The Sandias, the John Roberts Dam, and the flora along the Arroyo del Oso trail.

Northeast Heights Bike Trails

Bicycle trails connect the east edge of the city of Albuquerque, Tramway Boulevard, with the Interstate-25 corridor or even further west in six places, all of them north of Central Avenue. Going from south to north, these are

The Interstate 40 Trail. Discontinuous, with several stretches on city streets, it nevertheless is one of the longest, from Tramway Boulevard on the east to Unser Boulevard, 17.4 miles away to the west.

Interstate-40 Trail combined with the Paseo de las Montañas Trail. Paseo de las Montañas carries you from a pedestrian bridge over Tramway Blvd. to Louisiana Blvd., where this trail meets the I-40 Trail.

Arroyo del Oso Trail uses city streets to start in the Sandia foothills east of Tramway Blvd. to reach Juan Tabo Blvd., where a dedicated bike trail proceeds westward to beyond San Pedro Drive. At this point, city streets again take over until you get to the spanking new bridge over I-25 and a bike trail connection to the North Diversion Channel Trail.

Del Rey Avenue/North Pino/ Pino Arroyo Trail takes you from one block west of Tramway Blvd. to the North Diversion Channel Trail, including the use of some city streets near the west end.

Paseo del Norte Trail/South Domingo Baca Arroyo Trail takes you from Tramway Blvd. to the east frontage road for I-25; if you can somehow maneuver through the I-25/Tramway interchange, currently dangerous, you can continue west as far as Coors Boulevard. We recommend a brief detour to the south for now.

Tramway Road, though not technically a bike trail, connects Tramway Blvd. with Second and Fourth Streets west of I-25. It has wide shoulders and is heavily used by bicyclists wanting a rapid descent or a tough climb.

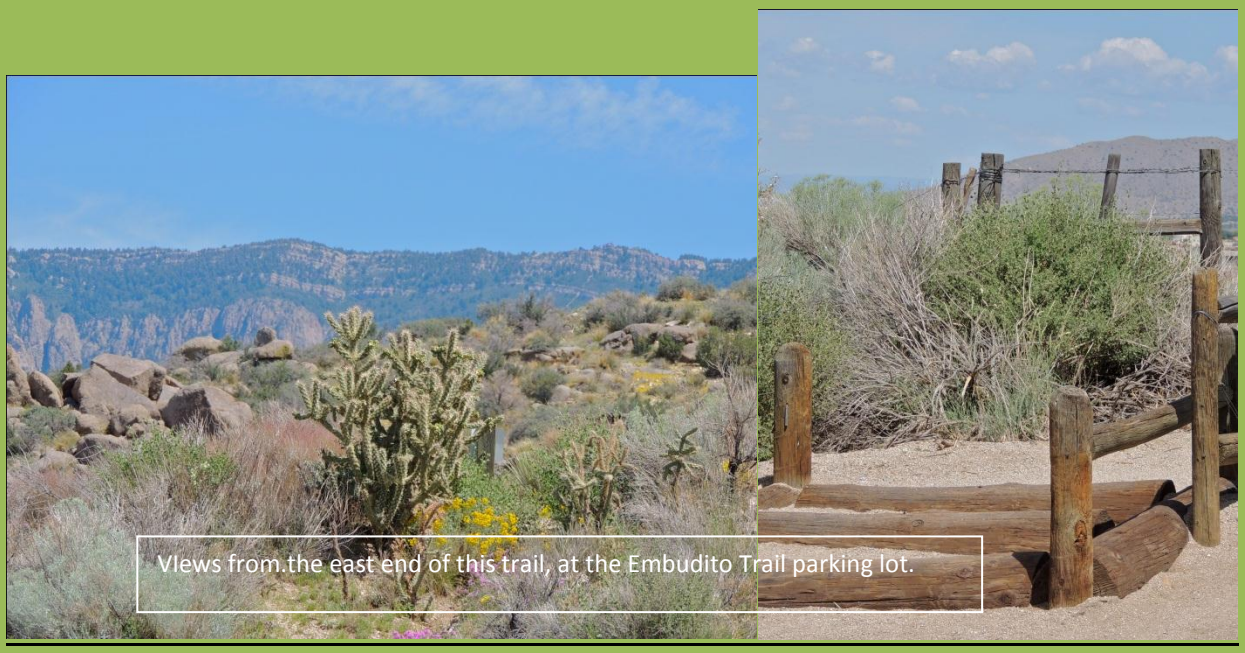
The Interstate-40 Trail and Paseo de las Montañas Trails are described elsewhere in this guide. See those and also the Tramway Trail, which describes the Tramway Road route. In addition, we describe the Paseo del Nordeste/Hahn Arroyo Trail, which serves the west portion of a bike route that includes a lane on Comanche Road from Tramway Blvd. west to Montgomery Park, meeting the Paseo del Nordeste there.

This guide describes the third, fourth, and fifth trails listed above, in accordance with their common history and features. Each takes you through neighborhoods and parks; we have frequently made a round-trip from the west by ascending one of these trails to Tramway Blvd. or the National Forest beyond and descending another back beyond Interstate-25.

We'll start with brief descriptions of the routes and then write of the geology and the water courses that have shaped the Northeast Heights and of the human history of the area all in one narrative. These attributes are shared by the three trails.

External and internal night views of the new bike bridge over I-25 near Jefferson St.

Arroyo del Oso/Bear Canyon Trail



Vlews from the east end of this trail, at the Embudito Trail parking lot.

Parking is available at Embudito Trailhead, along Manitoba, at Oso Grande Parking Area next to CNM, at Xeriscape Garden and along numerous residential streets near the trail.

0.0/7.9 miles This route/lane/trail starts at the Embudito Trailhead at the east end of Trailhead Rd. NE. To get to Manitoba Dr. and Tramway Blvd., at the bottom of Trailway Rd., turn north at Glenwood Hills Dr., which curves west as Manitoba Dr. and then south again as Calle de Luna. From Calle de Luna, turn west very soon on another segment of Manitoba Dr. This segment of Manitoba ends in a few blocks at Larchmont Dr.; turn north on Larchmont for one block, then turn west on Manitoba. From here, Manitoba is continuous all the way downhill to Juan Tabo Blvd.

