FRIENDS OF TWIN PARKS

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A Study of Stormwater Management in Albuquerque

by William Fanning Architect | October 15, 2020

This study is about management of stormwater runoff in Albuquerque. It began with a question: How can the City justify destroying a much-beloved, 80-year-old park, by converting it to a 10' deep drainage basin that might be used once a year to harness runoff from a brief but heavy thunderstorm? Further, how can the City justify the same fate for another 12 parks scattered around Albuquerque's Northeast Heights for the same purpose? Are there alternatives to stormwater management that begin with water as an asset rather than a problem to be disposed of?

The genesis of this inquiry is the City's pending plan to reconstruct Twin Parks as a detention pond to contain runoff coming from the nearby Pueblo Alto subdivision to the east. Specifically, flooding has occurred in recent years in the 800 block of Jefferson NE. Before platting and construction, this immediate area was crossed by a natural arroyo. Developed in a typical orthogonal grid pattern common in western cities, the Pueblo Alto subdivision design ignored natural topography. An underground storm system constructed to carry a 100-year flood volume was under-designed. As a result, several localized floods have occurred in this section of Jefferson NE over the years.

Street flooding at the 800 block of Jefferson Street NE, June 2020

Background

The Northeast Heights is Albuquerque's suburban "bedroom community." It has been almost entirely developed with low density, single-family houses and apartments interspersed with shopping centers and strip commercial development along with public schools and city parks. It is typical of many western cities in the second half of the 20th century, built in a regular grid pattern, largely without regard to the natural topography. Major arterials in a north-south and east-west pattern bisect the area. The Heights mostly developed over fifty years beginning around 1945 following the end of the Second World War, accelerating in the 1950s and 60s during which most of this large area was subdivided.

The Northeast Heights is located on an alluvial fan plain extending downward from the base of the Sandia Mountains to the Rio Grande Valley. It contained a system of arroyos that, prior to development, carried runoff water from 10 to 12 miles with a vertical drop of between 1,500 and 2,000 ft. Given the porosity of the native soils, most stormwater was absorbed before reaching the river, thus maintaining an extensive underground aquifer. It is this aquifer that has provided plentiful, clean water to Albuquerque's extensive Northeast Heights. Now, however, this underground water supply has been largely depleted. Since most of this area is now paved over, little runoff makes its way back into the soil, instead being carried down thru storm drains, east-west streets, and concrete channels from the base of the mountains to the Rio Grande River valley below. This condition is made worse by sloping terrain that creates swiftly flowing water that cannot be readily absorbed, instead of scouring streets and channels, carrying pollutants along with it.

Stormwater Management Today

An underground storm drainage network was installed piecemeal throughout much of the Heights. This system works reasonably well given moderate rainfall. Yet sudden, intense thunderstorms often overwhelm the capacity of the system resulting in backups and subsequent flooding. The chief character of hard paving in streets and parking lots is that even a small amount of rain can cause a sudden surge of runoff before subsiding. To deal with the problem of street flooding, Albuquerque has a state agency dedicated to managing stormwater.

Albuquerque Metropolitan Arroyo Flood Control Authority (AMAFCA) was created in 1963 with the responsibility of solving flooding problems in the greater Albuquerque area. To quote their charter: "AMAFCA's purpose is to prevent injury and loss of life, and to eliminate or minimize property damage. AMAFCA does this by building and maintaining flood control structures which help alleviate flooding." To meet its goal, AMAFCA has developed a stormwater system designed to channel floodwater from the base of the Sandias to the Rio Grande River by the most efficient means possible. Thus, they have constructed a network of concrete channels, diversion dams, and other flood control devices throughout the area with success. Following storm events though, major east-west thoroughfares often carry large volumes of water downhill to the river valley with streets often flowing from curb-to-curb.

These traditional methods of stormwater control lack a fundamental ingredient: a means to use runoff for irrigation and aquifer recharge. Further, despite AMAFCA's work, there are still localized areas where flooding occurs, such as the 800 block of Jefferson NE. Other pockets of flooding can be found throughout the Northeast Heights.

Under current practices, stormwater runoff is a problem to be solved rather than an asset to be utilized: runoff should be carried as quickly as possible in pipes and channels from mountain to valley. But this solution does not recognize the scarcity of water in New Mexico and more intense rain events likely caused by climate change have exacerbated the problem. Starting with the concept of water as a resource, the City can and should develop new means to use runoff productively. It can be put to better use by irrigating open spaces, encouraging percolation into streets and parking lots, and recharging the aquifer. While not as simple as conveying water downstream in a pipe, there are a variety of strategies that can be used to recycle valuable stormwater.

