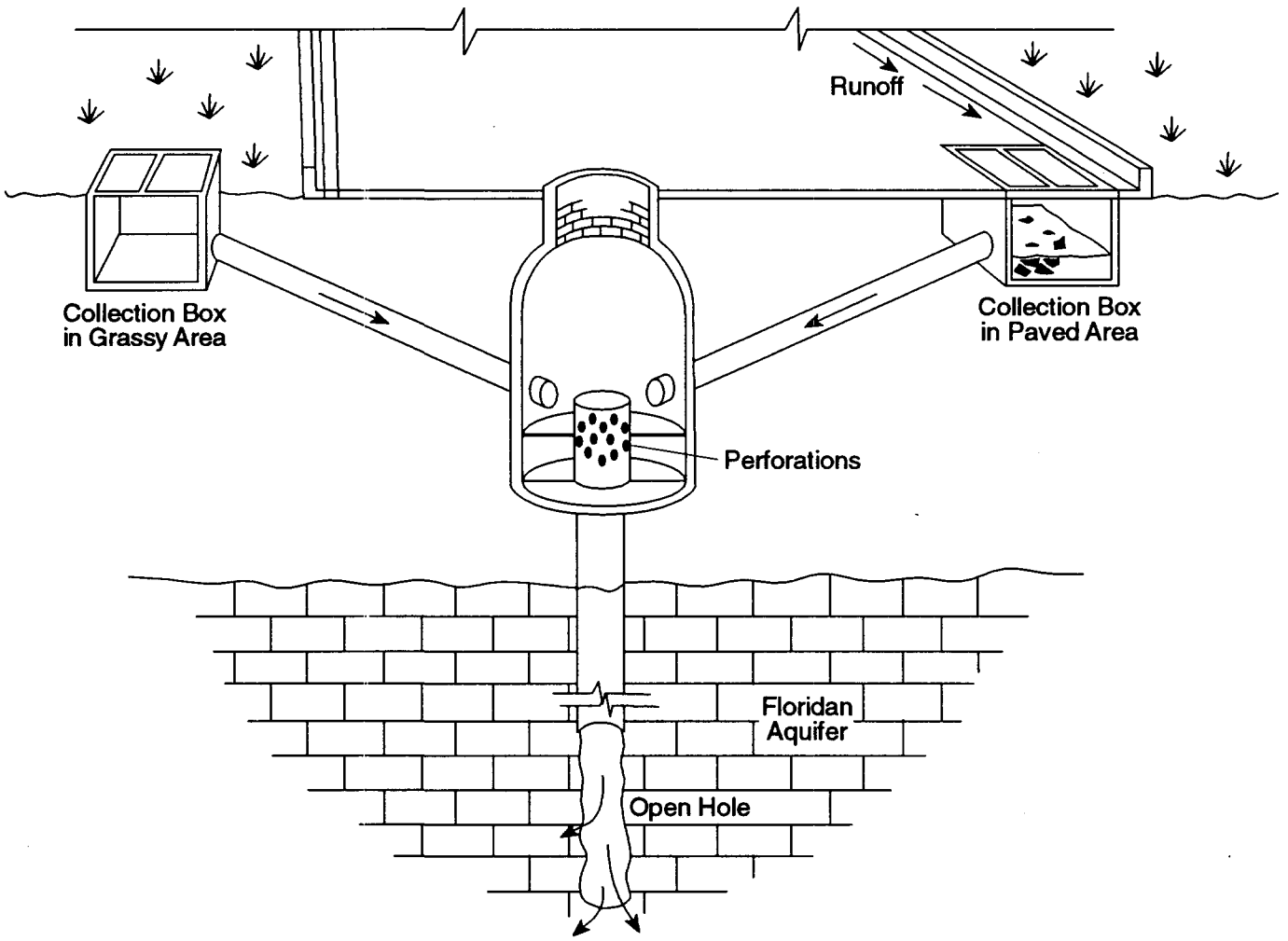
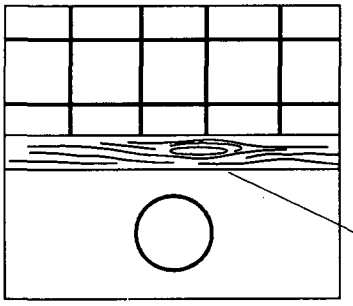


Figure 1. Storm Sewer Drainage Well with Connecting Inlets (After Dyer, Riddle, Mills & Precourt 1984).