1.1/6.8 Miles Manitoba reaches Tramway Blvd. after crossing the Cedarbrook Channel

2.2/5.7 Miles Manitoba ends at Juan Tabo Blvd. Take a one-half block jog to the north, riding on the sidewalk on the west side of street. The John B. Robert Dam towers above the east side of Juan Tabo Blvd., cutting off Arroyo del Oso. The Arroyo del Oso (Oso=bear in Spanish) collects water from by far the largest catchment area of any of Albuquerque's arroyos, taking

Sculpture in the Bear Arroyo just west of Tramway Blvd.

in effluent from some 3830 acres, so the dam can at times fill. It's still dry most of the time.

Across the street, west of the dam, the trail heads west down the hill. Sheltered picnic tables in the Arroyo's flood plain and green grass, fruit trees, and playground equipment grace the developed part of El Oso Grande Park north of the trail. To the south of the trail, between Juan Tabo and Morris St., stand the brick buildings of the Montoya Campus of CNM.

Part of the Central New Mexico community college Montoya campus alongside the Arroyo del Oso.

2.8 /5.1 Miles The Bear Canyon Arroyo trail reaches Morris St., at the west end of Oso Grande Park. At Morris, make a brief jog to the south side of the arroyo.

3.3/4.6 Miles Bear Canyon Trail crosses Eubank Blvd. There is a protected turn lane in the center of this busy street to get back to the north side of the arroyo. There is a clanging steel mesh bridge at 3.7 miles over a side channel; Bear Arroyo is not concrete lined here, so it supports lots of vegetation growing in it. There is a short spur trail to the north at the side channel.

3.9/4.0 Miles A large bridge over the arroyo to the south of the trail connects to Moon St., which sports a bike lane leading south.

4.4/3.5 Miles The Bear Canyon Trail crosses Wyoming Blvd. through a protected turn lane in the middle of that busy road. A new bike trail continues west, alongside often-crowded Arroyo del Oso Park's tennis courts and soccer fields before crossing a new bridge over the Arroyo del Oso. The trail crosses behind the Xeriscape Garden and then John Arthur Carrillo Police Substation which are at the northwest corner of Osuna and Wyoming. A large sculpture from the City's One Percent for the Arts program called "Protect and Serve" by Storm Townsend depicting a policeman protecting a young child stands on the north side of the substation. The trail then runs alongside the arroyo and soccer fields of Arroyo del Oso Park. There is a brief interlude of natural vegetation along the arroyo and then the trail passes along the west side of

Children playing on a temporarily unused soccer field at the Arroyo del Oso Park.

the Arroyo del Oso Golf Course

5.0/2.9 Miles Pennsylvania Blvd. and Osuna.

5.5/2.4 Miles Louisiana Blvd. and Osuna, where the bike trail crosses the driveway for the Arroyo del Oso Golf Course.

6.0/1.9 Miles San Pedro Drive. The bike trail curves to the north just west of San Pedro, crossing the lower end of the golf course and the Arroyo del Oso on a bridge on its way to Academy Rd. But to continue on this route, exit the bike trail for the bike lane along Osuna Rd.

6.6/1.3 Miles San Mateo Blvd. and Osuna. Continue west on Osuna past San Mateo

6.8/1.1 Miles Brentwood Place. Take a right on Brentwood Place, which leads to the east side ramp for the bike bridge pictured on page 2 of this guide and lit with stylish blue lighting at night.

Looking east from Jefferson St. up the upaved Arroyo del Oso to the bike bridge,, with the Sandias behind.

6.9/1.0 Miles The east end of the bike bridge over I-25.

7.2/0.7 Miles West end of the bike bridge. From here, the bike trail heads due west to Jefferson St.

7.3/0.6 Miles Bear Arroyo trail crosses Jefferson St.

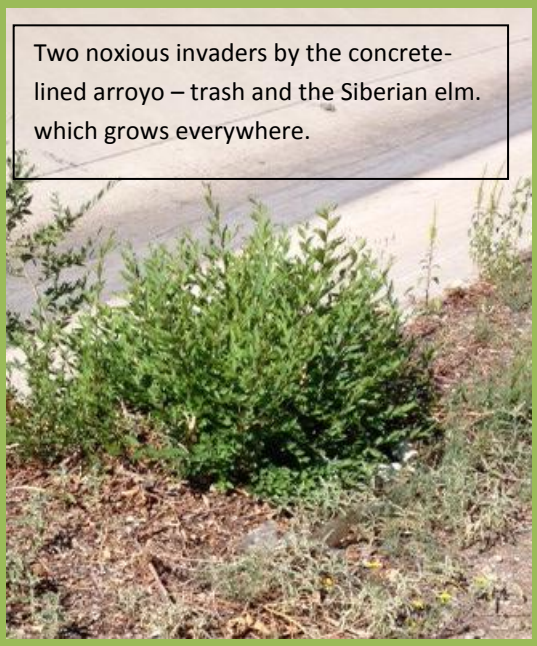
7.7/0.2 Miles Large metal "cages" at the bottom of the arroyo are designed to catch debris before it gets into the North Diversion Channel ahead and the river beyond. The cages are immediately followed by what is known as a secondary environmental pond, an area with soil, grass, bushes and even trees. The pond acts as a purifying filter for water passing through and also creates wildlife habitat.

7.9/0.0 Miles Head left at the fork (the right fork takes you to the businesses on Osuna), then take a sharp left, crossing the Bear Arroyo, and just over the bridge, join the North Diversion Channel trail.

8.0 Miles The Bear Arroyo Trail reaches North Diversion Channel Trail. Turn left to go south on the NDC Trail as far as UNM. To go north toward Balloon Fiesta Park, turn right and go over the bridge spanning the NDC.

