# Arroyo Threat Assessment Surveys of 15 Major Arroyos in the Santa Fe River Watershed

June 21, 2016

Santa Fe Watershed Association

Report to Melissa McDonald, River & Watershed Coordinator, Public Works Dept., City of Santa Fe 2016

## Overview

There are hundreds of miles of arroyos within the Santa Fe River Watershed. They are used recreationally, roads and trails crisscross them, utility lines run through them, and by nature they are highly erodible. With the increase in severity of summer rainstorms combined with a larger population and thus, greater use, these arroyos have a large impact on the City of Santa Fe infrastructure. As we are learning, they require attention and maintenance. Additionally, proper care emphasizing specific measures to help control erosion, slow down storm-water, spread it across a broader area, and promote its absorption into the ground can add to the City of Santa Fe's longer-term water security by capturing more water from rainfall, helping to recharge aquifers, and promote greater ecological health. Slowing the erosion will also help protect municipal infrastructure such as electrical lines, sewage lines, etc.…which in turn protects public safety.

Between February 2015 – May, 2016, Santa Fe Watershed Association staff conducted assessments on fifteen different arroyo systems within the boundaries of the City of Santa Fe.

The City of Santa Fe Public Works Division requested this assessment in order to identify high priority areas for infrastructure repair as a part of the General Obligation Bonds funding dedicated to arroyo maintenance and repair.

Staff walked approximately 50 miles armed with a GPS camera and data sheets. The assessments examined the arroyos for erosion and decay in two primary areas: Infrastructure Risks (where erosive conditions are causing a risk to the general public or to Municipal infrastructure) and Channel Characteristics (areas of concern where continued erosion could endanger both public and private property assets). Specifically, Infrastructure Risks looked at: Trail deterioration (if there was a trail running along an arroyo), bank deterioration, damaged and restricted culverts, endangered utility lines (such as electrical, water, sewer), foot/bicycle/vehicle bridge damage. Channel characteristics were evaluated according to the following: Incised, incised & braided, constricted, collapsed banks, vertical banks, or deteriorating rip rap. A scoring system of 1-4, 1 being the worst, 4 being the best, was applied.

Other observations were noted and photographs were taken so that each situation could be mapped and referred to easily by City staff. The scores of each reach were recorded and tabulated. The data sheets for each reach are in Appendix A.

Included in the study were the following:

| | | |
|---|---|---|
| Arroyo de los Chamisos | Arroyo en Medio | Arroyo Foothill |
| Arroyo Rosario | Arroyo Ancha | Arroyo Cloudstone |
| Arroyo Saiz | Arroyo de los Pinos | Arroyo Nopal |
| Arroyo Mora | Arroyo Mascaras | Arroyo Torreon |
| Arroyo Cabra | Arroyo de la Piedra | Arroyo Chaparral |

A map identifying the location of the arroyos is in Appendix B.

The report also includes a summary chart of the scores that each arroyo received. The lower the score, the higher priority the arroyo reach. The highest priority reaches are emphasized with a white background. Please refer to the notes for greater detail on the identifying problems.

**Recommended Measures Defined:** Within this report we are including our suggestions for possible measures that could be implemented to help correct the problems assessed. These are not major, large, engineered measures but rather possible measures that volunteer groups may be able to construct with assistance from professionals. They are:

**1) Rip-rap:** also known as shot rock, rock armor or rubble, rock or other material used to armor shorelines, streambeds, bridge abutments, pilings and other shoreline structures against scour and water or ice erosion.

**2) One Rock Dams:** A simple structure where a single layer of rock of approximately 10-12" in diameter is added to a drainage area for controlling the speed of water and sediment moving through it. ORDs are usually about 4' wide and can be installed on contour or simply in the low point of a drainage area.

**3) Rock Run Downs:** A *headcut* (the edge of a small waterfall or bluff) control structure where the face of the headcut has been laid back to a stable angle of repose (minimum of a 3:1 slope), and then covered with a single layer of rocks approximately 10-12" in diameter.

**4) Zuni Bowls:** A headcut control structure, composed of rock lined step falls and plunge pools, prevents headcuts from continuing to migrate upstream. Zuni Bowls stabilize actively eroding headcuts by dissipating the energy of falling water at the headcut pour-over and the bed of the channel. The structure converts the single cascade of an eroding headcut into a series of smaller step falls.

**5) Vanes:** Vanes are linear structures that extend out from the arroyo bank into the arroyo in an upstream direction. They are usually placed along the arroyo bank where erosion is occurring along the toe of the slope. The purpose of vanes is to reduce erosion along the arroyo bank by redirecting the stream flow toward the center of the stream.

**6) Ramp Bank:** Removal of soil to reduce the slope of very steep banks to a more stable angle and an increased area for the water to flow into.

**7) Cover Exposed Utility:** If the utility component is sound and not leaking, the recommendation is to re-trench and re-cover the exposed line or pipe.