Weir Inlet Structure - Typically:

For Old Wells, a Small Concrete Box with Rebar Grating

For New Wells, a Corrugated Steel Beehive with Angle-Iron Grating

Removable Board to Adjust Lake Level

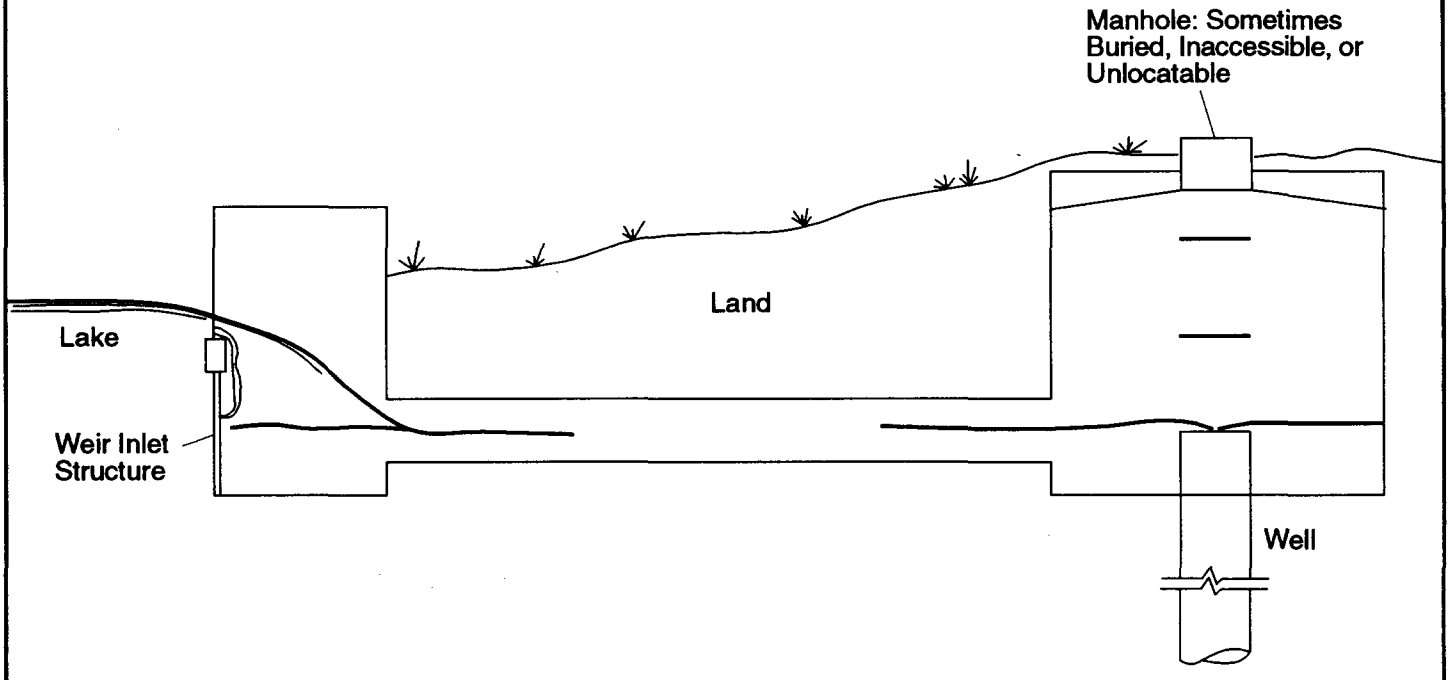


Figure 2. Typical Lake Control Drainage Well (After Mcbee 1985).

Unfortunately, during the first half of the century, drainage wells were used for many purposes other than surface or lake water recharge. Gravity drainage wells were also used for waste disposal, including industrial or agricultural wastes, and municipal wastewater. These practices resulted in the emplacement of highly polluted waters.

In the 1950s, the practice of using drainage wells for municipal sewage disposal was reduced and finally eliminated with the construction of the area's first municipal wastewater treatment plant. The use of drainage wells for industrial and agricultural waste disposal, notably the disposal of orange juice processing wastes, was also phased out through the 1960s and 1970s.

In 1965, the Florida State Board of Health stopped granting permits for the construction of new drainage wells; however, the replacement of existing wells was allowed. In the 1970s, the state stopped granting permits for the construction of drainage wells (Mcbee 1985). Thus, for the past 25 years or more, modifications to or replacements of existing drainage wells have not been allowed, even if the proposed replacements or modifications resulted in a net water resource management benefit, such as increased aquifer recharge or reduced pollutant loading to the aquifer.

ARTIFICIAL RECHARGE QUALITY

The recharge water currently emplaced by drainage wells in Orange and Seminole counties is one of two types: direct urban runoff or lake or stormwater retention pond outflow. The discharge of highly polluted waters, such as septic system discharge and citrus wastes, no longer occurs.

Street, urban drainage, and lake level control wells in operation today emplace stormwater and lake water contaminants in the aquifer. In general, one or more primary drinking water standards (DWSs) are not met at the point of entry into the aquifer. It is likely that the total coliform DWS is always exceeded and has been for more than 90 years. However, there is no evidence of significant aquifer contamination caused by existing drainage wells in Orange or Seminole County.

