technical note

Select Springs of the Austin Area: Descriptions and Associated Hydrogeology

Alan J. Cherepon

Introduction

While Austinites are well aware of the most famous springs in the city, Barton Springs, few, including many geologists, are aware of the huge number of springs and seeps that grace the city. The City of Austin estimates over 700 such features (City of Austin database, unpublished). While impossible to address every one of them, representatives of the major spring types in the various rock and sediment units are presented herein. These springs are not described in the important work titled Springs of Texas (Brune, 2002), nor are they currently found in the internet-based Texas Water Development Board's Groundwater Database (TWDB, 2012).

A generalized geologic map is provided as Figure 1. Below the Edwards is the Walnut and Glen Rose Formations, which form the stair-stepped alternating beds of less-resistant marls and more-resistant limestones and dolomites. Springs in this formation appear in the western portion of the Austin area. Above the Edwards Group is the Georgetown Formation, which is combined with the Kainer and Person Formations to comprise the Edwards Aquifer in the Austin area. Above the Edwards Group is the Buda, Austin Chalk, and Colorado River Terrace Deposits, all of which include springs or seeps addressed in this summary.

Each of the springs and associated hydrogeologic units (except for a combined Edwards) will be presented stratigraphically from oldest to youngest. Figure 1 indicates by letters where the springs identified in this paper are located. The springs were chosen for the following reasons:

- Accessibility (both permission-wise and relative ease of getting to it in most weather conditions)
- Clear, impressive exposure of the rock units, or the best for that unit
- Classic stratigraphic characteristics for the units
- Adequate spring flow
- Additional interesting information

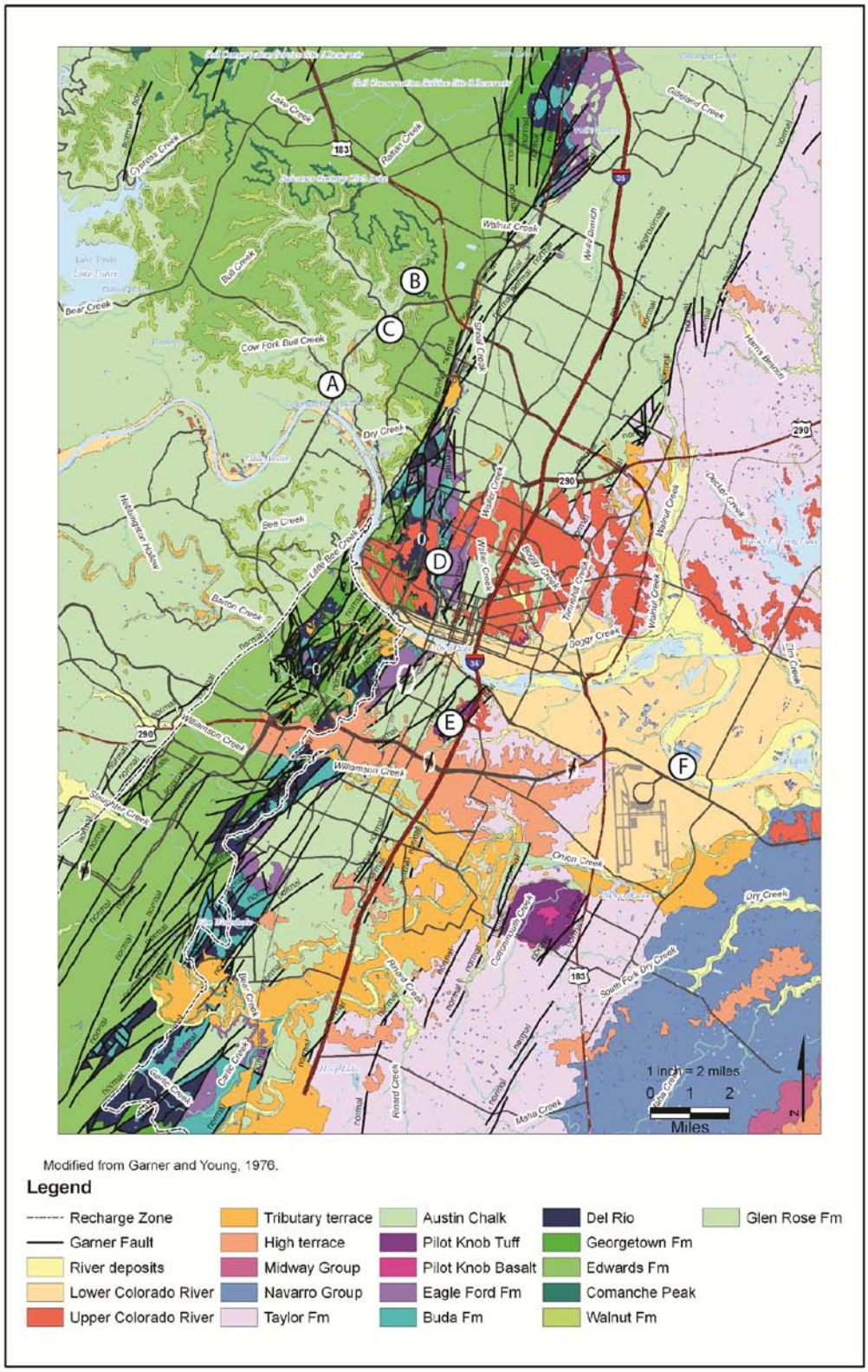

Figure 1. Geologic Map of Austin with springs indicated as A-F. Geologic basemap is from Garner et al., 1992.