**8) Remove Obstruction:** Often, the removing of an obstruction may be the easiest and simplest method to reduce the arroyo problem.

Like all natural environments inhabited by humans, these high-priority reaches require well-designed restorative actions to help stabilize, protect, and secure the infrastructure that runs through them.

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**APPENDIX A**.....ARROYO DATA SHEETS

**APPENDIX B**..... ARROYO MAPS

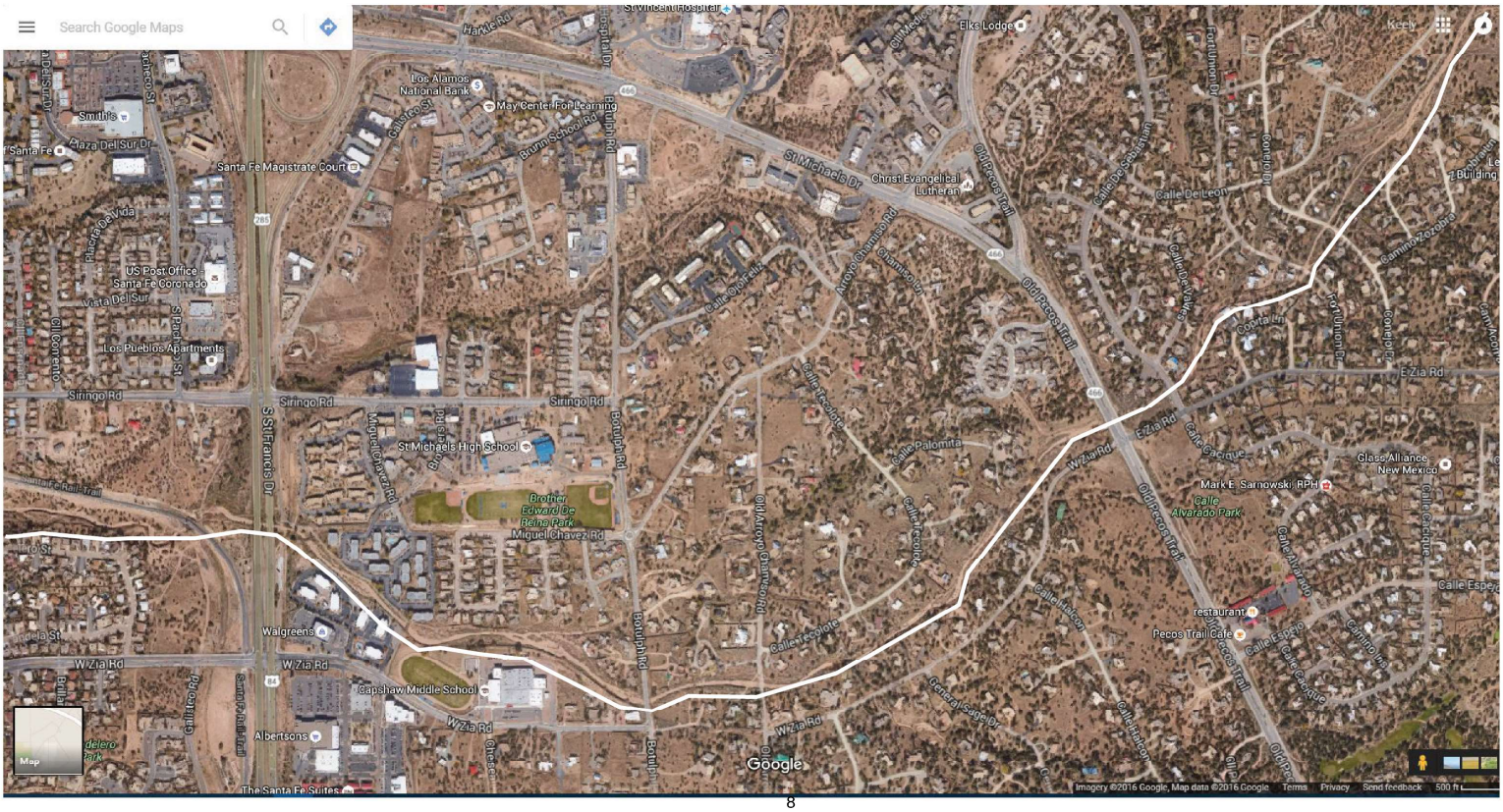
## City-wide Watershed and Arroyo Projects