Del Rey Avenue/North Pino/ Pino Arroyo Trail

Parking is available near the trail on residential streets such as Tennyson St., as well as at the parks along the way, including Quintessence Park, Heritage Hills Park, and near the park west of E.G. Ross Elementary School.



Two noxious invaders by the concrete-lined arroyo – trash and the Siberian elm. which grows everywhere.

0.0/7.2 Miles Start at Del Ray Ave. and Tennyson, one block west of Tramway Blvd. and one block south of San Rafael. The trail runs like a sidewalk along the south side of Del Rey, cut by numerous driveways; it's probably easier to use Del Rey Avenue itself down to Eubank.

1.0/6.2 Miles Del Ray crosses Browning St.

1.5/5.7 Miles Del Ray reaches Eubank Blvd.; jog to the south over the arroyo, turning west again very quickly again along the south side of the arroyo. This intersection is confusing in both directions, and lacks signage.

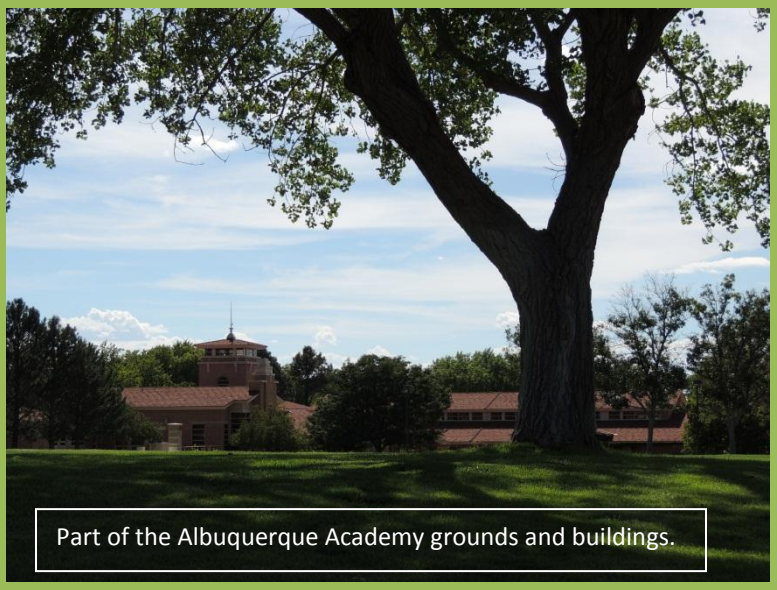
Pretty Quintessence Park, a small, Nevada-shaped green space lies a short distance ahead above a large concrete dam across the arroyo. Keep left (south) at the end of the park after passing its playground equipment, picnic tables and parking lot. Beyond the park, the trail first heads south for a short distance and then west again down the hill. Lots of native vegetation lies along this trail.

2.8/4.4 Miles Cross Ventura St. Long, narrow Heritage Hills Park lies west of Ventura and just to the north along the arroyo. Heritage Hills Park has sports fields, paved trails, and a large parking area. Going downhill, keep left (south); uphill, keep right (south) to stay on the bike trail. West of here, the trail accompanies tall power lines.

3.4/3.8 miles Just east of Barstow, you'll come to an unmarked Y in the trail; keep left here.

The trail crosses Barstow St., curving to the southwest around Cherry Hills Library (parking, water, and bathrooms are available here when it's open) for the short distance to

Quintessence Park, looking toward the Sandias.



Part of the Albuquerque Academy grounds and buildings.

Harper Rd. Cross Harper to the south, then west and south around the corner so you end up on the east side of Wyoming Blvd. for a few feet; then cross Wyoming (**4.0/3.2 miles**) so you're on the bike trail along the north side of Pino Arroyo again. Note that this intersection (Harper/Wyoming/San Antonio is quite confusing, with no signs to indicate where the bike trail you're to follow will next be seen.)

If you were to continue south alongside Wyoming the trail follows the Albuquerque Academy's property fence to Academy Rd. The Academy can't be seen well from this vantage point; it hides in the trees in the middle of its large property, but it is well known throughout Albuquerque. It started out small in 1955 with 12 students, but now has almost 100 times as many in the seven grades from sixth to twelfth. It had remained a small school until the early 1960s, when a series of gifts from banker and rancher Albert Simms and his wife Ruth Hanna McCormick Simms gave the Academy funds and land on which to build. The couple met when both were congressmen, Albert from New Mexico and Ruth from Illinois. The tract of land given to the Academy was huge, stretching to the crest of the Sandias. The Academy built a large, modern campus at the west end of the then undeveloped land, now surrounded on all sides by the city. The school is renowned for its educational, sporting, and cultural programs.

Summer flowers along the trail front the view east to the mountains.

From Wyoming to I-25, the bike trail lies between Pino Arroyo to the south and San Antonio Dr. to the north, with its power lines in the wide median.

4.5/2.7 Miles Cross Louisiana Blvd.

5.0/2.2 Miles Cross San Pedro Dr.

5.6/1.6 Miles The bike trail reaches Pan American Frontage Road North. Turn north here around a 90 degree bend of the bike trail, then west again on the trail on the south side of San Antonio Dr. and under the I-25 underpass.

6.1/1.1 Miles Remain on the sidewalk-like bike trail on the south side of San Antonio until you

reach Jefferson St. Continuing across Jefferson you're on the side of the street which has become Ellison St., the separated bike trail having ended.

6.4/0.8 Miles Ellison ends at Washington St., where you turn north, making a jog to the right at Hawkins St. to continue on Washington through this industrial area.