Still, the potential for local aquifer contamination exists, as street drainage wells provide a direct conduit to the aquifer for urban runoff and accidental spills that might occur. In almost all cases, lake water is of much better quality than direct urban runoff. Available lake water

quality data indicate that the only primary DWS exceeded by lake water recharge is total coliform.

EXISTING RECHARGE

The current average annual recharge rate achieved through gravity recharge wells in Orange and Seminole counties is estimated to be between 39 and 52 million gallons per day (mgd). Approximately 80 to 85 percent of the total recharge occurs through lake level control wells. The remainder is emplaced by street drainage wells.

Approximately 400 recharge wells were constructed between 1906 and the early 1960s. Most of these wells are located in closed hydrologic basins where urbanization occurred over this time period. Consequently, most of the existing wells are concentrated in or near the Orlando urban area (Figure 3).

POTENTIAL FOR ADDITIONAL RECHARGE

The effectiveness of recharge wells as an important source of central Florida aquifer recharge could be substantially increased by constructing additional gravity recharge wells to emplace excess lake water. There are about 590 lakes in Orange County alone, and only about 13 percent of them are currently served by lake level control wells. Thus, the opportunity exists to increase the number of lakes with gravity recharge wells and to substantially increase the artificial recharge volume.

Ultimately, additional recharge wells could be sited where they would do the most good. These sites would likely be in closed lake basins with drainage needs and in areas where the Floridan aquifer would benefit most from increased recharge.

The surface water yield generated by the land area of Orange and Seminole counties is estimated to average about 656 mgd (11.8 inches per year), or about 13 to 17 times the existing artificial recharge rate. Given the availability of significant surface water and an abundance of lakes without existing recharge wells, it is technically feasible to at least double the existing central Florida artificial recharge rate. Increased recharge of this magnitude would have many positive water supply and water resource management benefits.