Green Stormwater Strategies

The Albuquerque Bernalillo County Water Utility Authority (ABCWUA) is actively seeking alternative solutions to current City and County stormwater management practices. It recognizes that stormwater is a precious commodity to be harnessed and used to maximum advantage rather than being discharged into the Rio Grande. As Kendra Chamberlain (2019) has remarked,

> Groundwater levels have dropped significantly across much of the West in recent years, impacting food production and drinking water access. Aquifers are being pumped dry in an effort to meet demand for water as populations boom throughout the West. Albuquerque relies on the Santa Fe Group aquifer system, a network of interconnected groundwater deposits within the Middle Rio Grande Basin stretching beneath Albuquerque and the surrounding communities. Generally, aquifers are recharged from precipitation that filters down through sediment, Galanter said. It's a slow process, and much of the water beneath Albuquerque is "old water."

The ABCWUA has also stated:

> Until recently, the sole source for Albuquerque's drinking water has been an underground aquifer. The need to preserve this aquifer — and ensure that we will have sufficient water supplies for future generations — means we must continue to explore alternative sources while conserving and making the most efficient use possible of what we already have. Guiding this process is the Water Authority's recently updated "Water Resources Management Strategy," which outlines a conjunctive approach to addressing the region's water needs. That approach includes recycling aquifer storage and recovery, non-potable water reclamation, and the San Juan – Chama Drinking Water Project. (Albuquerque Bernalillo County Water Utility Authority, n.d.)

Stormwater collected from streets and parking lots contains various pollutants such as solids, phosphorus, nitrogen, metals, and petroleum products. As this "grey" water percolates into the ground, it is filtered by the earth over time, seeping down again to the aquifer. However, when stormwater is discharged into shallow surface basins, such as city parks, it must be pre-treated in sediment traps installed upstream of these basins. Treatment structures take the form of concrete baffle boxes or centrifugal chambers that must be cleaned periodically, much like a septic tank. Without such treatment, this water will leave unhealthy deposits that will accumulate on the bottom of basins creating a health hazard for park users. Further, it can leave noxious odors (Southall & O'Meara, 2020).

Across the US, the concept of green streets is founded upon treating water as a scarce resource. The practice of integrating stormwater management into urban land planning is taking hold. Its underlying principle is to strike a balance between development and the natural environment. Green streets are designed to be integral with topography and natural watercourses to minimize grading, reduce impervious areas, and controlling stormwater at its source. The result is less water down the drain. The operating design concept is:

- Soak it in
- Sift it out
- Slow it down
- Spread it on the ground

Green streets employ several strategies for integral stormwater control (Southall & O'Meara, 2020). These include:

Buffer parks are typically shallow linear parks alongside thoroughfares that separate residential areas from arterials. They soften the interface between major streets and residential areas, reduce noise, lower the heat-island effect, and provide a green buffer. They also absorb CO 2 from auto exhaust.

Linear bioswales are narrow landscaped strips between curb and sidewalk. They are formed into a shallow concave basin that street water can flow into and as a by-product, irrigate trees, and shrubbery. They work effectively along residential streets and the edges of parking lots.

Dry wells are deep wells filled with sand and graded gravel that can be used alone or in conjunction with bioswales to good effect. Similar to a dry well, the French drain is a perforated pipe buried in a sloping trench surrounded by gravel. Both allow the percolation of water at a rate controlled by native soil composition.

Stormwater planters are placed at intervals along streets and contain street trees or shrubbery. They are set into the ground to accept street runoff.

Permeable pavement is a hard surface with large voids that allows water to flow thru to the soil beneath. Typically made of interlocking concrete pavers or brick, they are well-suited to parking lanes on streets, sections of parking lots beneath cars, and bike lanes (CNT, 2020).

FUN FACT: For every car in the United States, there are eight parking spaces.

The chief characteristic of hard paving in streets and parking lots is that even a small amount of rain can result in a sudden surge of runoff which quickly peaks before dissipating. The design goal of green street design is to lower the rate of runoff back to its original condition.