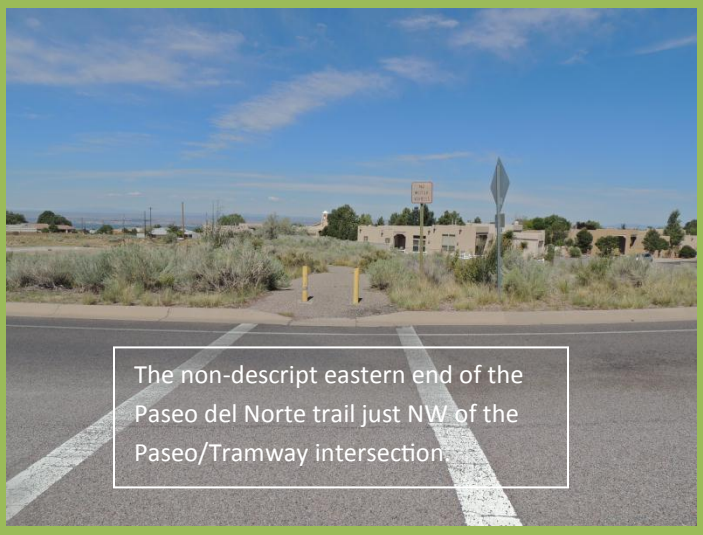
6.7/0.5 Miles Turn west on Rutledge St.

6.9/0.3 Miles Turn north on the marked bike trail spur, which soon curves around to the west.

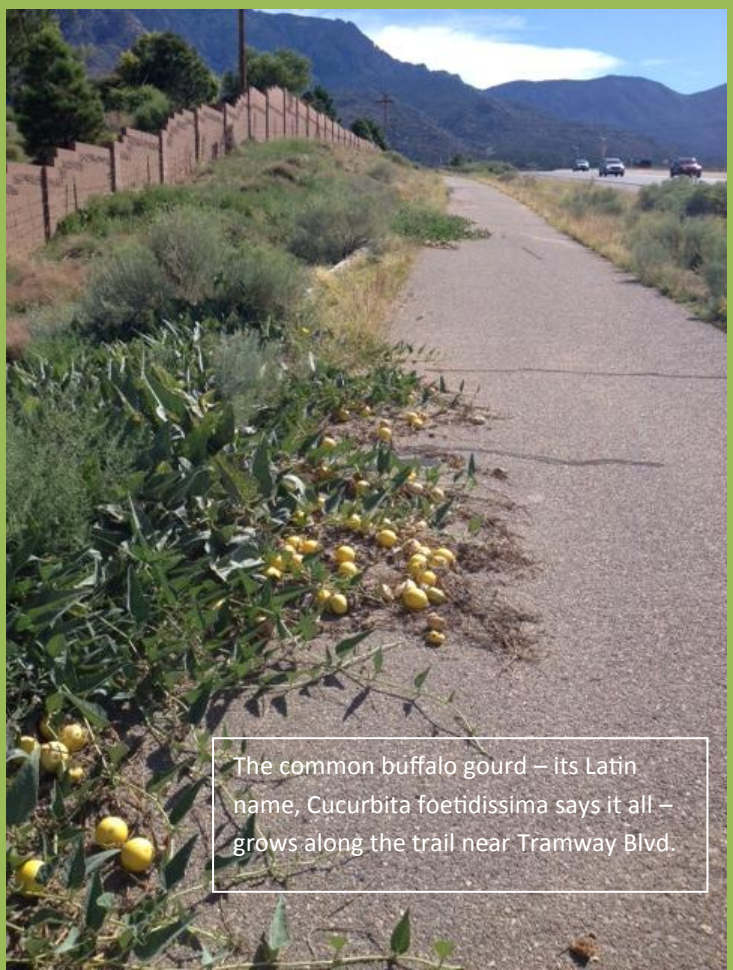
7.2/0.2 Miles Arrive at the North Diversion Channel bike trail.

Paseo del Norte/South Domingo Baca Bike Trail

There is no parking at the east end of the trail, but there is parking nearby at the Little League park and at other parks and businesses along Tramway. Parking is available at the Railrunner's Los Ranchos/Journal Center station at El Pueblo Rd. between Edith Blvd. and Second Street. There's a large parking lot off Paseo del Norte between Rio Grande Blvd. and the river itself.



The non-descript eastern end of the Paseo del Norte trail just NW of the Paseo/Tramway intersection.



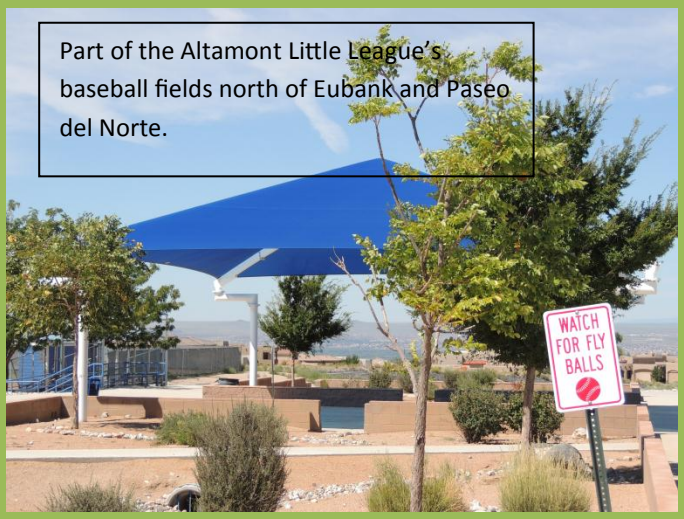
The common buffalo gourd – its Latin name, Cucurbita foetidissima says it all – grows along the trail near Tramway Blvd.

0.0/17.6 Miles This long trail begins covertly at the northwest corner of Tramway Blvd. and Paseo del Norte. There's no signage to tell you're there, but you're in the right place if you find that the trail descends briefly into a cut for Tennyson St., which parallels Tramway and passes under Paseo del Norte. Cross Tennyson and head up the brief slope.

0.6/17.0 Miles Cross Lowell Dr.; between here and Browning St., on the south side of Paseo is a fire station and a large dam, this on the South Domingo Baca Arroyo. The Sandia Tramway's first tower can be seen clearly to the northeast from this stretch.

1.1/16.5 Miles Cross Browning St.

1.6/16.0 Miles Cross Eubank Blvd. To the



Part of the Altamont Little League's baseball fields north of Eubank and Paseo del Norte.

northwest of this intersection are several baseball fields of the Altamont Little League as well as a sheriff's substation and a large dam on the North Domingo Baca Arroyo.