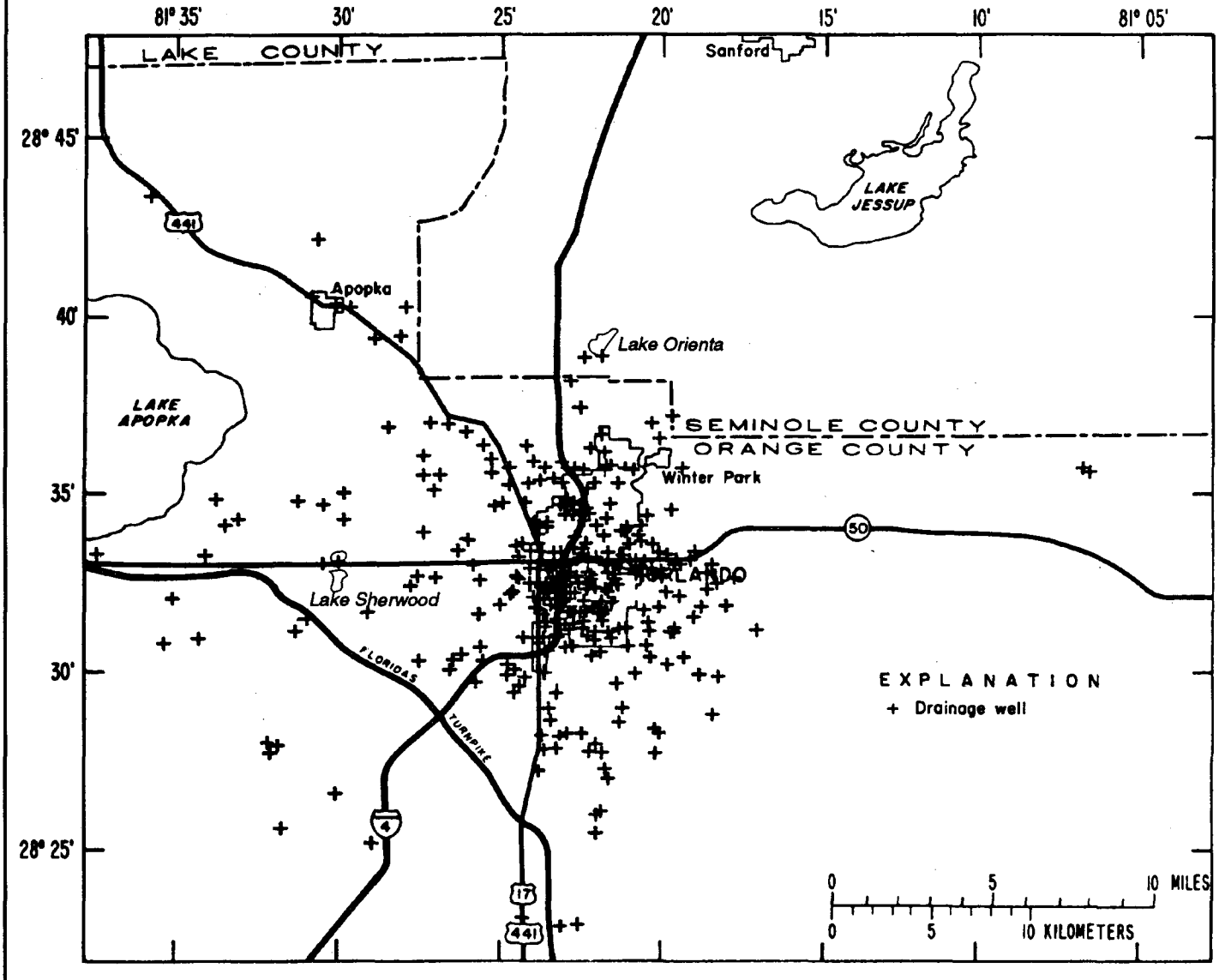


Figure 3. Approximate Distribution of Drainage Wells in the Study Area (Adapted from Schiner and German 1983).

REGULATORY FRAMEWORK AND CONSTRAINTS

Aquifer recharge wells are regulated by both federal and state of Florida UIC programs. Under the UIC program, aquifer recharge wells are categorized as Class V, which includes all wells that introduce non-hazardous fluids into or above an aquifer designated as an underground source of drinking water (USDW).

Federal regulations pursuant to the 1974 Safe Drinking Water Act (SDWA) do not address the potential water supply benefits of drainage wells and other Class V recharge wells, but address only the potential for aquifer contamination. The failure of the regulations to anticipate potential beneficial uses and to focus only on risks has resulted in interpretations that severely constrain opportunities for the use of drainage or recharge wells in an integrated water management strategy. The focus of the problem is found in the interpretation of 40 CFR Part 144.12(a):

> "No owner or operator shall construct, operate, maintain, convert, plug, abandon, or conduct any other injection activity in a manner that allows the movement of fluid containing any contaminant into underground sources of drinking water, if the presence of that contaminant may cause a violation of any primary drinking water regulation under 40 CFR Part 142 or may otherwise adversely affect the health of persons. The applicant for a permit shall have the burden of showing that the requirements of this paragraph are met."

The meaning of this requirement, as currently interpreted by EPA and FDEP, is that the injected water must meet all drinking water standards prior to injection. No zone of mixing (zone of discharge) is allowed under Florida rules [62-522.300(2)(a) FAC] for direct recharge to ground water. The rules do provide for a zone of discharge for indirect recharge, including percolation ponds and land application systems.

40 CFR Part 142, referenced in subparagraph (a) above, is the national primary drinking water standards regulation. Part 142.2 provides the following definitions:

- *National primary drinking water regulations* means any primary drinking water regulation contained in Part 141 of this chapter. (Part 141 provides maximum contaminant levels.)
- *Maximum contaminant level* means the maximum permissible levels of a contaminant in water that is delivered to the free-flowing outlet of the ultimate user of a public water system, except in the case of turbidity, where the maximum permissible level is measured at the point of entry into the distribution system.

The language of 144.12 suggests a prohibition on contamination of a USDW that results in the exceedance of a Maximum Contaminant Level (MCL) after the raw water has been treated and distributed in a potable water system. The language of these regulations seems to prohibit contaminating a drinking water aquifer with pollutants that cannot be readily removed from either an economical or technical standpoint at a water treatment plant before distribution to consumers. CFR Part 144.12 was promulgated pursuant to the 1974 SDWA, 42 U.S.C.A., Section 300h, et seq., which states:

> "Underground injection endangers drinking water sources if such injection may result in the presence in underground water which supplies or can reasonably be expected to supply any public water system of any contaminant, and if the presence of such contaminant may result in such system's not complying with any national primary drinking water regulation or may otherwise adversely affect the health of persons."

This language seems clear in its intent to prevent contamination of aquifers with pollutants that will cause finished water in a public water supply system, not a raw water source, to violate primary standards.

The current interpretation of EPA and FDEP that the law and regulations require that recharge water must be treated to drinking water standards before recharge is the main issue that inhibits the use of Class V injection wells for aquifer recharge and other beneficial uses. Under this standard, recharging aquifers containing Class I or Class II ground water with water not meeting drinking water standards is prohibited, even if such recharge may be necessary to maintain the aquifer as a viable drinking water source.

We believe that considerably less restrictive interpretations of the legislative mandate are appropriate and logical. Specifically, in the

case of artificial recharge wells, the only primary drinking water standard known to be exceeded by lake water recharge is total coliform. The fate of coliform and other bacteria in the aquifer is largely unknown, and bacteria are effectively eliminated by conventional water treatment technology. Therefore, we believe that the major constraint impeding beneficial artificial aquifer recharge is the current regulatory interpretation of existing law.

