M E M O R A N D U M

TO: Mayor and Council

FROM: Victoria J. Li, P.E., Director
Watershed Protection and Development Review Department

DATE: March 25, 2009

SUBJECT: Report: Groundwater Characteristics and Challenges for Subsurface Structures

The attached report is in response to Council Resolution No. 20080306-041, which requested a study and report to Council on the adequacy of the City's development codes, technical criteria, and other policies regarding underground structures and groundwater.

The study contains recommendations related to One Stop Shop review practices and code clarifications, and the development of strategies to encourage groundwater infiltration and groundwater reuse. Recommendations are also provided for a mapping and data tracking system to identify potential contaminated groundwater discharges, and further investigation of funding alternatives for drainage improvements in areas with inadequate infrastructure.

Should you have questions regarding the report or if we can provide any additional information, please feel free to contact me at (512) 974-9195 or Pat Murphy at (512) 974-2821

cc: Marc A. Ott, City Manager
Sue Edwards, Assistant City Manager

Executive Summary
Groundwater Characteristics and Challenges for
Subsurface Structures in Austin's Urban Core
February 2009

This report addresses issues with groundwater interception and discharge as surface water from subsurface structures in the City of Austin's urban core. The report includes recommendations for addressing the quantity and quality of groundwater discharges.

Groundwater may come from natural or man-made sources and is likely to be encountered in the urban core anywhere a subsurface structure is constructed. Once the water is intercepted and discharged to the ground or pavement, standing water may create a nuisance, cause property damage, or create a safety hazard. Groundwater may also contain contamination associated with from previous land uses or spills.

The City of Austin has not historically considered groundwater discharges in the development permitting process. Recent examples in redeveloping areas have demonstrated the importance of ensuring that groundwater discharges are disposed of in a safe and appropriate manner. The City Code addresses surface water discharges by development and recent improvements in the One Stop Shop have ensured that safe conveyances of groundwater discharges are being addressed.

It is important for the City to address potential contaminated groundwater discharges from subsurface structures. Maps are currently being created by the City that will show known groundwater contamination locations in the urban core. This map should provide a necessary tool for the identification and prevention of future contaminated discharges to waterways.

The lack of available funding and financial alternatives for stormwater infrastructure improvements limits the City's ability to adequately address drainage issues. This is especially apparent in redeveloping areas with inadequate drainage infrastructure to safely convey increased stormwater from development.

Groundwater reuse and infiltration are also important considerations that may reduce groundwater discharges to storm sewers, reduce reliance on potable water for landscape irrigation, and restore natural groundwater patterns. These alternatives demand further consideration for the benefits that may be achieved.

Groundwater Characteristics and Challenges for Subsurface Structures in Austin's Urban Core

February 12, 2009

RESOLUTION NO. 20080306·041

WHEREAS, groundwater is a valuable resource that contributes to Austin's quality of life; and

WHEREAS, constructing subsurface structures can impact the City's infrastructure, public health and safety, and the environment by intercepting and disrupting groundwater sources and by resulting in discharges of significant volumes of water to the surface; and

WHEREAS, this groundwater is a significant resource that could potentially be utilized to help achieve the City's water conservation goals and environmental goals through beneficial use;

NOW, THEREFORE

BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY OF AUSTIN:

Council directs the City Manager to provide a report to the Council within six months on the adequacy of the City's development codes, technical criteria, and other policies regarding underground structures and groundwater, including recommendations on appropriate, feasible, and permissible measures to address potential impacts on the City's infrastructure, health and safety, and the environment.

TABLE OF CONTENTS

INTRODUCTION

On March 6, 2008, Austin City Council approved a resolution directing the City Manager to provide an assessment on the adequacy of the City's development codes, technical criteria, and other policies regarding underground structures and groundwater, including recommendations on appropriate, feasible, and permissible measures to address potential impacts on the City's infrastructure, health and safety, and the environment. Staff from the Watershed Protection and Development Review Department (WPDRD) compiled this report using input from Public Works and the Water Conservation Division of the Austin Water Utility.

Prolonged Ponding of Water Causes Pavement Damage

Figure 1: Standing Water in Parking Lot

Recent development activities in Austin's urban core have highlighted the need to address groundwater in relation to construction and operation of subsurface structures. With increased urbanization, denser redevelopment is often accompanied by the construction of underground structures. Continued construction of these structures intensifies the need to predict and plan for the presence of groundwater. Understanding how to manage this critical resource becomes more important. Unplanned disposal of groundwater may deteriorate City streets and utilities, expose citizens to potential health hazards from contaminated groundwater, or create nuisance and safety issues.

The challenges of managing groundwater in a sustainable manner fall into two separate categories: water quantity, and water quality. As the Pearl Street case study indicates, the problems with water quantity are often times apparent. Water is discharged at the surface and ponds on the roads or sidewalks where it may create a nuisance or safety concern. Water quality on the other hand is much more obscure. Water that appears to be clean and clear may contain bacteria or chemicals beyond safe levels.

Case Study: Pearl Street Groundwater Drainage

Summary

The West Campus area has localized, shallow groundwater in a number of locations. Recently a number of multi-story buildings with sub-surface structures have been built. The sub-grade portions of these buildings have encountered the local groundwater. Foundation drains are typically utilized to prevent groundwater infiltrating into the structures.

