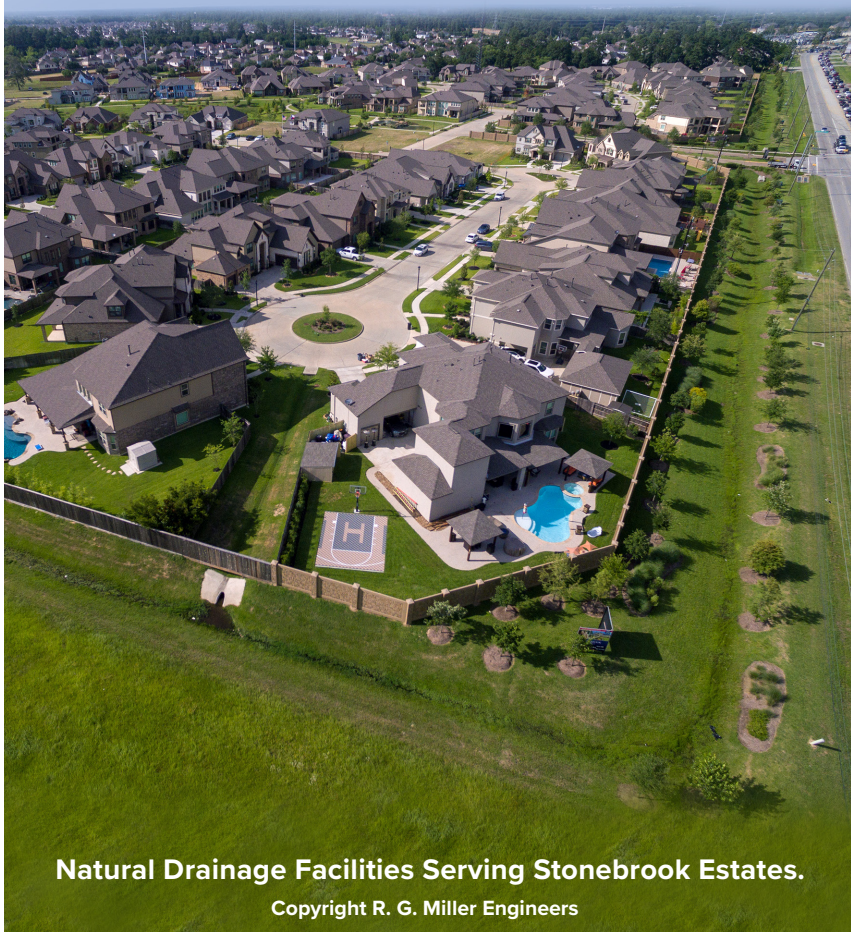
Using a "Natural Drainage" Approach to Enhance Real Estate Development Projects



Natural Drainage Facilities Serving Stonebrook Estates.

Houston area real estate developers have traditionally used concrete parking areas, concrete streets, and pre-cast concrete storm sewer systems to convey rain water quickly and efficiently to "end-of-pipe" detention basins or underground cisterns. From there, the collected rainwater is discharged into nearby streams or bayous or the public storm sewer system at a restricted rate to avoid downstream flooding from storms smaller than the design storm.

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Suburban developments are typically disconnected from their nearby streams in favor of locating homes and businesses around the detention basins, which are often designed with permanent pools of water and are viewed as manicured "lakes" by future residents. Urban developments typically place stormwater systems underground – out of sight and out of mind.

There is an alternative, however: natural drainage systems – also known as "low impact development (LID)" or "green stormwater infrastructure (GSI)."

Natural drainage systems are beneficial to property development in a number of ways.

Natural drainage systems simulate natural headwater streams and bayous, more closely mimicking the natural flow of water across the landscape.

In suburban settings natural drainage systems can extend the existing bayou and stream corridors up into the development, serving as natural open-space, creek or bayou-style amenities that support adjacent trails and parkland. In urban settings stormwater management systems can be integrated into the landscape design, thus providing an attractive, park-like amenity and a green respite from the hard and grey features of much of the urban environment.