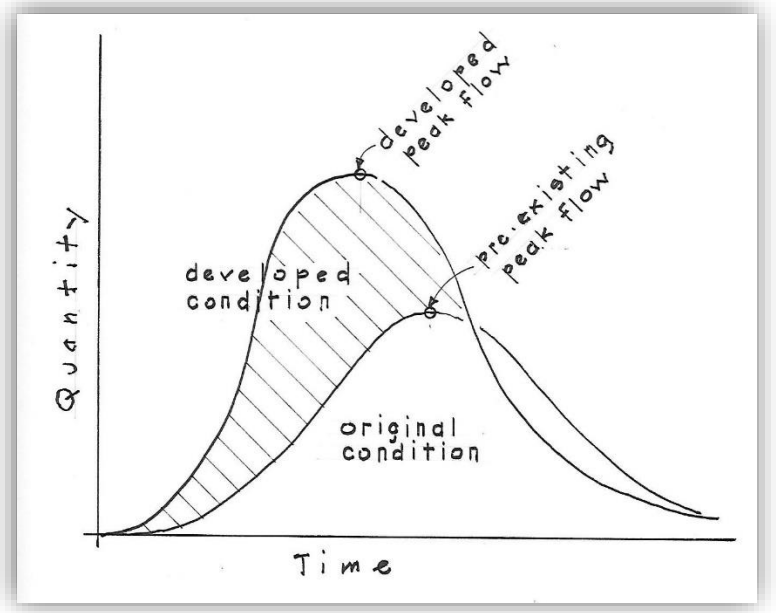

Figure 1. The effect of hard paving on runoff. The intent of green design is to reduce the amount of runoff and lengthen its time back to that of its original state.

A Green Solution to Flooding in Pueblo Alto

The problem of street flooding in the 800 block of Jefferson NE can be found at various locations around the Northeast Heights. As noted earlier, the Pueblo Alto subdivision was platted in a rectangular grid, common to western cities. This rigid pattern ignored natural watercourses or arroyos. Further, topography was not considered as flooding in this area in its natural state rarely occurred. Nonetheless, the infrequent but brief, heavy thundershower does happen. An underground storm runoff system was installed in Pueblo Alto that has proven to be inadequate to handle the 100-year flood volume. As a result, water backs up at the lowest spot in the immediate area when the drainage system is pushed to overcapacity.

The City has allocated $4m. to solve the flood problem on Jefferson NE. The solution put forth by consultants to the City, Smith Engineering, and more recently by Bohannan Huston Engineers, is to enlarge the storm drain lines from Pueblo Alto westward to discharge into drainage basins in Twin Parks. This solution would destroy these parks as the basins would be about 10' deep and cover most of the surface area of the parks. Further, preliminary design work does not include any pre-treatment facilities to remove pollutants from the greywater deposited in the bottoms of the proposed ponds. These deposits can be hazardous to health and produce foul odors. In recent years, the City has developed runoff basins in large parks, notably on the West Side. However, given the small size of Twin Parks, together about 1.7 acres, characterizing the bottoms of these basins as usable recreation areas is unrealistic. Effectively these 80-year old parks would be destroyed.

In lieu of ruining our parks, The Friends of Twin Parks ask the City and its consultants to consider the application of green stormwater practices on Jefferson NE. Such a project could encompass several blocks in the immediate area and even help with control of runoff as far south as Lomas Blvd. NE, which frequently is inundated with stormwater.

The street section illustrated below shows several means to manage street flooding. A combination of these applications could achieve the goal of returning these streets to their natural condition before development. While they would involve relocating existing sidewalks and installing water catchment features, this solution would most probably cost considerably less than the proposal to install much larger storm drain lines some three blocks west to Twin Parks, excavate deep detention ponds, and re-landscape the parks.

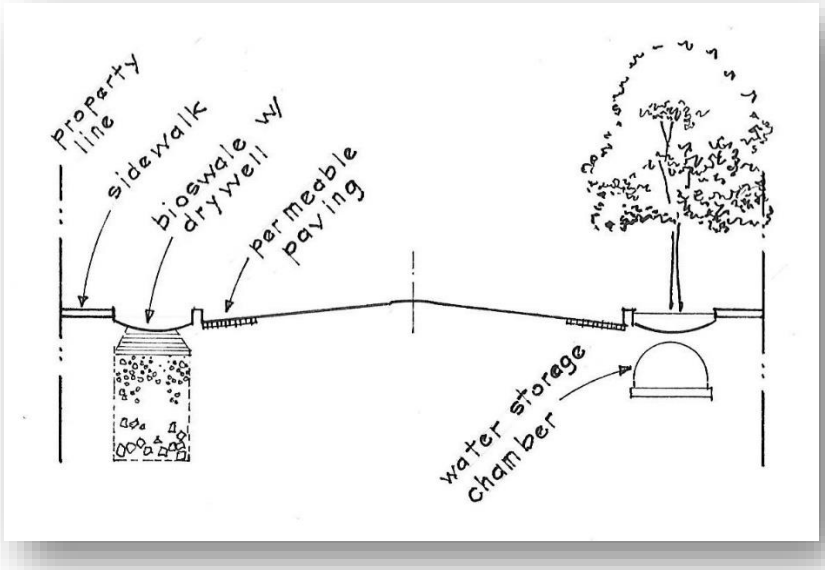

Figure 2. Street flooding management options.