Two buildings at 2200 and 2208 Pearl St. (The Block at Pearl St. North and South) are continuously discharging groundwater from foundation drains directly to an alley, then to Pearl St. The water then pools at the intersection with 22nd St., and slowly drains down Pearl to a storm drain on Martin Luther King Blvd. approximately 6 blocks away. There is no storm sewer pipe on Pearl St. and the nearest storm drain is at the corner of 22nd St. and Rio Grande, approximately 2 blocks away. The foundation drain system was not included in the approved plans for either site.

Issues

- There are typically 2-6 inches of water pooled in the street at 22nd and Pearl.
- The street was deteriorating due to the constant presence of water, there was one large pothole in the intersection.
- Pedestrians had to walk through water when crossing the alley, the street, or getting in and out of cars on 22nd St. west of Pearl St.
- Nearby property owners, developers, and the neighborhood association have lodged multiple complaints about the situation.
- If planned before the start of construction, cost-effective reuse strategies could have been implemented.
- At the direction of City staff, this groundwater discharge was eventually connected to a storm sewer using a forcemain.

This report examines the degree of urban groundwater problems within the urban roadway boundaries. For the foreseeable future, construction of underground structures is anticipated to continue in this area. Generally, Austin's inner urban area is bordered by Interstate 35 on the east; Route 183 to the north; Route 1 on the west; and the U.S. 290 to the south. This is the region where recent directives have focused regarding underground structures and impervious cover.

The City and State's approach to urban groundwater management has historically been an assortment of uncoordinated efforts between the Austin Water Utility (AWU), the Watershed Protection and Development Review Department (WPDRD), Public Works, the Texas Commission on Environmental Quality (TCEQ), and local groundwater

conservation districts. Currently management depends upon the understanding and experience of the developer and their design and construction team with little oversight of critical design decisions by regulatory authorities.

WATER QUANTITY

Geology

Austin's urban core is located at the eastern edge of the Balcones Fault zone along the Colorado River. The Balcones Fault Zone creates a transition from the western steep hills and canyons of the Hill Country to the gently rolling terrain known as the Blackland Prairie. Ancient flood deposits of the Colorado River are also present as terrace deposits.

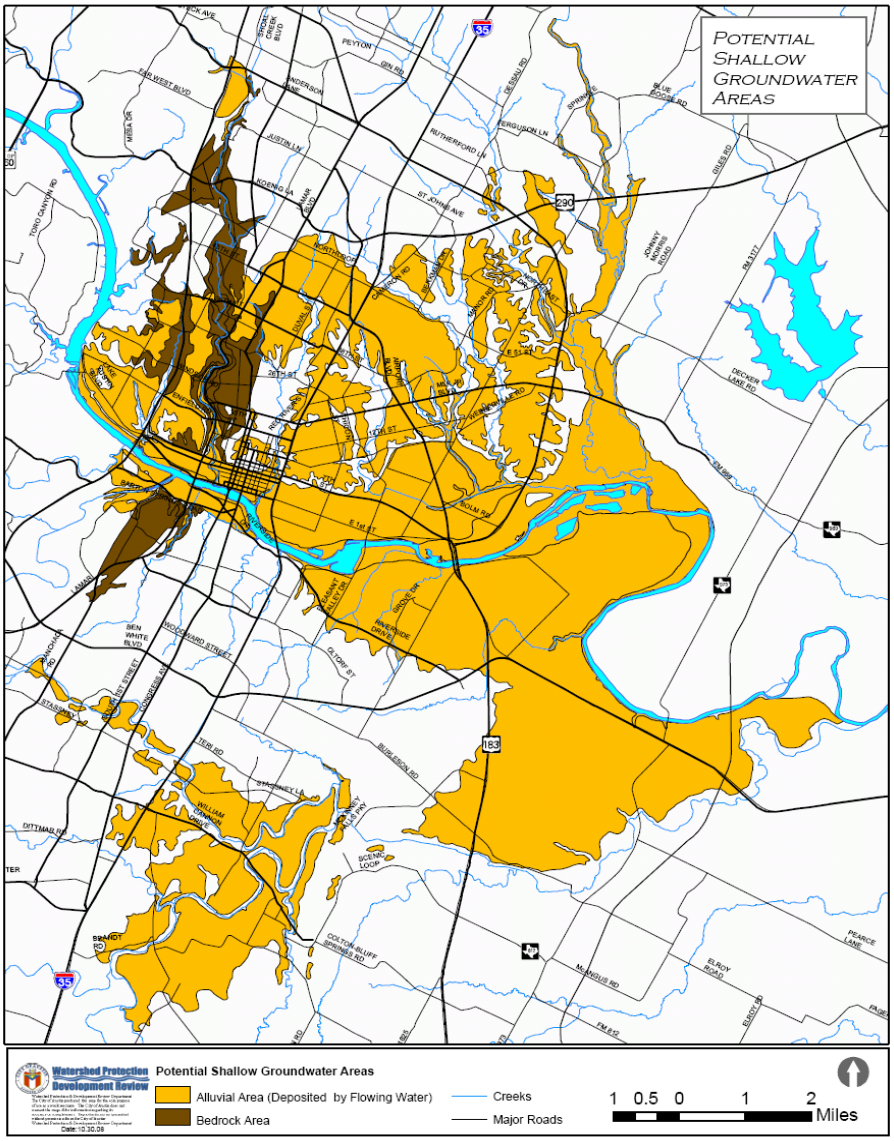

Figure 2: Potential Shallow Groundwater

Figure 2 is a map of Austin and indicates where there is a high probability of encountering groundwater when excavating for a below grade structure. Tan areas indicate deposited alluvial sediment whereas the darker brown reveals places of bedrock. Both of these locations are prone to containing shallow groundwater. Most of the varied geological formations