| Arroyo Name | Segment Location, Upstream | Segment Location, Downstream | Recommended measures | Basin Size | Infrastructure Damage/Risk | Channel Character, Drainage |
|---|---|---|---|---|---|---|
| **1. C. Arroyo de los Chamisos** | Conejo Road | Saint Francis Drive | $7^{2},5^{3},6,1$ | | 1.2 | 1.6 |
| **1. D. Arroyo de los Chamisos** | S.Saint Francis Drive | Yucca Street | $3^{3},4^{3},5^{2},6$ | | 1.4 | 0.8 |
| **1. E. Arroyo de los Chamisos** | Yucca Street | Carlos Camino Rey | 3,5,6,8 | | 2.4 | 1.7 |
| **1. F. Arroyo de los Chamisos** | Camino Carlos Rey | Ave de las Campanas | $4,5^{2},6$ | 3 | 1.7 | 1 |
| **1. G. Arroyo de los Chamisos** | Ave de las Campanas | Rodeo Road | $1^{2},5,7$ | | 1.7 | 1.3 |
| **1. H. Arroyo de los Chamisos** | Rodeo Road | Governor Miles Road | 3,4,5 | | 1.4 | 1.9 |
| **2. A. Arroyo Rosario** | Below HWY 285-S | 373 Calle Loma Norte | | | 1 | 1.7 |
| **2. B. Arroyo Rosario** | 373 Calle Loma Norte | 388 Calle Loma Norte | | | 2.4 | 2.4 |
| **2. C. Arroyo Rosario** | 388 Calle Loma Norte | Los Arboles | $3^{6},4^{3},5,8^{3}$ | 1 | NA | 0.9 |
| **2. D. Arroyo Rosario** | Los Arboles | Rio Grande Street | | | 2.2 | 1.4 |
| **2. E. Arroyo Rosario** | Rio Grande Street | Paseo de Peralta MASCARAS | | | 2 | 2 |
| **3. Arroyo Saiz** | Begin at Hyde Park + Gonzalez Rd | **SANTA FE RIVER** | $3^{3},4,5$ | 1 | 1.7 | 1 |
| **4. Arroyo Mora** (Upper Canyon Road) | South of Calle Militar | **SANTA FE RIVER** | 4,5 | 1 | NA | 1.9 |
| **5. Arroyo Cabra** (Cristo Rey Area) | Apodaca Hill | **SANTA FE RIVER** | 4,5 | 1 | NA | 1.9 |
| **6. Arroyo en Medio** | Old Santa Fe Trail | St Francis Drive CHAPARRAL | 1,4,5,7 | | 1.4 | 1.3 |
| **7. A. Arroyo Ancha** | Near Ten Thousand Waves Spa | Cañada Sur | $4^{4},7^{6}$ | 1 | 0.9 | NA |
| **7. B. Arroyo Ancha** | Cañada Sur | **SANTA FE RIVER** | 2,5 | | 1.2 | 0.3 |
| **8. Arroyo de los Pinos *Upper A*** | Camino Corrales/Lejo | Galisteo Street | 8 | | NA | 0.9 |
| **8. Arroyo de los Pinos *Upper B*** | Camino Corrales/Lejano | Don Gaspar Street | $4^{3}5,6,8$ | | 2 | 1.1 |
| **8. Arroyo de los Pinos *Ditch*** | St. Michael's Drive | Siringo Road | 4,5 | | 1.4 | 1.8 |
| **8. B. Arroyo de los Pinos** | St. Francis Drive | 6th Street | $2,3,4^{3},5,8$ | 3 | 2.3 | 2.5 |
| **8. C. Arroyo de los Pinos** | St. Michael's Drive | Camino Carlos Rey | $1^{2},2,4,7^{2}$ | | 1.9 | 1.9 |
| **8. D. Arroyo de los Pinos** | Camino Carlos Rey | Richards Avenue | 1,2,3,4,5,6 | | 2.7 | 2.2 |
| **8. E. Arroyo de los Pinos** | Richards Avenue | **ARROYO DE LOS CHAMISOS** | 1,2,3,4,5,6,8 | | 1.9 | 1.6 |
| **9. A. Arroyo Mascaras** | Bishop's Lodge Road | **ARROYO BARRANCA** | 1 | | 0.9 | 1.9 |
| **9. C. Arroyo Mascaras** | Old Taos Highway | Paseo de Peralta Culvert | 4 | 3 | 0.9 | 0.7 |
| **9. D. Arroyo Mascaras** | Paseo de Peralta Culvert | **SANTA FE RIVER** | 4 | | NA | 1.2 |
| **10. A Arroyo de la Piedra East Fork** | Calle Conejo | Camino Real | | | NA | 0.9 |
| **10. B Arroyo de la Piedra West Fork** | Brownell-Howland | Hyde Park Road MASCARAS | $2,3,5,6,7^{3}8$ | 1 | 1.1 | 1.1 |
| **11. Arroyo Foothill** | Old Santa Fe Trail | **ARROYO DE LOS CHAMISOS** | $1,2,3,4,5,6,7^{12}$ | | 1.2 | 1.2 |
| **12. A. Arroyo Cloudstone** | Old Santa Fe Trail | Old Pecos Trail | 2,4,5,7,8 | | 0.8 | 0.5 |
| **12. B. Arroyo Cloudstone** | Old Pecos Trail | **ARROYO DE LOS CHAMISOS** | 1,2,4,5,8 | | 1.4 | 1 |
| **13. Arroyo Nopal** | East of Calle Nopal | W. Alameda | 1,2,4,7 | | 1.9 | 2.4 |
| **14. A. Arroyo Torreon** | East of Buckman Rd | Camino de las Crucitas | 5 | | 1.2 | 1.1 |
| **14. B. Arroyo Torreon** | Camino de las Crucitas | **SANTA FE RIVER** | 1,2,3,4 | | 0.9 | 0.7 |
| **15. B. Arroyo Chaparral** | Galisteo Road | Esplendor Street | 1,2,3,4,5,6 | | 1.7 | 2 |
| **15. C. Arroyo Chaparral** | Esplendor Street | **ARROYO DE LOS CHAMISOS** | 2,2,3,7,8 | | 0.9 | 1 |