3.0/14.6 Miles Cross Ventura St.

3.7/13.9 Miles Arrive at Paseo del Norte and Barstow St. Turn south on Barstow for about 2 blocks, passing little Barstow Park north of the bike trail; turn west immediately after the park on the South Domingo Baca Arroyo portion of the trail.

4.2/13.4 Miles The trail crosses Wyoming Blvd. At Wyoming, there's an Intersection with a bike trail along the east side of Wyoming that goes north to Paseo del Norte and beyond to La Cueva High School.

4.3/13.3 Miles This trail passes small Rancho de Palomas Park, with a few parking spaces and play structures.

4.8/12.8 Miles Cross Louisiana Blvd.; Hope Christian School is to the north just beyond Louisiana. Head west, continuing to descend the south side of the South Domingo Baca Arroyo.

The intersection of Paseo del Norte and I-25 is too dangerous for bicycles at this point, and it appears as if the newly reconstructed interchange may not make things much safer. Therefore, we recommend the following detour to the south:

5.3/12.3 Miles Just beyond the small park over the bridge to E.G. Ross Elementary School, you arrive at San Pedro Blvd**.** Turn south here, following San Pedro beyond San Antonio Dr., where you turn west again on the Pino Arroyo Trail.

6.8/10.8 Miles Reach East Frontage Road of I-25. The trail extends north about 1/2 block to San Antonio Dr. Cross at the light and continue west along the south side of San Antonio Dr.

7.5/10.1 Miles Cross Jefferson St.; the road becomes Ellison St.; take the street itself to where it becomes Washington St, takes a short jog east at Hawkins and continues as Washington St. to Rutledge Rd.

7.9/9.7 Miles Turn west at Rutledge Road; watch on the right (north) for the bike trail heading north and then west about 1 1/2 blocks west of Washington St.

8.3/ 9.3 Miles Turn north on the North Diversion Channel Trail.

9.0/8.6 Miles Where the North Diversion Channel Trail reaches El Pueblo Road, avoid the underpass

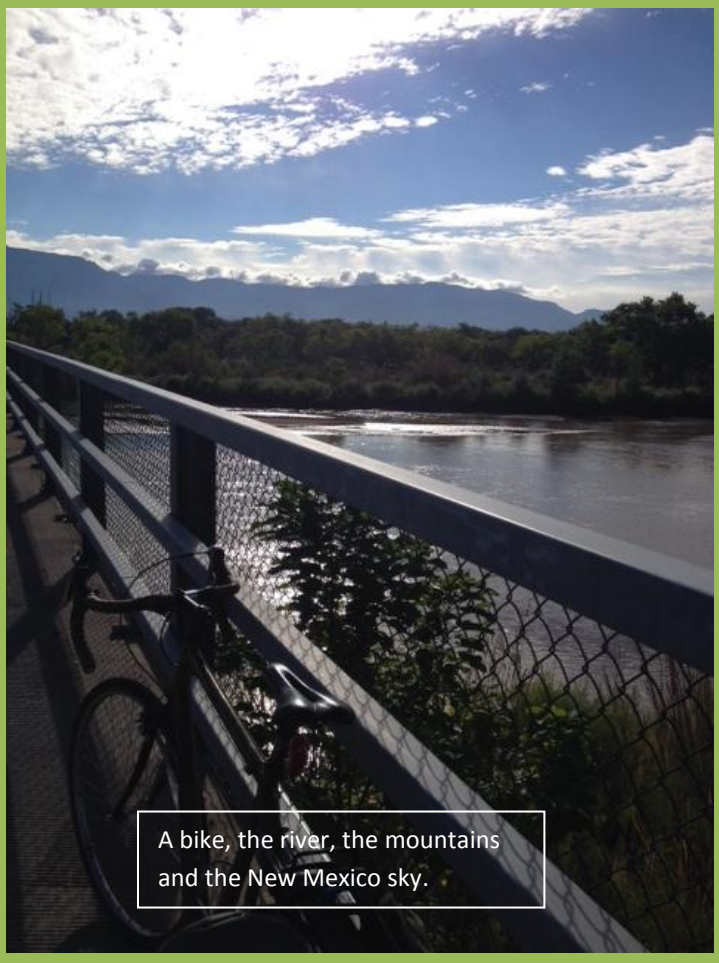
The Railrunner arrives at its Journal Center/Los Ranchos station.

below Paseo del North and cross El Pueblo Road, where the Paseo del Norte Bike Trail resumes, heading west.

9.7/7.9 Miles After crossing Edith Blvd., the trail takes you up to an overpass above the train tracks. The New Mexico Railrunner has a stop here just to the south of the bike trail. The spanking new train cars, decorated in New Mexico red and yellow like the state's flag, heads north from here to Santa Fe or south as far as Albuquerque and Belen. When the doors are closing on the train, the loudspeakers in the cars emit a "beep-beep" just as the roadrunner would when evading Wiley Coyote yet again. The trail crosses above Second Street on an overpass and below Fourth Street in a culvert, continuing along the south side of Paseo del Norte.

11.3/6.3 Miles Cross Rio Grande Blvd. to where you will reach the intersection with the Paseo del Bosque bike trail 0.1 mile later. Continue east on the trail along the south edge of Paseo del Norte.

The bike trail crosses the Rio Grande separated from but alongside the automobile traffic on Paseo del Norte. On the bridge, you can observe the Sandias to the east, the Bosque and the Rio Grande closer to hand.



A bike, the river, the mountains and the New Mexico sky.

At west side of bridge, the bike trail curves to the south and then stops but the route continues, joining Canal Frontage Road, which heads west and then curves around to the south to Southwest Indian Polytechnic Institute Road. Turn west on SIPI Road for 1/2 block to Coors Blvd.