RESEARCH NEEDS

Based on the results of CH2M HILL's investigation (CH2M HILL 1997), an array of research needs was identified. These needs are basic questions that must be answered before the decision to pursue large-scale increases in the use of artificial recharge wells is made. Because the major impediment to the increased use of aquifer recharge wells is the regulatory requirement to meet all primary and secondary DWSs at the wellhead and, because total coliform is the only DWS consistently exceeded, the focus of the proposed demonstration program is on quantifying the potential for bacterial contamination of the aquifer using lake water or treated stormwater as the source of recharge. The specific issues identified for the investigation are as follows:

1. The fate of bacteria in the Floridan aquifer.
2. The effectiveness of passive stormwater treatment for reducing bacteria.
3. The effectiveness and cost feasibility of physically reducing bacteria in lake water recharge.

The Central Florida Artificial Recharge Demonstration Program, described in the next subsection, is designed to address these research needs, while also demonstrating on a limited scale the potential benefits of increasing recharge and improving existing aquifer water quality.

PROPOSED ARTIFICIAL RECHARGE DEMONSTRATION PROGRAM

There is considerable interest among local governments, SJRWMD, and FDEP in conducting the research necessary to objectively evaluate current drainage well management policy. Local governments interested in participating in the Central Florida Artificial Recharge Demonstration Program include the City of Altamonte Springs, the City of Orlando, and Orange County. Each of these co-sponsors has identified a demonstration project for inclusion in the program. The individual demonstration projects are listed below and described briefly in the following pages:

- Lake Orienta project
- Mills Avenue street drainage treatment project
- Lake Sherwood project

LAKE ORIENTA PROJECT

Lake Orienta is a 135-acre urban lake with a 916-acre tributary watershed. The total basin area is 1,051 acres. Lake Orienta is completely landlocked and is served by two existing drainage wells owned by the City of Altamonte Springs. The adjacent urban lands are subject to periodic and chronic flooding (Figure 4). Over the years, many flood relief alternatives have been evaluated, many of which involved the interbasin transfer of flood waters using stormwater pumping and conveyance facilities. These alternatives involved potentially undesirable environmental impacts and loss of recharge to the aquifer.

The Lake Orienta artificial recharge demonstration project would involve construction of an additional lake level control well and several monitoring wells (Figure 5). The objectives of the demonstration project are to monitor the fate of pollutants, including total coliform bacteria, entering the aquifer from a new lake level control well; investigate the necessity and feasibility of recharge water disinfection (Phase II); and provide much needed relief from flooding without diminishing aquifer recharge. A site is available to construct the new well, appropriate monitoring wells, and a recharge water treatment facility, if necessary.

The Lake Orienta demonstration project would be conducted in two phases, as described in the following subsections.

Figure 4. Residential Area Flooding in Lake Orienta Basin.