**Recommended Measures:** **1 = Rip Rap 2 = One Rock Dam 3 = Rock Run Down 4 = Zuni Bowl 5 = Vanes 6 = Ramp bank 7=Cover exposed utility 8 =**

**Graded Scoring System** **A = 4 B = 3 C = 2 D = 1 F = 0**

Arroyo Chamisos 1






Arroyo Chamisos 2

Arroyo Chamisos 3


Arroyo Chamisos 4

# Arroyo City-Wide Watershed and Arroyo Projects

## I. Arroyo de los Chamisos

**Valuable for recreation / wildlife corridor**

**Segment A.** Approximately 800 ft. upstream from the Old Santa Fe Trail Bridge

**Notes**: Bank erosion is common in this segment of the arroyo despite its width. As a result of the arroyo's proximity to the mountains a suitable habitat for wildlife is provided. The arroyo is also popular for recreation. An exposed metal pipe spans part of the arroyo upstream from the Old Santa Fe Trail Bridge. Along a cut bank, downstream from the pipe, is a manhole. It was approximately 10-12" from the edge of the arroyo. An old dumpsite lies beneath the building of the Carmelite Sanctuary. As in 2012, minimal erosion continues to impact the upstream side of the arroyo bank adjacent to the bridge. If it were not for the Old Santa Fe Trail road crossing, this segment would be free of artificial constrictions.

**Segment A/ Upper Arroyo de los Chamisos, 2016.**

**Segment B.** Old Santa Fe Trail Bridge Crossing to Conejo Road

**Notes:** The channel of the Arroyo de los Chamisos broadens and becomes braided below Old Santa Fe Trail Bridge. The upper end of the arroyo is sparsely inhabited which provides wildlife a valuable corridor. Rabbits, lizards, and birds were sighted throughout the arroyo. The upper part of the arroyo is free of trail deterioration, exposed sewage lines, and deteriorating vehicle bridges. A stand of cottonwood trees continues to thrive in this section of the arroyo. Perhaps further restoration of this area and the addition of a water infiltration basin may enrich this part of the arroyo.

Approximately midway through the arroyo, the broad and braided channel begins to narrow and straighten. The channel continues to constrict as it nears the Conejo Road crossing. At this point of constriction, private property was heavily damaged by erosion. Sometime after 2012, gabion baskets were erected to protect this area from further damage. Walkers, bikers, and joggers frequent this segment.

**Segment B/ Broad open plain on the Arroyo de los Chamisos, 2016.**

**Segment C.** Conejo Road to the St. Francis Drive Bridge

**Notes:** This segment of the arroyo continues to be used as a walking, jogging or biking path. Beyond the Conejo Road crossing, the arroyo widens then branches left and right to reconnect downstream. An exposed utility was found between Ft. Union Road and Calle Sebastian Bridge. The sandy, incised arroyo channel continues to narrow as it passes under the overgrown Calle Sebastion Bridge towards the Old Pecos Trail Bridge. Rip rap in varying states of disrepair along with submerged gabion baskets were observed in this section.

**Segment C/ Illustration of the channel characteristic in Arroyo de los Chamisos, 2016.**

The arroyo flows beneath the Old Pecos Trail Bridge, over a concrete spillway and into a small riparian habitat of willow and cottonwood. Since the instance of bank erosion heightens beyond this growth, the riparian area that is currently stable, could be expanded upon to remediate further destruction of these banks.

In 2012 the bank erosion was considered severe. As of 2016, storm water continues to erode away 75 feet of a ~15 foot high vertical wall. Located on top this eroded bank is a sewage outlet. Bank loss continues to lessen the distance between this utility and the arroyo.

About 300 feet downstream from the spillway, high waters from storms could be slowed down to spread out in a large open basin like the area west of the main channel. At the lower end of this basin a stand of mature cottonwood trees has been established.

Approximately 1,000 feet downstream from the Old Pecos Trail Bridge, a concrete encased utility appears to be eroding from the bed of the arroyo.