The Southwest Indian Polytechnic Institute, which lies east along this road, is a unique Native American institution founded in 1971. Its mission, according to its website, www.sipi.edu , is as follows:

"Southwestern Indian Polytechnic Institute is a National Indian Community College that prepares Native American students to be productive life-long learners as tribal members in an ever-changing global environment. As a land grant institution, SIPI partners with tribes, employers, and other organizations with a stake in Indian education. An enduring commitment to student success is the hallmark of SIPI's operations."

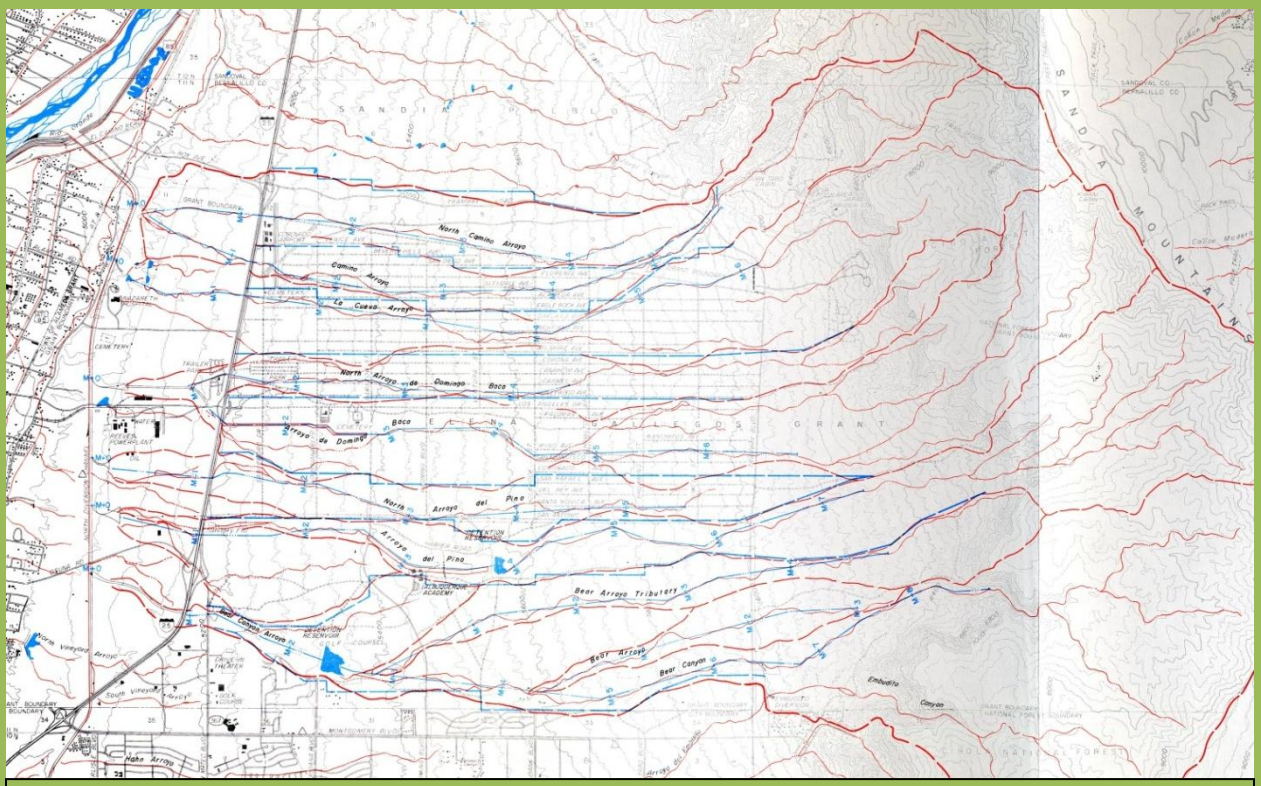
The modern campus is run by an all-Native American Board of Regents and draws students from throughout Indian Country.

13.0/4.6 Miles Cross Coors at the light, traveling south in the bike lane to the next light at Eagle Ranch Road, where you make a sharp right turn to the northwest. Ascend Eagle Rock Rd. beyond Paseo del Norte to Paradise Blvd.

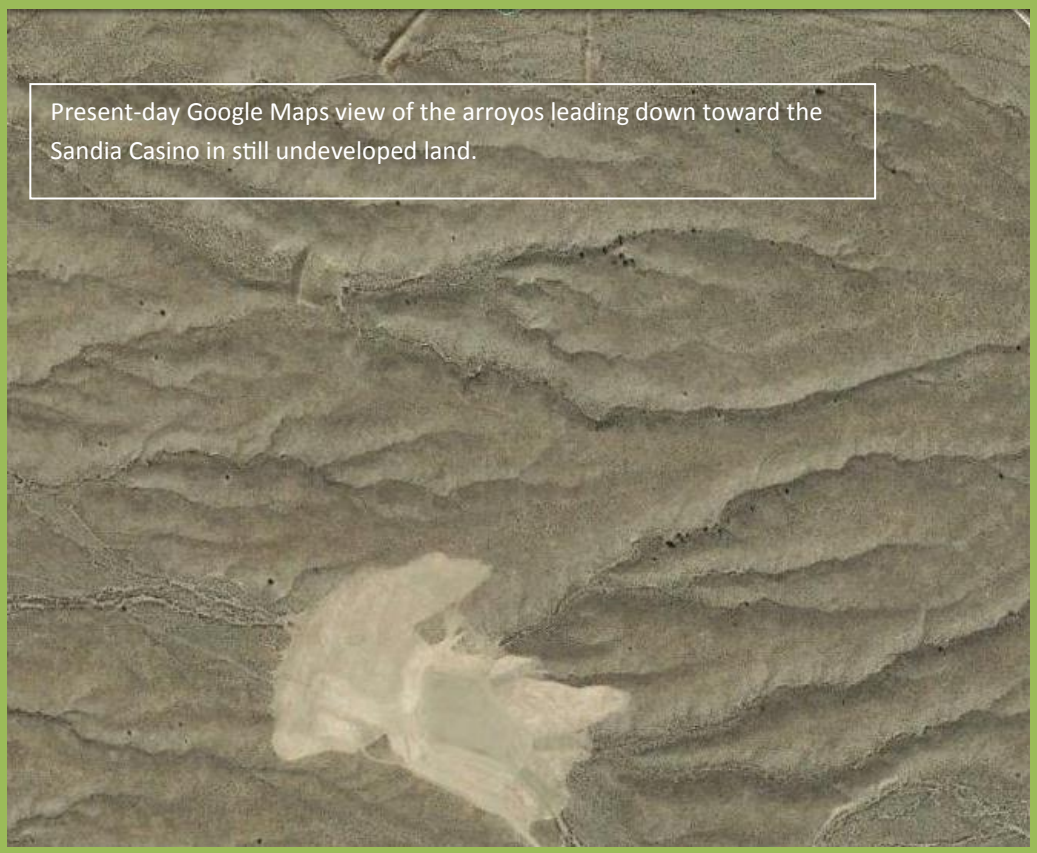
14.2/3.4 Miles Continue west along Paradise Blvd. to Universe Blvd. past James Monroe Middle School and Paradise Hills Park and Community Center. There are several discontinuous stretches of bike trail alongside Paradise Blvd. in this portion of the ride.