have groundwater expressions that may be encountered during excavation of underground structures. The soil characteristics within this area are somewhat unpredictable and can only be accurately determined on a site-by-site basis.

Infrastructure

Leaking Water and Sewer Mains

It is often expected that development brings a decrease in groundwater recharge and stream baseflow as urbanization increases. However, a recent study at the University of Texas estimated that the groundwater recharge may actually increase in Austin due to outside water use and leaking municipal infrastructure[1]. The authors estimate that the leakage rate for water distribution mains in Austin is 7.7% or over 11 million gallons per day. This water, along with irrigation flow, recharges the groundwater continuously and therefore may be more than occurred before development.

The above numbers are confirmed in a current audit of Austin Water Utility's (AWU) water use for FY2007. At the time of this report some engineering calculations are still pending, but preliminary numbers show the water lost due to possible leaks and system overflows is between 5.5 and 12 million gallons per day or between 2 and 4.5 billion gallons annually.

The influence of leaking infrastructure is further evidenced by the experience of City geologists. They are called upon to investigate springs and seeps where they may be creating a nuisance. Their analysis sometimes indicates that perceived springs are the result of leaking water mains or sewers.

Proximity or Capacity of Storm Sewers

[1] Garcia-Fresca, B. "Urban Enhanced Groundwater Recharge: Review and Case Study of Austin, Texas, USA." Urban Groundwater – Meeting the Challenge, Selected Papers from the 32nd International Geological Congress, Florence, Italy. Ed. Ken W.F. Howard. International Association of Hydrogeologists: London: Taylor & Francis. 2004. 3-18.

Another challenge with respect to managing groundwater in an urban setting is the proximity and adequacy of the drainage collection system or storm sewer system. As urban redevelopment continues, areas that at one time had adequate drainage for a given impervious cover, are now faced with too much rain water and not enough infrastructure. The storm sewer system in some areas was developed to support single-family residential at 25 to 35 percent impervious cover. Urban redevelopment regulations allow for more intensive impervious cover and the once adequate storm sewer system is now undersized.

In some areas such as Pearl Street, there may not be any storm sewer near the proposed development. In cases like this, connection requirements are inferred by code, but lack specificity. For water mains and sanitary sewers, the Water Utility has a cost recovery program where the developer pays what is necessary for the development and any cost for over sizing the utility to meet other needs is paid for by the City. This arrangement will be discussed further in this report.

Existing Groundwater Quantity Regulations

State

State water law currently focuses on the rights of individuals to utilize the groundwater that flows beneath their property, the protection of groundwater quality and the authorization of regional water planning groups. Under 30 TAC Chapter 230, cities may require a demonstration of the availability of groundwater to subdivisions prior to plan approval. It is worth noting that the State Energy Conservation Office, in *Suggested Water Efficiency Guidelines for Buildings and Equipment at Texas State Facilities*, recommends that alternative water sources be used for landscape irrigation purposes and includes suggestions to use the basement sump pump discharges for this purpose. No regulation was found that correctly speaks to the issue of excess groundwater management in urban areas.

Other Municipalities

Many municipalities address excess urban groundwater in their regulations for the sanitary sewer collection systems. In many parts of the country, groundwater discharges were first connected to

the sanitary sewers. This created a serious problem with wastewater treatment plants where significant municipal resources would be expended to treat relatively clean groundwater. Some treatment plants found their flows doubling or tripling during high groundwater seasons. Regulations were enacted that prohibit these connections. Some municipalities encourage or require groundwater to be discharged onto the surface[2], some require subsurface discharge away from the building such as the discharge system shown in Figure 4 on the following page, and others require that they be connected directly to a storm sewer[3].

City of Austin

The following are applicable City of Austin code sections that applied to excess urban groundwater:

- Building Code, Appendix A requires:

Section 5610 Reduction of uplift pressures.