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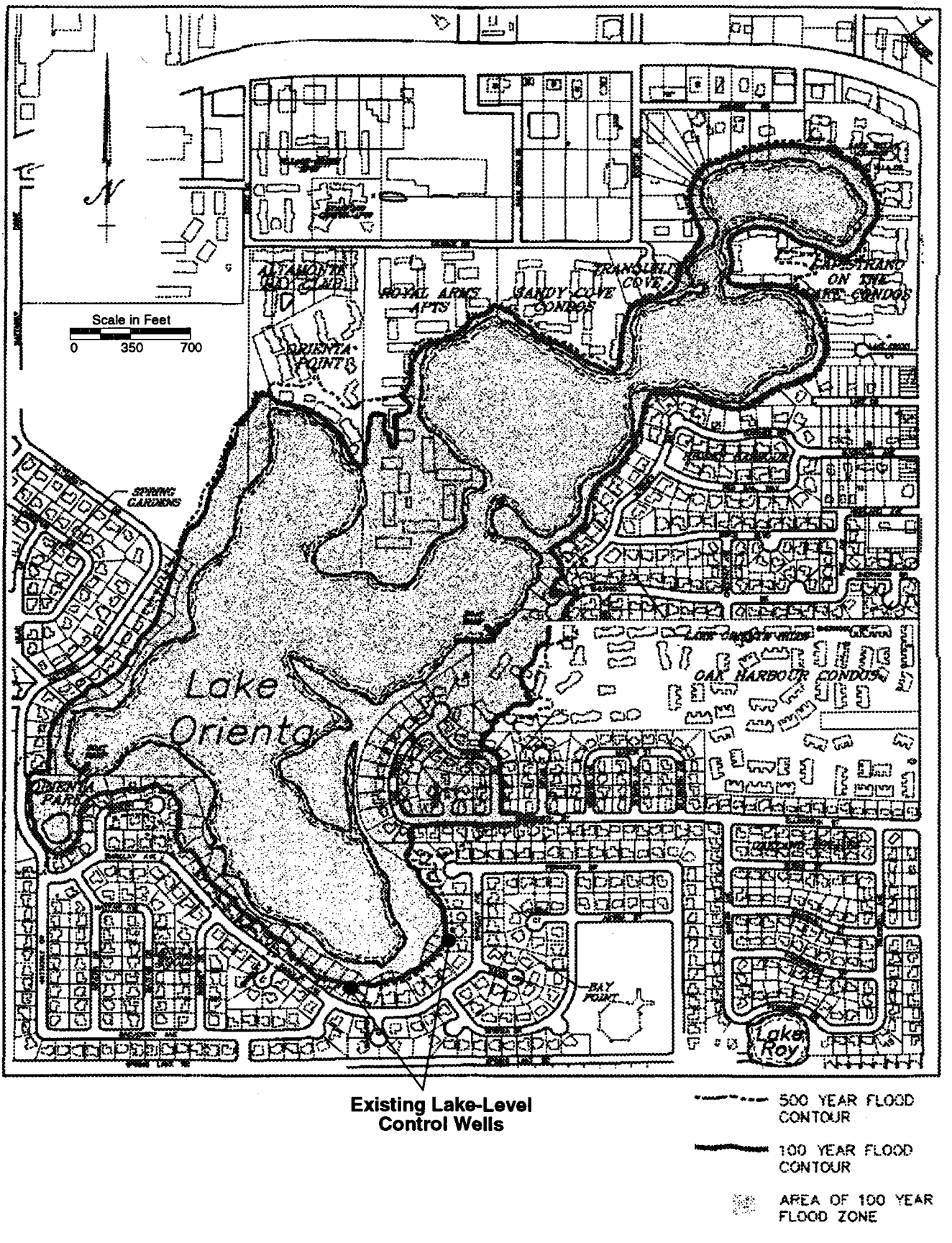

Figure 5. Lake Orienta Showing Existing Lake Level Control Wells and Floodplain Limits. (The New Demonstration Well Would Be Sited at or Near the North End of the Lake.)

Phase I. New Lake Level Control Well with Monitoring

The objective of Phase I would be to monitor fate of pollutants, including total coliform bacteria, entering the aquifer from a new lake level control well. This objective would be accomplished in the following manner:

- Design and construct a new lake level control well on a site provided by the City of Altamonte Springs. This well would include inflow control, flow measurement, flow recorders, and inflow sampling equipment.
- Construct three or four receiving zone monitoring wells at appropriate locations and distances from the drainage well. One monitoring well should be very close (within about 25 feet) to monitor immediate response. Others would be more distant (100 to more than 1,000 feet) to quantify transport, dilution, and bacteria die-off.
- Prior to recharge, perform background sampling to determine pre-operational receiving aquifer water quality characteristics. This would include total coliform bacteria measurements as well as other constituents of interest.
- Begin operation of the recharge well. Maintain as near steady- state inflow conditions as possible. Establish inflow water quality characteristics using extensive monitoring at the wellhead.
- Perform periodic sampling of monitoring wells to establish changes in aquifer water quality as a function of recharge volume, quality, time, and distance. This would be a long-term (about 2 years or longer) monitoring program.
- Analyze data and prepare a report with recommendations. Recommendations could be to continue monitoring for an additional period of time, to allow continued recharge without additional treatment, or to build a demonstration ultraviolet (UV) lake water disinfection facility (Phase II).

Phase II. Recharge Water Disinfection

During Phase II, the following activities would be performed:

- Based on measured inflow quality and variability (e.g., color, turbidity, bacteria concentration) design and construct a UV disinfection facility for the new recharge well.

- Monitor the performance of the disinfection facility (i.e., inflow quality as compared with outflow quality).
- Monitor aquifer response to improved recharge water quality.
- Prepare monitoring report on the effectiveness of the disinfection facility and resulting aquifer water quality improvements.

This demonstration project would provide important information on the fate and transport of bacteria within the aquifer. This project would not increase total annual loadings. All excess lake water is currently emplaced in the aquifer by the existing lake level control wells. A new well would increase the hydraulic capacity and rate of recharge, but the total annual volume and quality of the recharge water would remain unchanged.

The Lake Orienta demonstration project would be a long-term undertaking. Design and construction of the recharge and monitoring wells and the flow control and monitoring equipment would require 9 months to 1 year. Background monitoring would require approximately 3 months. Recharge volume and water quality monitoring and aquifer water quality monitoring would probably require about 2 years, depending on aquifer response. Analysis of the results and report preparation would require about 6 months. Therefore, Phase I would require about 3-1/2 years after receipt of a recharge well construction permit. If Phase II is implemented, a similar time period would be required.