Segment C/ Cottonwoods at base of spillway beneath Old Pecos Trail, 2016.

Segment C/ ~75 feet of eroded bank below spillway, Arroyo de los Chamisos, 2016.

**Segment C/ Encased utility line, Arroyo de los Chamisos, 2016.**

Between Old Pecos Bridge and Old Arroyo Chamisos Road, the arroyo is in various states of erosion ranging from moderate to severe. High banks, collapsed walls, and deep incisions reoccur throughout the channel. The erosion also threatens bank stabilizing mature trees located along the arroyo banks.

The arroyo continues beyond Old Arroyo Chamisos Road in the direction of Botulph Road. Between these two points, a bank restoration project begun in 2012 has matured and looks to be successfully retaining the banks of the arroyo.

Segment C / Arroyo bank remediation 2012, Arroyo de los Chamisos, 2016.

Segment C / Mature cottonwoods and willows at arroyo bank remediation started in 2012, Arroyo Chamisos.

The arroyo passes beneath Botulph Road where the channel widens. Several bridges that serve the Gail Ryba trail system span the Arroyo de los Chamisos. Approximately 175 feet beyond the southern foot bridge, a protective gabion wall has separated from the arroyo bank to sag into the channel. Segment C ends beneath the S. St. Francis bridges. Sometime between 2012 and 2016 the concrete supporting the roadbed has become rotten enough below the guardrails to expose rebar.

**Segment C/Gabion walls coming off arroyo bank, 2016.**

Segment C/ S. St. Francis Bridge with damage in 2016, Arroyo de los Chamisos, and 2016.

Segment C/ 2012 S. St. Francis Bridge same location as above photo, 2012 Arroyo de los Chamisos.

**Segment D.** South St. Francis Drive Bridge to Yucca Street Bridge

**Notes:** The arroyo segment has been severely incised due to poor drainage, soil type, natural and artificial constrictions. The height of an intermittent system of vertical walls increases as the arroyo channel drops in elevation. The corridor of these highly eroded vertical walls begins about 145 feet below the Santa Fe Rail Trail. The longest, continual, vertical wall system in the arroyo is approximately 1,300 feet in length. It is found in here. Although it is the longest corridor, the 1,150 foot section of vertical bank between the two Vo-Tech bridges is the most dangerous regarding trail safety and infrastructure stability.

Improvements since 2012 have helped protect sewage lines and minimized the impact of storm water in some areas. Segment D of Arroyo de los Chamisos is a high -risk area in much need of remediation. Immediate corrective action to the vertical banks along the Arroyo Chamisos trail between the Vo-Tech bridges is recommended.

Segment D/ Vo-Tech Bridges with examples of eroding banks and footings, Arroyo Chamisos, 2016.

Segment D/ Bank erosion, Arroyo de los Chamisos, 2016.

Segment D/ Corridor of vertical banks, Arroyo Chamisos, 2016.

**Segment E.** Yucca Street Bridge to Carlos Camino Rey Bridge

**Notes:** The arroyo in segment E is broader than Segments C and D. As expected, erosion continues throughout the entire length of the Arroyo de los Chamisos. Natural obstructions since 2012 have entered the arroyo bed and will affect the flow of storm water. The narrowest part of the entire Arroyo de los Chamisos is located in this segment. It measures roughly 20 feet across.

**Segment E/ Erosion along arroyo bank, Arroyo de los Chamisos, 2016.**

**Segment F.** Camino Carlos Rey Bridge to Ave de Las Campanas Bridge

**Notes:** The arroyo continues to be broad in nature maintaining this characteristic through to Governor's Miles Road. Below the Camino Carlos Rey Bridge the damaged rip rap of 2012 is being replaced in 2016. Storm water has increased the number of vertical banks in this section. The Ave de Las Campanas Bridge suffers from deteriorating concrete sides.

Segment F/ Bank erosion, Arroyo de los Chamisos, 2016.

Segment F/ Rotting concrete on Ave. de las Campanas Bridge, Arroyo de los Chamisos, 2016.

**Segment F/Possible location for infiltration basin, Arroyo de los Chamisos, 2016.**

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**Segment G.** Ave de Las Campanas Bridge to Rodeo Road Bridge

**Notes:** Between the Ave. de Las Campanas Bridge and the Rodeo Road Bridge several high cut banks exist that continue to threaten private property near the Kachina Heights subdivision. Rip rap used to stabilize the arroyo banks is undercut. Since 2012, a public utility, 300 feet upstream from a state maintenance yard has emerged from the arroyo bank. The chain link fence at this facility is flush with the arroyo bank. Also a steel culvert extends further into the arroyo than observed in 2012. It is in danger of being damaged by storm water.
Active transient use is common in this area thus creating unusually large amounts of trash to be prevalent in this segment. A concrete culvert beneath Camino de los Arroyos and Vegas Verdes Road and the west side over pass of Rodeo Road Bridge are continually inhabited producing biohazards, trash and safety issues to the public. Part of this section of the arroyo has been adopted by The Masters Program an early college charter high school and sponsored by Sam's Club.