A) Bull Creek (360) Springs (City of Austin database): Glen Rose Formation

The Glen Rose Formation and associated springs are typically found in the westernmost portion of the Austin area. Classic exposures are found along the Capitol of Texas Highway/Route 360, as stair-stepped examples of "layer-cake" geology. The overall structure is due to the weathered marl layers intermittently located between the resistant limestone and dolomite beds. Some good crystals of calcite and Celestine (the correct name for this mineral is Celestine, not celestite, as per the International Mineralogical Society and agreed to by the Mineralogical Society of America, however it is commonly and often still referred to as celestite) have been found along Hwy 360, and dinosaur footprints can be found in the South Fork of the San Gabriel River a little upstream from Hwy 183 in Leander. The seeps at the southwestern corner of Hwy 360 and FM 2222 provide a good view of several features in this spring-bearing unit, including (Figure 2):

- Tufa/Travertine deposits formed by seepage dripping down the bedding planes (note rapid deposition on roots and fresh leaves)
- Mini-caverns/vugs formed by the dissolution of the limestone, dolomite and evaporate materials, complete with mini-stalactites, columns, and root and weed coatings
- Colluvium (paleo creek-fill material above the Glen Rose)that allows for greater water flow to the underlying Glen Rose
- Textbook Glen Rose, with alternating more and less resistant beds forming characteristic stair-step stratigraphy along Hwy. 360

The exposure of the Glen Rose is a classic gravity-fed spring mechanism, where waters percolate downward from the hills above this steep road-cut. If the road cut had not been made, the waters would have naturally discharged along West Bull Creek near its confluence with the main stem of Bull Creek at FM 2222 and Hwy 360. The waters above percolate down through the colluviums and into fractures and faults in the Glen Rose, and when they encounter more solid beds, preferentially flow along the bedding planes and discharge through gravity flow at the cut face, or at dissolution openings as seen at the base of the cut.)

Figure 2. Small grotto and spring with lime encrusted roots, location A on Figure 1, Hwy 360 and FM 2222, Glen Rose Formation.

B) Great Hills Springs (City of Austin database): Walnut Formation

The Walnut Formation and associated springs are concentrated primarily in the northwestern portion of the Austin area. These exposures, which include Great Hills Park Spring, are located along an unnamed tributary that feeds into Bull Creek, in the Great Hills neighborhood of northwest Austin. The thin, weathered marly, argillaceous/silty beds are located below the fossil rich, honeycombed beds of the basal Edwards Kainer Formation, Kirschberg equivalent member. The lower portion of the Walnut is a thick, dense subgraphic limestone, which includes small fossils of gastropods, pelecypods, and hollow, calcite crystal-lined geodes above the Glen Rose. This is an example of a gravity flow spring, with surface waters trickling through the honeycombed Edwards above and into the Walnut beds and migrating down to the top of a confining unit. The springs are more like seeps trickling down to the thin upper beds of the Walnut, and vertically along faults or fractures on the cutbank cliff faces into a small, unnamed creek. Features in this unit include the following (Figure 3):

- Thin tufa layer coating cliff faces and surrounding vegetation, from seepage dripping down the cut-face

- A vertical fracture or fault showing vertical movement of water through more resistant beds
- A good exposure of the calcite geodes identified in several papers
- A view of what the Walnut Formation looks like in northwestern Austin, as one of the minor spring/seep-bearing units
- A great view of the honeycombed member of the Edwards and underlying Walnut

Figure 3. Hearth Springs, located in the Floral Park Drive and Raining Oak Cove, Great Hills neighborhood.

C) Stillhouse Hollow Spring (City of Austin database): Edwards Aquifer, Kainer Formation, Kirschberg Evaporite Member equivalent

Most field trips and papers frequent Barton Springs, as it is the classic Edwards aquifer location, is located in a park, and has an education center. The Stillhouse Hollow location is less frequently visited, but offers many interesting features not present at Barton Springs. The Kainer Formation and associated springs are found in the western half of the Austin area. This exposure is located off Spicewood Springs Road, near Hwy 360. City of Austin dye trace studies both in the preserve and adjacent neighborhood showed rapid travel times from karst features to springs. A sinkhole is visible next to the trail about 100 yards from the entrance. The honeycombed Kirschberg Evaporite Member equivalent is located above the more resistant and confining limestone bed of the Walnut Formation. The spring is another example of a gravity flow spring, with surface waters migrating into the honeycombed unit to the top of the confining unit, and down slope to this discharge point in a steep ravine. The trade-offs between this spring versus Barton Springs include the visible rock units and karst features. The spring is adjacent to

a rock shelter/observation deck in a City of Austin park (Balcones Canyonlands/Stillhouse Hollow Preserve). The spring area itself is off limits to the public due to the sensitive nature of the site and the presence of the Jollyville Plateau Salamander, a candidate for listing as an endangered species. Features in this unit include the following (Figure 4):