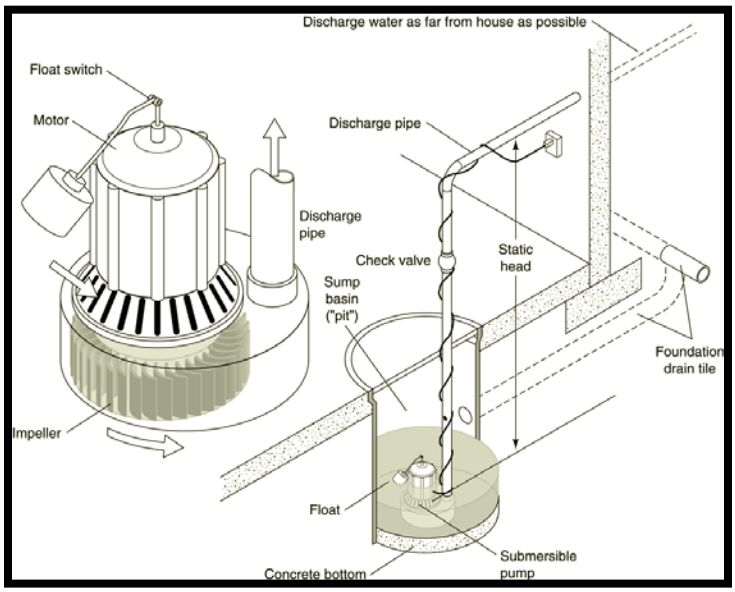

Figure 3: Discharge System

"Uplift forces, in conjunction with lateral hydrostatic forces, are the most adverse flood-related load on buildings and structures. Their combined effect determines, to a major extent, the requirements for weight and anchorage of a structure to assure stability against flotation, sliding and overturning. …Such provisions shall include, but are not limited to, impervious cutoffs, foundation drainage, and sumps and pumps."

- City Code Section 25-7-151

Stormwater Conveyance and Drainage states that "owner or developer of property to

[2] Kane County Stormwater Technical Manual, http://www.co.kane.il.us/kcstorm/ordinance/Technical_FINAL.pdf.
[3] "Engineering Specification." City of Batavia, Illinois. <http://www.cityofbatavia.net/content/articlefiles/422-Eng%20Specifications.pdf>.

be developed is responsible for the conveyance of all stormwater flowing through the property…."

- City Code Section 25-7-151 Stormwater Conveyance and Drainage (F) requires that projects provide "off-site drainage to accommodate the full effects of the development."
- City Code Section 6-1-51(B)(8)(c) prohibits the discharge of any substance that increases the maintenance requirement of a storm sewer or watercourse.
- City Code Section 11-3-7 Internal Drainage requires that retaining wall drains "must not discharge where drainage can flow onto adjacent sidewalk or into the street."
- City Plumbing Code, Section 323 Requirements for Floodplain Areas, "Whenever the dryness of a space depends on sump pump systems, all interior storm water drainage or seepage, appliance drainage, and underslab drain tile system shall be directly connected to the sump pump and discharged at an elevation of five feet above the RFD (referenced flood datum)."

To summarize, City code requires:

- the existence of systems to relieve groundwater pressure on structures
- developers are responsible for the conveyance of storm water
- developers are responsible for off-site improvements to accommodate development
- retaining walls cannot discharge drainage water to sidewalk for streets
- the discharge of groundwater must be five feet above the referenced flood datum

Although code can be an effective means for governing groundwater within the city, it can also be cumbersome and expensive due to the infrastructure already in place.

WATER QUALITY

Concerns

Good governance looks to the future while being mindful of the past. This is especially true in regard to the beneficial reuse of excess urban groundwater. Prior to considering the beneficial reuse of groundwater, all known potential sources of contamination should be examined. There are several sources of information about this potential contamination: the State of Texas has several databases; the City has GIS data for abandoned landfills and Council-approved underground storage tanks.

Currently success in considering groundwater contamination is dependent upon the diligence of the developer's technical team to pull all these disconnected information sources together and decide if further testing is warranted. The level of oversight by City staff is significantly less than other aspects of the development process.

Case Study: **Block 21 Groundwater Contamination**

Developers of Stratus Block 21 located just north of City Hall and soon to be the future home of the "W" Development, encountered relatively low levels of groundwater contamination during the planning stages of a three level underground parking garage with a groundwater sump system. Historical records revealed that a former dry cleaning facility located near 5th Street and Guadalupe Street had a release of perchlorethylene (PCE), a common dry cleaning solvent that allegedly leaked from a private sewer main at the facility. Over a 10 year period since the release, the groundwater plume of PCE has slowly migrated in natural groundwater flows to the south and southwest.

Although the levels detected at Block 21 are relatively low, State law still requires monitoring and pretreatment of the groundwater prior to discharge to the storm sewer system. As a result, a large carbon filtration system has been installed in the parking garage that will pretreat an estimated 18,000 gallons of groundwater per day prior to entering the city storm sewer system and ultimately Lady Bird Lake.

With respect to groundwater quality, potential groundwater sources within the City were reviewed. Over 700 locations were found that pose some potential problems. Included in this list are sites from the State's database for the Voluntary Cleanup Program and known leaking underground storage tanks as well as known pollution plumes existing within the City limits. These groundwater pollution plumes have been observed to move slowly through the City. The known locations do not include abandoned landfills or the 878 Council-approved underground storage tank locations discovered earlier in 2008 (approvals that date back to the early 1900's). WPDRD staff has committed to map the locations of known contaminated groundwater sites by the end of the 2009 calendar year. This information will be useful to developers and the City in determining when ground water discharges should be sampled for contaminants.