**Segment G/ Exposed utility pipe, Arroyo de los Chamisos, 2016.**

Segment G/Bank erosion at State facility, Arroyo de los Chamisos, 2016.

Segment G/ Erosion below private property in Kachina Heights, Arroyo de los Chamisos, 2016.

**Segment H.** Rodeo Road Bridge to Governor Miles Bridge

**Notes:** The Arroyo de los Chamisos bike trail below Rodeo Road Bridge has suffered from more erosion since 2012. Soil is eroding from the footing of the foot bridge closest to the Villa Linda Park. Also the grate of a large culvert located near the mall parking lot is restricted by a huge volume of trash. Another drainage ditch flowing from Santa Fe Place into the Arroyo de los Chamisos has bypassed a check dam control point to erode a large channel into this arroyo. Storm floods since 2012 have removed a considerable amount of sediment from the base of a gabion wall. The last point of erosion from a storm drainage pour off pad belonging to a tenant of the auto park has carved a deep channel into the arroyo bank. The arroyo continues to be a popular place for dumping trash. More transient camp sites were encountered throughout this arroyo segment. This arroyo segment is heavily used by off road vehicles. There are many places for vehicle access from the Governor Miles Road Bridge to the Villa Linda Park as noted in 2012.

Segment H/Erosion threatens sidewalk, Arroyo de los Chamisos, 2016.

Segment H/Culvert obstructed with trash, Arroyo de los Chamisos, 2016.

Segment H/Pedestrian bridge with exposed footing, Arroyo de los Chamisos, 2016.

**Segment H/Side channel bypasses gabion wall, Arroyo de los Chamisos, 2016.**

**Segment H/ Illustration of sediment fluctuations. Sediment levels remain intact against gabion wall at far right of photo while left and center sediment no longer exists, Arroyo de los Chamisos, 2016.**

**Segment H/ Trash a common presence from Segment G through Segment H, Arroyo de los Chamisos, 2016.**

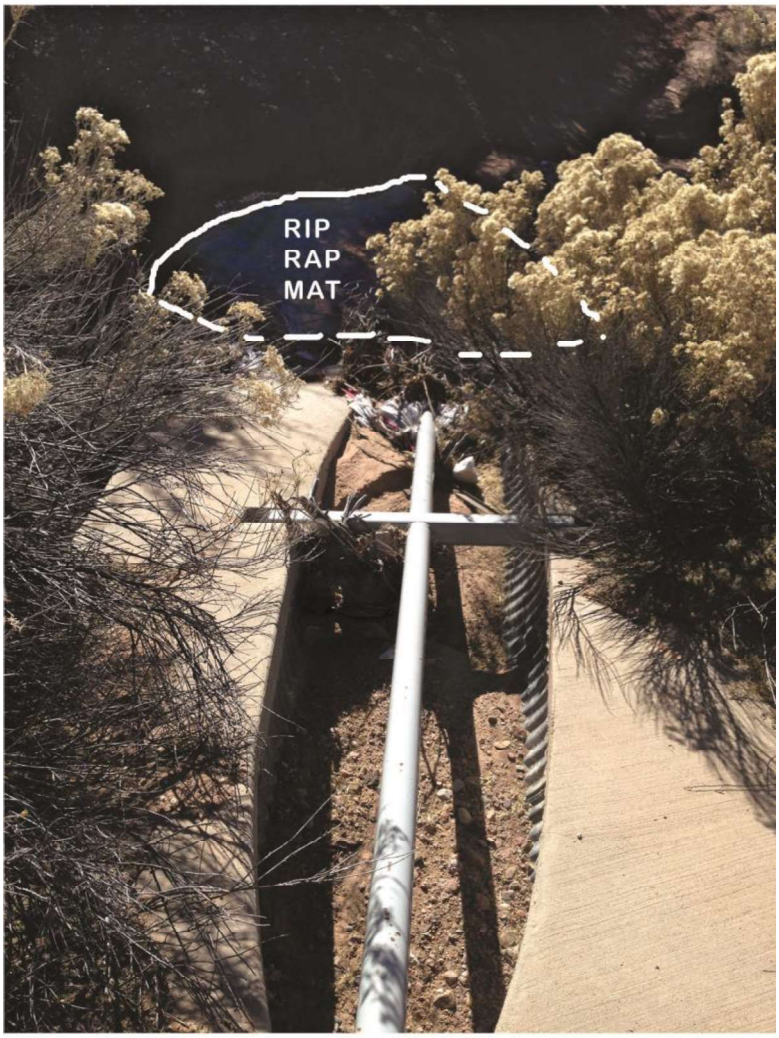

Arroyo Rosario Map 1


Arroyo Rosario Map 2

# II. Arroyo Rosario- Headwaters-Paseo de Peralta

**Valuable as a wildlife and recreational corridor.**


Segment A/View of Arroyo Rosario from culvert.2016




Segment A/ Outlet and rip rap map at head of Arroyo Rosario, 2016.