MILLS AVENUE STREET DRAINAGE TREATMENT PROJECT

The City of Orlando owns and operates approximately 80 street or urban drainage wells, most of which are located in downtown Orlando. In general, street drainage wells emplace urban stormwater runoff, which is of poor quality compared with lake water or treated urban stormwater. For example, typical total coliform concentrations in direct urban runoff are on the order of 1,000 to 10,000 Most Probable Number (MPN) per 100 millileters (ml). Lake water in the Orlando area averages 174 MPN/100 ml, several orders of magnitude less. Although neither source of recharge water meets the primary drinking water standard of 4 MPN/100 ml, it is obvious that emplacement of lake water and treated urban stormwater pose less risk of aquifer

contamination than the emplacement of direct urban stormwater runoff.

The City of Orlando proposes to sponsor a demonstration project to retrofit an existing street drainage well system. The objective is to reroute street drainage through a conventional stormwater treatment facility, likely a wet pond system, before recharge. This would require constructing a new drainage well and abandoning an existing street drainage well. This is because most street drainage wells are located within the street right-of-way and are often part of a manhole or stormwater inlet. Retrofitting an existing street drainage well with conventional stormwater treatment would be impractical because of location and space constraints.

The most likely location for the proposed street drainage treatment demonstration project is Mills Avenue and Minnesota Street. This intersection is served by a 12-inch-diameter street drainage well that provides drainage for a 15-acre mixed land use (commercial and residential) drainage basin. The area is characterized by residential brick streets in the interior and is bound by four-lane arterial streets.

Stormwater flow to the well is conveyed through an inlet pair and 12-inch-diameter pipe. Additional flow enters the drainage well box through a slotted manhole cover that drains a portion of the Mills Avenue and Minnesota Street intersection.

The proposed demonstration project would abandon in place the existing street drainage well and redirect the stormwater runoff to an adjacent residential lot. The residential lot, which is for sale, would be purchased and the existing structure demolished to allow construction of an appropriate passive stormwater treatment facility. Figure 6 shows the Mills Avenue and Minnesota Street intersection and the residential lot available for this demonstration project.

The treated stormwater runoff would then be directed to a new recharge well constructed adjacent to the treatment facility. The well will be located approximately 1,250 feet from the inlet collection system and about 240 feet from the existing street drainage well. The property is 7,313 square feet in area.

Some reconfiguration of the street drainage conveyance system would be necessary to direct the stormwater to the proposed treatment facility. However, this will require a minimum amount of pipe and structures.

Mills Avenue and Minnesota Street intersection. Drainage well is located beneath street.

Residential Lot — Site of proposed passive stormwater treatment system and new drainage well.

Figure 6. Mills Avenue and Minnesota Street Drainage Treatment Demonstration Project Location.

The proposed street drainage treatment project would provide practical experience in retrofitting an existing street drainage system for passive stormwater treatment before recharge. Inflow volume and quality of the runoff into the treatment system at the wellhead would be monitored to provide measurements of water quality benefits, particularly reduced total coliform, obtained by conventional urban stormwater treatment systems.

Once the demonstration site selection is final and a permit is obtained for a new recharge well, design and construction should take about 1 year. A 1-year water quality monitoring period is proposed. Data analysis and report preparation would require about 6 months, for a duration of about 2-1/2 years for the whole demonstration project.

This demonstration project would not increase recharge volume, but would reduce aquifer pollutant loads, resulting in a net benefit to the aquifer.

LAKE SHERWOOD PROJECT

Lake Sherwood is a 119-acre lake with a direct tributary area of 1,240 acres, for a total basin area of 1,359 acres. During flood conditions, Lake Sherwood will receive inflow from four upstream lakes, increasing the total maximum tributary area to 5,450 acres. The lake is served by one lake level control well owned by Orange County. The inflow control elevation of this well is currently set very high. Therefore, this well provides recharge only during extreme high water conditions. In most years with normal or below average rainfall, the lake water level never reaches the control elevation and no recharge occurs. Only during extreme hydrologic conditions does the well operate.

Orange County is preparing a comprehensive watershed management plan for the Lake Sherwood basin. One of the issues being investigated is lowering the existing lake level control well inflow elevation to provide the necessary increase in flood protection. Hydrologic analyses are being performed to quantify the relationship between inflow control elevation and level of flood protection provided, and the total recharge volume emplaced. Watershed planning is also quantifying the relationship between additional stormwater treatment provided and improvements in recharge water quality.