Another potential source of groundwater pollution is leaking sanitary sewer systems. Some urban areas have found increased bacterial contamination in groundwater caused by exfiltration, or the leaking of sanitary sewage into groundwater. The Austin Water Utility has been actively replacing and rehabilitating sanitary sewer lines throughout the city under the Austin Clean Water Program since 2002. According to the latest status report on the project, over 700,000 feet of sanitary sewers have been replaced or repaired and 83 of 100 projects are complete or substantially complete.

Ground Water Quality Regulations

At the present, if groundwater contamination exceeds a state standard, the Texas Commission on Environmental Quality (TCEQ) issues and regulates permitting of the treatment and discharge of the groundwater quality. The State of Texas assumed the authority to administer the National Pollutant Discharge Elimination System (NPDES) program in Texas in 1998. NPDES is a federal regulatory program to control discharges of pollutants to surface waters of the United States. The TCEQ Texas Pollutant Discharge Elimination System (TPDES) program now has federal regulatory authority over discharges of pollutants to Texas surface water.

The following are the applicable TCEQ regulations that pertain to discharges of pollutants:

- Section 402 of the Clean Water Act-gives the State the authority to administer the NPDES program.
- Chapter 26 of the Texas Water Code- States that the Commission (TCEQ) may issue permits for the discharge of waste or pollutants into or adjacent to waters of the state.
- Chapter 26.040 of the Texas Water Code - The commission may issue a general permit to authorize the discharge of waste into or adjacent to waters in the state by category of dischargers in a particular geographical area of the state or in the entire state if the dischargers in the category discharge storm water
- 30 TAC Chapter 205 – General Permits for waste discharges (Stormwater)
- 30 TAC Chapter 213 – Edwards Aquifer - "Unless otherwise provided under this chapter, the owner of an existing or proposed site, such as a residential or commercial development, sewage collection system, or aboveground or underground storage tank facility for static hydrocarbons or hazardous substances, who proposes new or additional regulated activities under this chapter, must file and receive executive director approval of all appropriate applications prior to commencement of construction of new or additional regulated activities."

Title VI, Chapter 6-5 of the Austin City Code-City surface water quality rules and associated discharge limits. Under existing code, stormwater discharge permits are required for systems which have a groundwater treatment prior to surface discharge. Permitting is accomplished after a TPDES permit is received from TCEQ.

Sustainable Strategies

Water Conservation

The life cycle cost for water and wastewater services can be significant. Building these savings into the design of the project can be a selling point for the property in the future as well as reducing operational costs from the start. This becomes even more important as water and wastewater costs continue to rise. The Pearl Street groundwater problem would have been significantly less expensive to address as onsite water conservation rather than a sewer connection project if it had been designed into the project from the outset.

The Water Conservation Division of the Austin Water Utility publishes a water conservation publication entitled *"Water Efficient Equipment and Design."* In that publication a "top ten" list is given for considering water conservation. Second on the list is the suggestion to "maximize use of onsite water sources." The Tarrytown Methodist Church (see Case Study next page) demonstrated how to accomplish this by installing a collection, storage and distribution system for excess groundwater encountered during the construction of their parking garage.

Consideration of groundwater reuse in the design phase is much more cost effective than retrofitting later. Sales and property tax exemptions as well as rebates from the City are applicable in many cases for the use of on-site sources of water. Sites using alternative on-site sources must comply with all applicable backflow prevention.

Potential uses include:

- toilet flushing
- green roofs
- landscaping with possible enhanced carbon sequestration
- stream baseflow augmentation

Case Study: Tarrytown United Methodist Church Parking Garage

The City of Austin, Texas has multiple water conservation programs available to the public, for both private citizens and commercial entities. Programs are designed to financially reward water conservation methods utilized by participants. One successful example is the Tarrytown United Methodist Church located on the City's northwest side.

The church began offering religious services in 1946. Over the next 50 years, the congregation grew significantly and several structural accommodations were added including an administration and education building, a children's playground and finally in 2003, construction began on a parking garage. Contractors, hired by the church, discovered an underground spring which began pouring nearly 25,000 gallons of water into the area excavated for the garage's foundation. 1 Under the "Commercial Incentive Program," the City gave Tarrytown $5,000 to install underground storage tanks to capture and store the problematic ground water. This would prevent the water from doing additional damage by escaping into other areas or from being lost through pumping it into the City's sewer lines. Instead the rouge water is now used to irrigate the church's property and conserves several hundred thousand gallons of water annually.

Creek Baseflow Enhancement

Within watersheds, baseflow is the life-giving sustenance for Austin area creeks and streams. WPDRD sampling indicates that as impervious cover increases, baseflow to streams decreases. Baseflow in creeks is sustained by infiltration of rainfall and associated discharge of groundwater. While it is recognized that central Texas streams endure long hot summers and the prospects of intermittent flows, firsthand accounts observe that Austin streams go dry sooner and longer than historically occurred.

WPDRD stream monitoring statistics show a strong correlation that as impervious cover increases, baseflow to our streams decreases. Baseflow is defined as the natural flow of a stream between rain events. Austin's ecosystem, both aquatic and terrestrial bank vegetation depend on stream baseflow for sustaining water between rain events. The solution to the urban groundwater could also address the need to enhance or maintain baseflow in our urban streams.