Natural drainage systems cause water to move more slowly, allowing some to be absorbed by plants, some to infiltrate into the soil, and some to evaporate into the air.

Because the water runs off the site more slowly, these systems can be constructed with a smaller volume of detention. This can allow suburban developments to build smaller detention ponds and thus accommodate a higher number of homes or commercial buildings. In urban environments the use of natural drainage systems can reduce the volume of underground detention vaults, which can reduce development cost.

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Natural drainage systems are a marketing differentiator for developments.
They capitalize on the market demand for natural and environmentally friendly neighborhoods. They can serve as a framework for trail systems, which are ranked among the highest in consumer-requested amenities. They can provide a polished and manicured look along entryways and community front doors, while maintaining a wild and rustic look along paths and leading away from back doors.

Finally, natural drainage systems serve a drainage utility function under the Texas Water Code.
This means that suburban developers can be reimbursed for the cost of their construction with the proceeds from the sale of special district tax free municipal bonds.

Let's look at a few examples.

Audubon Grove, a large-lot, single family residential subdivision in Springwoods Village near the new Exxon-Mobil, campus features 57 lots on about 24 acres. Designed by Costello, Inc. for Taylor Morrison, the development includes trail systems along natural swales. The concrete roadways do not include curbs so that stormwater runoff can drain directly into the swales. Front yard swales have been landscaped with cobbles to create a more refined and polished look.

Camellia is another single-family subdivision that has used natural drainage systems. Camellia is located in Fort Bend County and includes 323 lots on about 50 acres. Designed by EHRA for Legend Homes, the development includes roads with cross slopes down to depressed vegetated center medians. The outside edge of the roads include traditional curbs while the inside edge is curbless to allow for sheet flow into a natural raingarden system.

The use of natural drainage systems in Camellia reduced overall project infrastructure costs by $1.6 million, increased lot yield by 99 homes, and reduced the volume of detention required to comply with floodplain regulations. [Ring, J. 2015. Talking Dollars and Sense: LID Construction Costs. Presented at the ASCE International LID Conference. Houston, Texas. January.]

Stonebrook Estates, in the Champions/Spring area, was designed by R. G. Miller Engineers, Inc. and Aguirre & Fields for Terra Visions, LLC. The development includes 135 lots on about 51 acres. About 70% of the development is served by a natural drainage system with landscaped and manicured ditches (called "swales") and biofiltration, which is basically a high flow rate sand filter for stormwater that removes pollutants. The rest of the development is served by traditional storm sewer. Roadways are sloped to one side and have curbs but feature "false back inlets" that drain stormwater to vegetated swales instead of expensive underground storm sewer pipes.

The use of natural drainage reduced the site detention requirement by 24%, which increased lot yield. In 2017, this project received the West Houston Association's Sustainability Stars Award because of its use of natural drainage features.

One example of the use of natural drainage systems in an urban setting is the **Bagby Street Reconstruction Project** in Midtown Houston, designed by Walter P. Moore and Associates with Design Workshop. The project includes a rain garden to attenuate rainwater runoff along its ten block project length. The project achieved a Silver certification under the Greenroads Rating System® for sustainable transportation infrastructure.

The business case for natural drainage in the Houston area is clear. Natural drainage:

- **Reduces the volume of detention required to comply with floodplain regulations and often increases developable area;**
- **Reduces the cost of drainage infrastructure in most cases;**
- **Allows reimbursement for the cost of drainage facilities if constructed in a utility district;**
- **In suburban settings, provides open space and a natural amenity to more of the homes in the development, allowing the developer to charge a premium on those lots;**
- **In urban settings, can be integrated into the landscape design and provide an attractive and park-like amenity;**
- **Capitalizes on the market demand for environmentally friendly and natural communities; and,**
- **Differentiates the development from all the rest.**

For more information about Houston-area natural drainage projects, check out the Houston-Galveston Area Council's Designing for Impact: A Regional Guide to Low Impact Development.