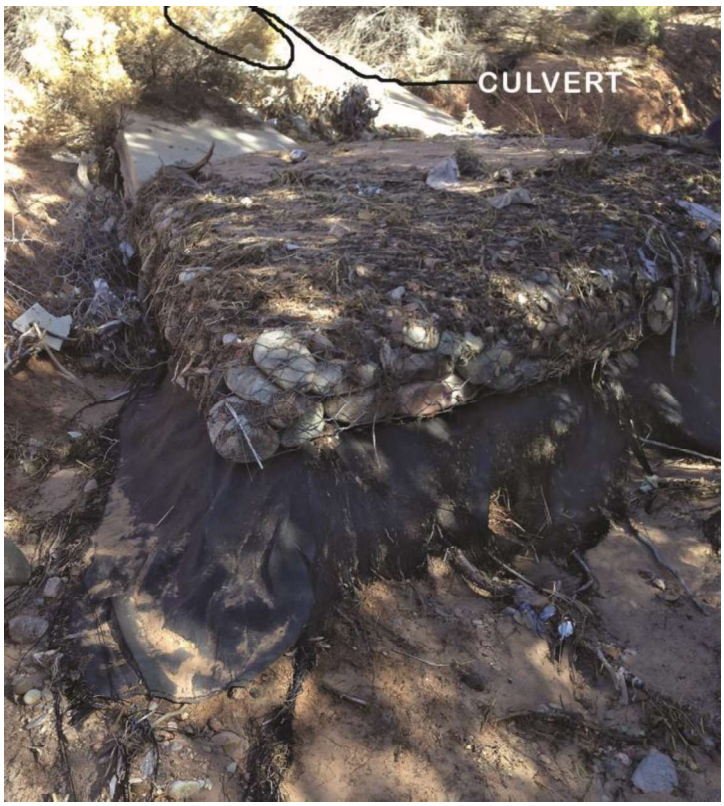
**Notes:** In general, the Arroyo Rosario is a city arroyo which begins at the base of a grade supporting the road bed for Hwy. 285 South, crossing Rio Grande Ave and flowing beneath the Paseo de Peralta Bridge box culvert. The main areas of concern are a culvert below 285 and the aforementioned bridge and surrounding area. Besides these concerns, the arroyo is a lively corridor for wildlife described by deer, coyote tracks, sighting of rabbits, in a juniper/piñon habitat. The arroyo is also home to recreational hiking, motorized vehicles, and Santa Fe's transient population. Evidence includes vehicle tracks, foot trails, campsites and encounters with hikers and homeless residents. Mature elm trees have successfully stabilized the banks of the arroyo's last segment.

## Segment A. Headwaters to 373 Calle Loma Norte

**Notes:** The "head" of the Rosario is highly impacted by two sources of storm runoff coming from the surrounding landscape and the culvert placed at the base of a steep grade that supports Hwy. 285 south. As a result, drainage infrastructure and the arroyo channel itself are negatively impacted. The drainage system consists of a steel culvert, concrete footing surrounding the culvert, a grate, and a rip rap mat at the base of the outlet. Earth beneath the concrete footing and rip rap mat system is eroding rapidly. Since 2012, a significant change in the arroyo channel and the elevation of these two systems is apparent. The arroyo channel is ~ 2 feet below the rip rap mat's original elevation. Remediation measures are highly recommended since further erosion to these important components will bring about structural failure in the culvert which will adversely affect drainage from both the arroyo and the road bed of Hwy. 285.

Storm runoff has significantly changed the characteristics of this area of the Arroyo Rosario. Common to this area are constrictions, deep incisions, collapsed banks that have left natural obstructions such as trees that have caught debris, vertical walls and tight meanders in the arroyo. Erosion along the western banks in this area is common.

Another important factor to note in this segment of the Arroyo Rosario contributing to high erosion is storm runoff above the arroyo from the National Cemetery. An area above this bank has been cleared by heavy equipment causing a deep incision into an already vertical bank. An attempt to slow the damage has been made by brush piles. Observation of this area is recommended.




Segment A/ Erosion beneath rip rap mat, Arroyo Rosario, 2016.

Segment A/ Eroded bank, Arroyo Rosario, 2016

Segment A/ Tree blocking channel, Arroyo Rosario, 2016

## Segment B. 373 Calle Loma Norte to 388 Calle Loma Norte

**Notes:** The arroyo channel in part of segment B continues to have deep incisions and tight meanders before it flows into segment C. As shown in Figure 6, banks are collapsed bringing trees into the channel. As debris is caught in the trees and builds a barrier the arroyo may back up and cause flooding.


Segment B/Trees become natural barriers, Arroyo Rosario, 2016.