Aquatic species depend upon baseflow as does the vegetation along the creek banks. Without healthy stream banks with vegetation, erosive flow decreases and property damage increases. Groundwater interception and pumping associated subsurface structures may divert groundwater flow patterns resulting in disruption of natural baseflow recharge through seepage along the creek banks.

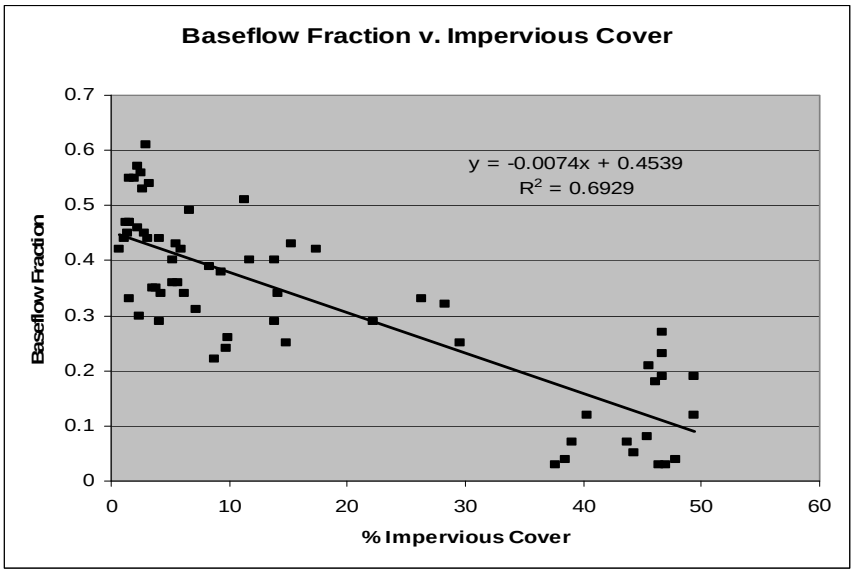

Figure 4: Baseflow Versus Impervious Cover

RECOMMENDATIONS

Recommendation 1 – Ensure Groundwater Discharge Review by One Stop Shop

Recent problems with groundwater discharges and conveyance associated with subsurface parking structures prompted the One Stop Shop to reevaluate the application of drainage requirements contained in City Code Chapter 25 for applicability to structures. It was determined that the existing regulations are adequate to apply to all stormwater discharges, including groundwater discharges from buildings. As a result, the drainage review staff now provides more scrutiny of groundwater discharges from subsurface structures and requires any discharges connected to a stormsewer or waterway. The commercial building permit review staff is also coordinating with the drainage review staff to ensure that subsurface structures comply with the drainage requirements. However the code language which delineates the responsibility of the developer needs to be more explicitly stated.

- It is recommended that the current One Stop Shop practices continue and that code or criteria amendments that are developed to clarify requirements be processed expeditiously.

Recommendation 2 – Encourage Groundwater Infiltration

Creek baseflow and ecology may be negatively impacted by the interception of groundwater by subsurface structures. Disruption of natural groundwater characteristics may negatively impact the baseflow and ecology of waterways. It would be beneficial to restore or mitigate natural groundwater and baseflow conditions.

- It is recommended that the City develop criteria requiring properties along stream corridors to recharge the baseflow of the streams by means of a linear French drains or infiltration trenches and to develop appropriate code and criteria amendments.
- It is recommended that the City evaluate the feasibility of allowing groundwater infiltration as an alternative to discharges to stormsewers.

Recommendation 3 – Encourage Groundwater Reuse

The City is actively encouraging water conservation and reuse to reduce long term water demands. Groundwater quantity that is intercepted by subsurface structures can be significant but is often subject to seasonal variations. It may be beneficial for uncontaminated groundwater to be reused for landscape irrigation or other purposes to reduce water demand.

- The City should continue to encourage water reuse and to evaluate additional incentives and assistance that would encourage reuse of groundwater discharges.

Recommendation 4 – Identify Potential Contaminated Groundwater Discharges

The City currently has the authority to issue a Temporary Stormwater Discharge Permit for surface discharges to the storm sewer or a watercourse of identified or known contaminated groundwater from on-site industrial, manufacturing, trade, or commercial establishments including nonprofit organizations or government agencies. The City also has the authority to require the permittee, at the permittee's expense, to sample the discharge or conduct sampling themselves. This enables the City to monitor the quality of contaminated groundwater discharges and to prevent degradation of surface water in known contaminated areas. The treatment and removal of contamination found is currently coordinated with the TCEQ. The City does not currently track off-site subsurface contamination that could eventually migrate in natural groundwater flows to an adjacent groundwater sump system.

- It is recommended the City continue issuance of Temporary Stormwater Discharge Permits but provide information to the One Stop Shop to better determine, during the review process, whether or not a proposed site has identified subsurface contamination and conducted an Environmental Site Assessment.
- It is recommended the City research and collates contaminated groundwater data from multiple known sources and produce/maintain a data tracking system and a map of known groundwater contaminated sites that will assist the City and developers in determining when groundwater discharges should be sampled and permitted.