Watershed management techniques under consideration in the Lake Sherwood basin planning process include the following:

- Regional stormwater pond and urban wetland systems
- In-lake alum treatment systems
- Non-structural techniques, including street sweeping, public education, pesticide/herbicide/fertilizer control, and improved drainage maintenance programs
- Baffle boxes (e.g., Vortex stormwater treatment system)
- Aeration treatment systems

The objective of this analysis is to identify the combination of inlet elevation and additional stormwater treatment that will increase flood protection and aquifer recharge without increasing pollutant loads to the aquifer. This project will demonstrate the concept of net benefits to the aquifer in the context of comprehensive watershed planning and water resource management.

If initial watershed planning indicates that a technically and economically feasible combination of increased recharge and increased stormwater treatment exists, then Orange County will proceed with implementation of the proposed solution. This solution would involve obtaining a permit to modify an existing lake level control well to increase recharge volume without increasing aquifer pollutant loads.

ALTERNATIVE RECHARGE WELL MANAGEMENT OPTIONS

The management of artificial recharge using recharge wells is governed by existing state of Florida and federal UIC programs. Existing wells are effectively grandfathered under current law and policy, and new wells are nearly impossible to construct. Current regulations require that all primary and secondary drinking water standards be met before artificial recharge water can be emplaced in the aquifer. This criteria is nearly impossible as well as economically unfeasible to meet in urban drainage and lake level control applications. Thus, the net effect of current policy in central Florida is maintenance of the status quo, with little or no improvement in aquifer recharge quantity or quality.

Current recharge well regulations and policy do not encourage comprehensive water resources management. To do so, total water resources management should include reducing the quantity of pollutants entering the Upper Floridan aquifer, increasing beneficial aquifer recharge, and providing cost-effective treatment of surface recharge waters.

An alternative drainage well management approach, which should be considered by water resource managers and regulatory agencies, is based on net incremental improvements. The objective of this approach is to permit improvements that provide a net benefit to the aquifer, even if the recharge water does not meet all primary and secondary drinking water standards at the wellhead. Benefits should be defined in terms of increasing recharge without increasing aquifer pollutant loading or by reducing existing pollutant loading.

The proposed Central Florida Artificial Recharge Demonstration Program would provide important and useful information for water resources management decision making. Program results should provide insight into the fate and transport of bacteria, including total coliform, in the upper Floridan aquifer. The program should also quantify the cost of bacteria removal as a function of the level of control provided.

We believe that aquifer recharge wells should be an available water resource management option. Like other water management alternatives, this technology has benefits and risks, and should be used when the benefits, including flood control and additional water supply, outweigh the risks. The Central Florida Artificial Recharge Demonstration Program would help quantify the risks and costs associated with artificial recharge wells in central Florida.

PROGRAM IMPLEMENTATION

Successful implementation of this important research and demonstration program will require the cooperation of the local governments, SJRWMD, FDEP and EPA, Region IV. All these entities have provided input to the development of the proposed program and appear prepared to participate, as demonstrated below.

LOCAL GOVERNMENTS

The local governments of the cities of Altamonte Springs and Orlando and Orange County have proposed specific projects that are suitable for inclusion in the demonstration program. Each local government is prepared to fund the construction and operation of its proposed facilities in accordance with the demonstration project plan.

ST. JOHNS RIVER WATER MANAGEMENT DISTRICT

SJRWMD has taken the lead in conducting investigations, studies, and this proposed project plan as part of its water supply planning responsibilities. SJRWMD is prepared to assist in developing the engineering designs and plans necessary to obtain permits, undertake construction, and commence operation. In addition, SJRWMD is prepared to fund the monitoring proposed as part of the program.

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION

FDEP has participated in developing this proposed project plan. As the state agency with regulatory responsibility for recharge wells, FDEP will need to provide the necessary approvals by permit or other appropriate mechanism for constructing and operating the recharge wells under the provisions of this demonstration program. Additional details in terms of project components, operation, and monitoring may be determined as part of this approval process. In addition, FDEP will need to review and analyze the monitoring data obtained from the program and participate in discussions with EPA and SRJWMD on the viability and benefits of large-scale implementation of an artificial recharge program in central Florida.

ENVIRONMENTAL PROTECTION AGENCY, REGION IV

EPA, Region IV, has also provided input that was used in developing this proposed program. EPA, in its role as the agency that delegates federal regulations concerning underground injection control to FDEP, will need to provide its approval and concurrence with FDEP's approval of the demonstration program, including necessary recharge well construction and operation permits. In addition, EPA will need to provide review and analysis of the monitoring data and participate in discussions with FDEP and SJRWMD on the viability and benefits of large-scale implementation of an artificial recharge program in central Florida.

STATUS AND NEXT STEP

The local governments are prepared to immediately undertake, with assistance from SJRWMD, the engineering design and permit applications necessary to obtain regulatory approval from FDEP. Funding is available to begin construction, operation, and data collection as soon as the permits are issued.

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