It is important to note that soil composition is critical to the ability of a bioswale or permeable pavement to percolate water. In the mid-heights area, the predominant soil type is sandy and silty loam. These soils compact over time beneath streets and sidewalks and do not readily accept runoff, therefore the subgrade beneath must be prepared for optimal drainage. For example, to ensure maximum water capacity, dry wells in this area are generally composed of sand overlaying medium to large gravel.

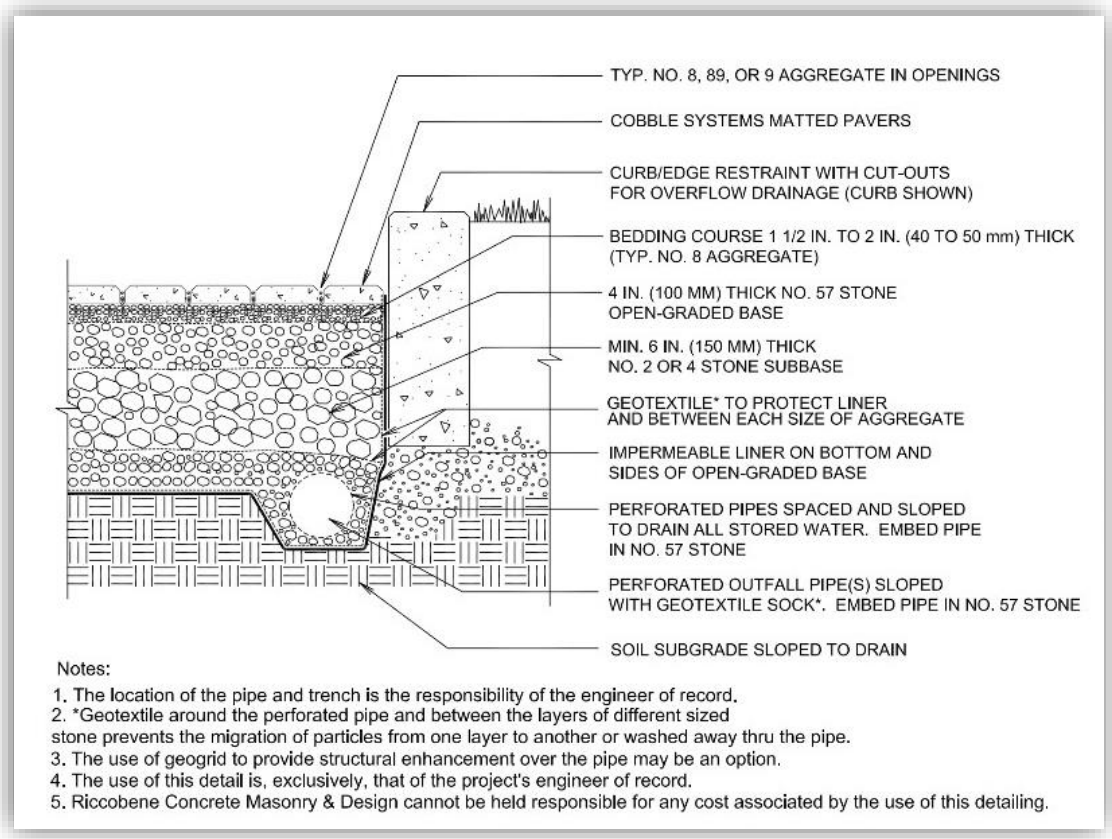

Figure 3. Typical permeable pavement with no exfiltration to soil subgrade.

This section thru a street illustrates a permeable paving system manufactured by Riccobene Masonry Co. of Albuquerque. It is composed of concrete pavers over a base course of sand, and small to large aggregate. The pavers are 1 5/8" thick concrete cobbles with wide joints (min. 3/16") installed in 16" x 48" mats. Following compaction, the joints are filled with a permeable, two-part epoxy grout. The drainage pipe is one option for draining off runoff water. As part of a recent street improvement project, this paving system was installed along both sides of 4th Street NW in Albuquerque.

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