17.6/0.0 Miles You reach the SE corner of the Ventana Ranch subdivision at Paradise Blvd. and Universe Blvd. There is an impressive network of bike trails throughout the Ventana Ranch subdivision, heading north and west from the Universe and Paradise intersection.

A LITTLE ABOUT THE GEOLOGY AND HISTORY OF THE NORTHEAST HEIGHTS



Taken from an old book, the braided arroyos of pre-AMAFCA northeast Albuquerque head from the Crest to the Rio Grande



Present-day Google Maps view of the arroyos leading down toward the Sandia Casino in still undeveloped land.

The geologic history of Albuquerque's Northeast Heights is concerned with water and lack of water. Albuquerque gets only 9.4 inches of precipitation per year (and less in the last several years of

drought), but flowing water has shaped the slope from the foothills of the Sandias to the Rio Grande. Maps and aerial photos of Albuquerque before the building boom in this part of the city in the late 20th century, and before the Albuquerque Metropolitan Arroyo Flood Control Authority began to channelize the water at its founding in 1963 show a myriad of water channels breaking off from one another, rejoining and seemingly crossing one another pell-mell in their hurry to get down to the river. Most of the time, these water-sculpted ditches were dry, but occasionally a localized or generalized storm would send a wall of water down one or more of these arroyos; the result might be the erosion of a new course or a flood in the Albuquerque valley, where habitation long preceded most building in the Heights. And our usual dry conditions assure that the water will run off quickly, often with great force. In general, AMAFCA has been quite successful in controlling the force of these infrequent inundations; unfortunately, neither they nor anyone else has been able to completely control the humans living alongside the remaining arroyos. Repeated warnings that "Ditches are Deadly, So Keep Out" fall on deaf (and sometimes wet) ears, and people are swept down the ditch, sometimes to be rescued, sometimes not.

The photos and diagram on this and the preceding pages show the Northeast Heights to be composed of a series of alluvial fans, interdigitating in the way of a group of overlapping hands, the fingers pointed down toward the Rio Grande. Vincent Kelley, long-time UNM geologist, wrote in his still-useful 1982 book, Albuquerque: Its Mountains, Valley, Water and Volcanoes,"

Today's Google Maps view of the arroyos at the Elena Gallegos Open Space, showing the eastern edge of Albuquerque housing below.

"Alluvial fans are so named because the alluvial deposits [or alluvium, defined as a deposit of clay, silt, sand, and gravel left by flowing streams in a river valley or delta] of a stream form a convex, fan-shaped surface at the mouth of a mountain canyon. Streams debouching into open, valley plains tend to branch into many ill-defined channels that may diverge 90 degrees or more. The water from these streams runs into all or several of a dozen or so distributing arroyos. Most of the discharge, though, flows straight out and builds a center to the fan higher than its sides; in time, the slope of

the sides of the fan become steep. Therefore, change of major flow from one arroyo to another usually occurs during heavy rainfall, because the power of a torrential downpour is enormous. If the stream chooses a side-channel at flood stage, the flow becomes entrenched and abandons the apex channel until the next heavy flood."

Traveling rapidly across the Northeast Heights by car, it may be difficult to recognize these fans through the buildup of houses and shopping malls. However, north of Tramway Road on undeveloped Sandia Pueblo land and also on the upper part of the Elena Gallegos/Albert Simms Park, the fan structure can be seen. Or, traveling south along Tramway Blvd. , one reaches the bottom edge of the alluvial fan when Tramway crosses Candelaria Rd., the top of the fan at Indian School Rd., and the south end going down the hill toward Interstate-40.