Recommendation 5 – Investigate Drainage Infrastructure Funding Alternatives

Impact Fees

Impact fees are a popular way to replace traditional means of funding capital improvement projects. Impact fees are a one time fee that can prevent increases in taxes and encourage "smart growth," in geographically defined areas and can assist municipalities when they must deal with increased financial burdens from new development placing heightened stress on existing infrastructure. The advantage of an impact fee is that it simply increases a charge that already exists and through them, financial strain can be shared rather than placing the entire responsibility on the City and/or residents.

There are some difficulties to overcome, such as determining how the fee would be managed, finding funding for the fee oversight and cost participation, and creation of new City ordinances to control impact fees and associated issues. As we look to the future and continued growth of Austin, assessing an impact fee is one viable approach to financing capital improvements in local government.

In both FY07 and FY08, drainage fee revenue represented 93% of all revenue collected in the Drainage Utility Fund (DUF). However, FY06 was the last of a five year phased increase in the drainage fee. Since then, the department has been structurally unbalanced, operating at a deficit in FY08 and a proposed deficit for FY09. The Drainage Utility Fund's reserve balance has funded the deficits for the past two years, but an increase in the drainage fee beginning in FY10 is needed to continue to provide adequate program resources and maintain a stable transfer to the Utility Fund's Capital Improvements Program (CIP). The department anticipates that if any changes are made to the drainage fee rate structure, implementation will occur in FY10. The department will request during the FY10 forecast period that any rate structure changes to the drainage fee be incorporated for consideration with the requested fee increase.

- It is recommended that the drainage fee be increased to fund additional drainage infrastructure improvements and that the City determine the plausibility of implementing an impact fee.

PID Structure and Framework

Recently the Texas State Legislature passed legislation for capital improvement public improvement districts, or PIDs. Essentially an assessment is added to the end-users tax bills and does not require an out-of-pocket expenditure by the developer or the City. The Austin City Council is currently encouraging establishment of PIDs as a tool to offset the costs of large infrastructure projects while encouraging high quality development in outlying growth areas. PIDs may be a viable tool to assist developers as well as the City in financing utility improvements that might be required to adequately address excess urban groundwater.

- It is recommended that the city study the prospect of employing PID structure and framework to implement a funding program separately from the impact fee.

Cost Sharing on Infrastructure Improvements

City code is clear about the responsibility of the developer to fund infrastructure improvements, but it is unreasonable to expect each developer to expend their own resources in an uncoordinated manner. Additional funding could provide opportunities to address needed overall improvements rather than site-by-site solutions that do not provide overall benefits.

- It is recommended that the City investigate alternative funding and cost-sharing options, to facilitate storm sewer improvements ahead of redevelopment and densification of urban areas.