- Numerous karst features (sink hole, rock shelter, numerous springs)
- Great exposure of the Kirschberg Evaporite Member equivalent (honeycomb solution vugs)
- Large tufa mound and terraces in hollow just below spring
- Sensitive environment (Jollyville Plateau Salamander)
- Estimated flow rate

Figure 4. Stillhouse Hollow Spring, located in the Balcones Canyonlands/Stillhouse Hollow Preserve.

D) Big Boulder Springs (City of Austin database): Buda Formation

Big Boulder Springs are located on Shoal Creek and 29th Street, a little southwest of where the streets intersect next to the trail. The spring is another example of a gravity flow spring, with surface waters migrating down the overlying terrace deposits and Buda limestone, along fractures and faults and discharging at an opening along bedding plane where the fractured/faulted Buda sits on top of the Del Rio Clay. Similar springs are present adjacent to Shoal Creek from the Pease Park area to near Koenig Lane. Features in this unit include the following (Figure 5):

- Great exposure of the Buda Formation limestone above the Del Rio Clay
- Good, steady spring flow, not just a seep
- Tufa deposits

Figure 5. Big Boulder Spring, on Shoal Creek and 29th Street, in the Buda Formation above the Del Rio Formation.

E) Blunn Preserve Springs (City of Austin database): Austin Chalk Formation

The Blunn Preserve is located along Blunn Creek off St. Edwards Drive. The spring and seeps alongside the creek are also examples of a gravity flow springs, with surface waters migrating through fractures and along bedding planes to the top of the confining unit, and down slope to discharge points alongside Blunn Creek in several places. The beds of the Austin Chalk exhibit slopes off the side of the buried volcano that lies beneath nearby St. Edwards University. Brecciated, solutioned beds appear to be a major water unit, sandwiched between more massive and less transmissive beds of the chalk. Features in this unit include the following (Figure 6):

- Brecciated, solution features in the main water-bearing unit
- Blocky and nodular fossiliferous beds with abundant oyster beds

Figure 6. Blunn Preserve Springs, off St. Edwards Drive, along Blunn Creek in South Austin.

Costley Spring (F, Texas Water Development Board WIID database, 2010): Colorado River Terrace Deposits

Costley Spring is entirely in terrace deposits above the present-day Colorado River. It is located in Del Valle, on the east side of Hwy. 71, before toll road 130 and Austin-Bergstrom Airport, far southeast Austin. The location is the site of a former gristmill from the 1880s, with only the dam remaining. The springs can be seen leaking from a gravel bed of the terrace sediments just downstream from the dam, along a steep cut face with about a 30-foot drop from the dam to the pool below. This may be the best gravity fed spring exposure in the terrace deposits, exhibiting classic sediment layering of finer and very coarse beds through which surface waters percolate to the gravel bed that sits on top of the Taylor Clay and into the incised valley the stream cut through these sediments and the underlying clay. Just to the northwest are impressive bluffs on the Colorado River across from Hornsby Bend. Features in this unit include the following (Figure 7):

- Classic gravel bed in Terrace deposits as water-bearing unit above the Taylor Clay confining unit
- One of several springs in Austin that issues from permeable unit downstream from a dam
- Very picturesque and historical, yet relatively unknown site

Biography

Alan Cherepon received his BA in geology from Rutgers University in 1976 and began his professional career in Texas that year. He worked several years in uranium and oil and gas exploration before changing over to environmental and hydrogeologic work. He is a past-president of the AGS (2006-2007), and this paper will eventually become the third field trip and guidebook he has prepared and conducted for the society. He is presently employed by the Texas Commission on Environmental Quality conducting work to prevent pesticide contamination of groundwater, which he has done for the past 14 years. It is his spring sampling for pesticides in Austin and San Antonio that led to the writing of this note and eventual field guidebook and field trip anticipated in the future.

References

Brune, Gunnar, 2002, Springs of Texas: College Station, Texas A&M University Press, 2d ed., 566 p.

Garner, L. E., K. P. Young, P. U. Rodda, G. L. Dawe, and M. A. Rogers, Geologic Map of the Austin Area, Plate VII, Reprinted 1992, from Garner, L. E., and K. P. Young, Environmental Geology of the Austin Area: An Aid to Urban Planning, Report of Investigations 86, The University of Texas at Austin, Bureau of Economic Geology, reprinted 1992, 1976.

TWDB, Water Information Integreation & Dissemination System (WIID), http://wiid.twdb.texas.gov/

Figure 7. Costley Spring issuing from a terrace deposit gravel bed on top of the Taylor Clay in southeast Austin.