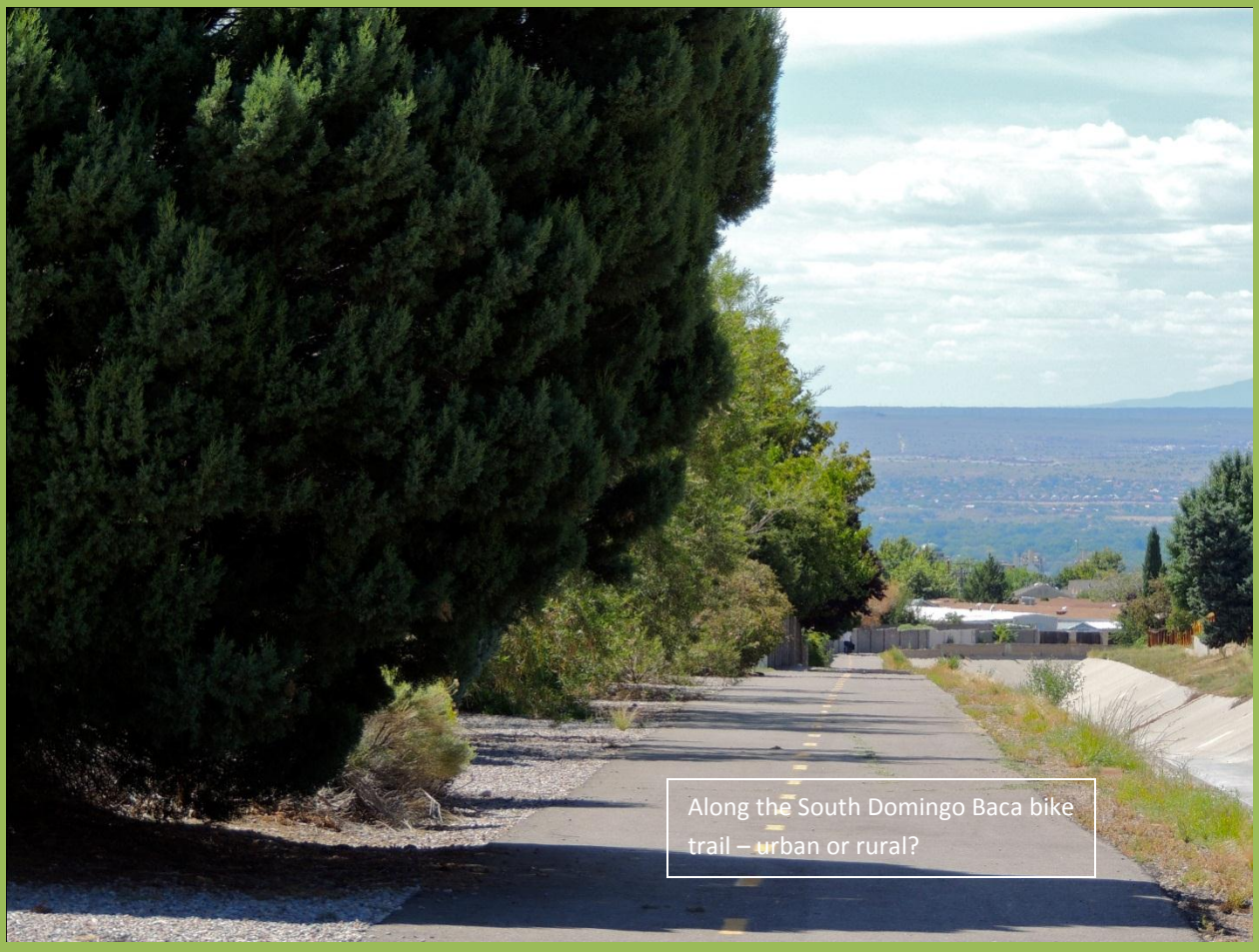
A hawk seen near the mountains in the Northeast Heights

Kelley's book states that the Sandias will continue to be worn down by the rain, washing sediment farther down the slope toward the river. Already a vast amount of sand, silt, and gravel has washed down the hill, raising the level of the valley floor over millions of years. This alluvium is what Albuquerqueans live upon, and Kelley predicts that sediment will continue to be deposited, raising the level of the river and the valley even further. He quotes evidence that the river itself was once 350 feet above its present level, but it gradually cut into the alluvial deposits down to where we see it today. The sediment is not just sand, silt, and gravel: large boulders also are washed down in floodwaters, and those can be seen all along the foothills of the Sandias, especially in the Elena Gallegos/Albert Simms City Park east of Tramway Blvd., at the parking lot for the Embudito (Hiking) Trail (see the Arroyo del Oso Bike Trail below) and in the city Foothills open space east of Tramway Blvd., and between I-40 and Comanche Road.

The often rich soils of the alluvial fans come with a caveat, however: they are porous and can absorb the water that rains upon them or comes out of garden hoses. When wet, the soil becomes compacted, which may disrupt gardens and, worse, foundations.

If you'd like more geological information about this and other parts of Albuquerque, take a look at Kelley's book, still available in libraries (and the geology hasn't changed much since the book was published in 1982), and the more recent (2003) "Albuquerque: A Guide to Its Geology

and Culture" by Paul W. Bauer and three others, and dedicated to the memory of Vincent Kelley. Both include tours of the geological features of the mountains, the valley, and the alluvial areas in between.



Along the South Domingo Baca bike trail – urban or rural?

The human history of the Northeast Heights is both ancient and modern, with little in between. Students at the Albuquerque Academy under the direction of Gordon Page and archeologist and current head of Albuquerque's Open Space Division Matt Schmader, excavated a Pueblo ruin on Academy land near the top of the Arroyo del Oso beginning in 1983. The small stone pueblo had been occupied for more than 300 years when it was abandoned in about 1425. Following the departure of the Native Americans – called Anasazi or Pueblo Ancestors – what is now called the Northeast Heights lay nearly empty until the middle of the twentieth century, used only for sheep raising by hardy Spanish pioneers (it is thought that Juan Tabo, after whom the major street in the Heights is named, may have been one of them), and later for cattle pasture by Albert Simms and others. Apparently, reluctance of the early proprietors of Albuquerque's water system stymied development in the area for a while by their refusal to build water lines onto the mesa. Then, however, the rapid enlargement of the city in the 1940s and 1950s and the city's taking over of the water system encouraged gradual spread of the built-up city to the north and east. The building was on a Midwest-like grid system that did not take account of the usually empty water courses. Occasional floods causing destruction of homes and property resulted, though that has been largely eliminated with the carefully planned water courses of the Albuquerque Metropolitan Arroyo and Flood Control Authority.

By now, almost all of the land between the University to the south and Sandia Pueblo land to the north, from Interstate 25 to the west and the foothills of the Sandia to the east, has been filled in with homes and shopping areas. Albuquerque has benefited from flood control in the obvious way – flood protection – but also in at least another three ways: the water impoundment areas have been used for parks and golf courses, such as the large Arroyo del Oso Park and Golf Course and the smaller Quintessence Park, unpaved sections of the arroyos allow the support of rich fauna and flora, and the sides of the channelized arroyos have been made available for bike trails throughout the city, including the three discussed here.