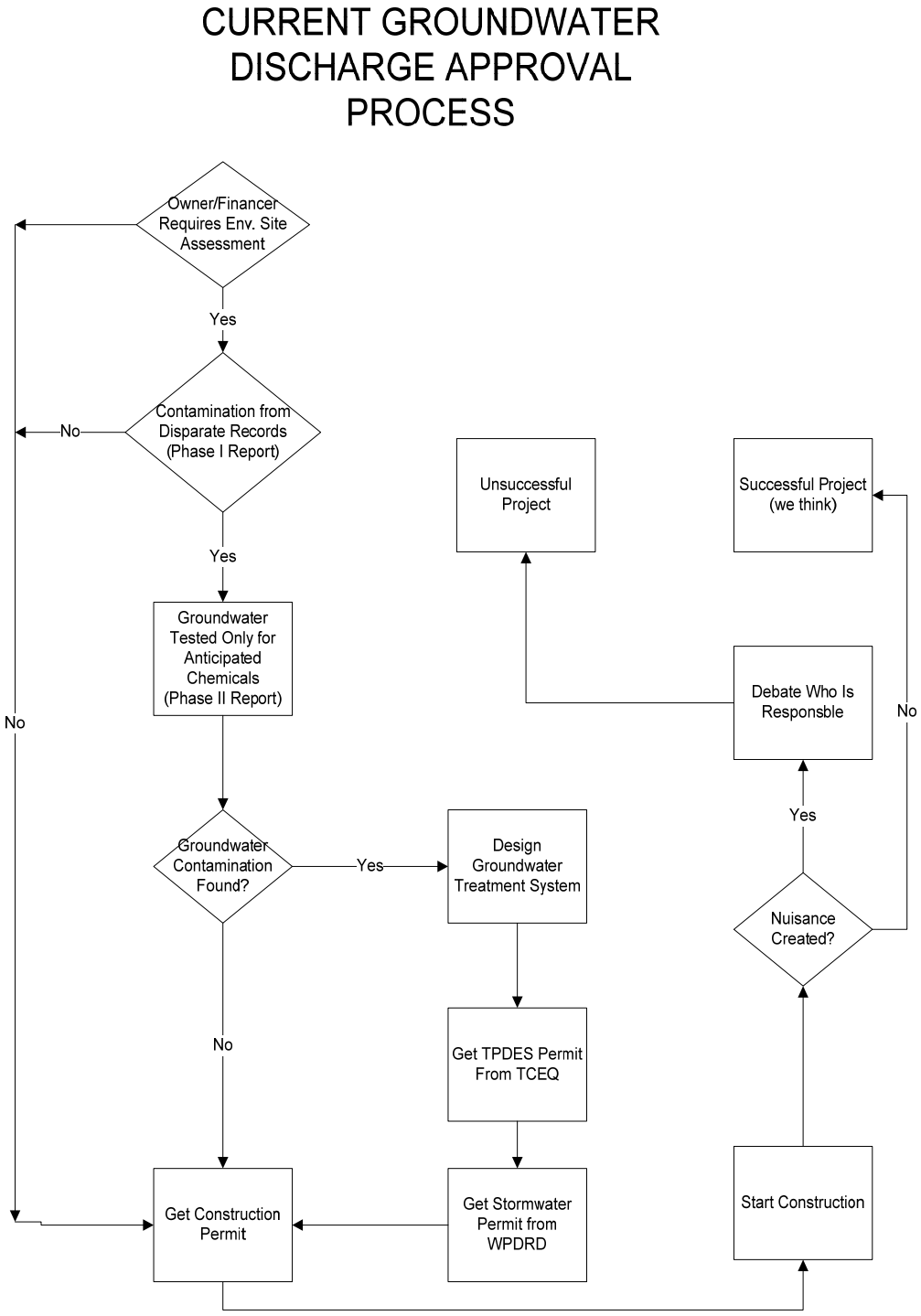

Figure 5: Current Groundwater Discharge Approval Process

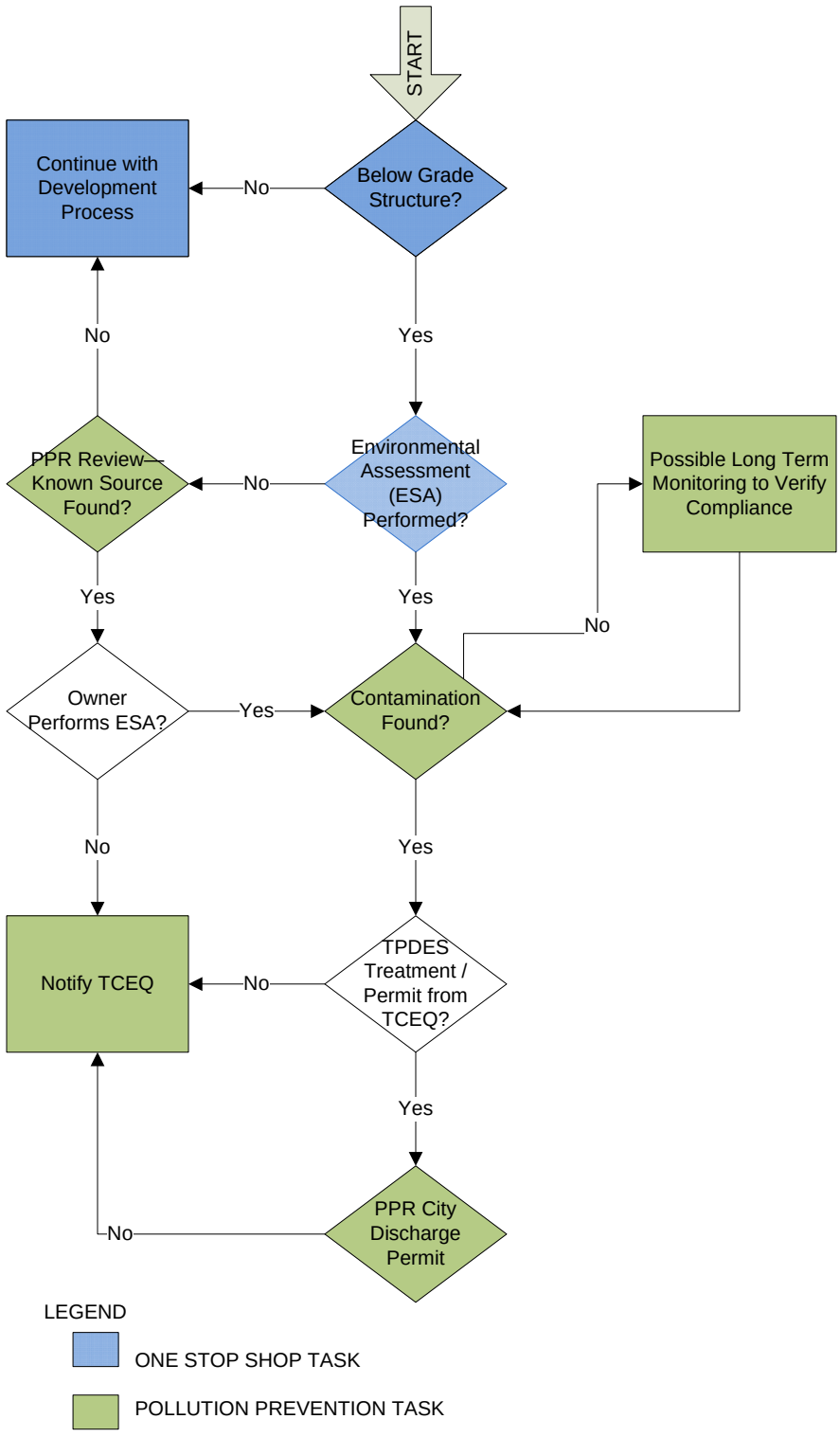

Figure 6: Proposed Groundwater Discharge Approval Process