## Segment C. 388 Calle Loma Norte - Los Arboles

**Notes:** The arroyo channel transitions from deep incisions and tight meanders in segment B into a broad, lightly, meandering arroyo bed. There are two areas of concern to be monitored in the future. The first area is a vertical, ~5 foot, bank below a large retaining wall belonging to the National Cemetery. The other area of note is found along the arroyo bank where Los Arboles Rd. ends at the edge of the Rosario. Here, storm runoff from exits two steel culverts. The arroyo bank is deeply incised. The construction of a rain garden could be effective.

## Segment D. Los Arboles to Rio Grande Road

**Notes:** The Arroyo Rosario's characteristics are like those in Segment C. The arroyo is broad with no areas of concern.

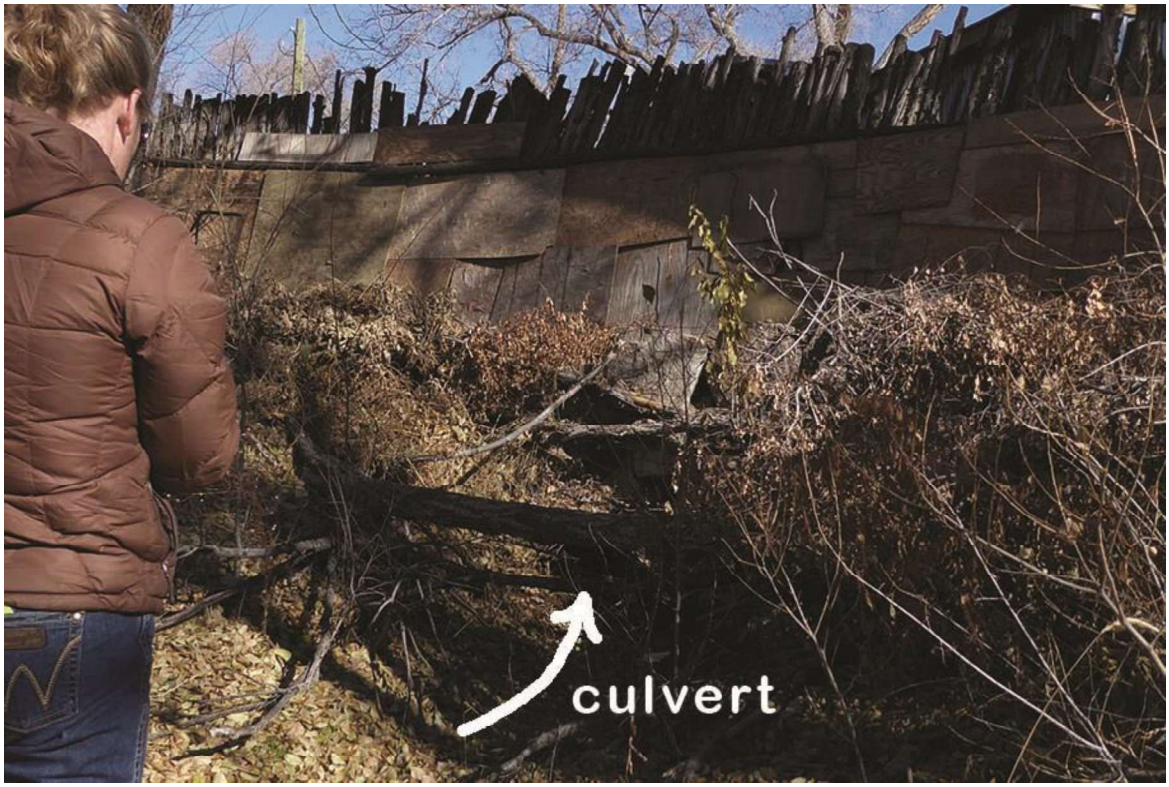
## Segment E. Rio Grande Road to Paseo de Peralta

**Notes:** Notable areas of concern appear in close proximity of the Paseo de Peralta box culvert bridge. The box culvert itself continues to gain sediment from each storm event. Two feet of head room exist between the sandy bed of the arroyo and the top of the box culvert. Next to this structure is a concrete, 18", culvert extremely full of sand. There are approximately 7 "of head room left in this culvert. Another condition affecting this same culvert is erosion around its footings. Since the original rip rap barely remains, pedestrian traffic and water is wearing away the surrounding bank. Lastly, on the east bank of the arroyo above these places is a storm water outlet into the arroyo. Here, the culvert is recessed into the arroyo bank. The outlet is blocked by brush piled above and across it. This segment of the arroyo Rosario has been adopted by the Historic St. Catherine Neighborhood Association through the Santa Fe Watershed's Adopt and Arroyo program.

Segment E / Paseo de Peralta box filled with sand, Arroyo Rosario, 2016.


Figure 1 Segment E/ View of restricted outlet and eroded west bank,2016

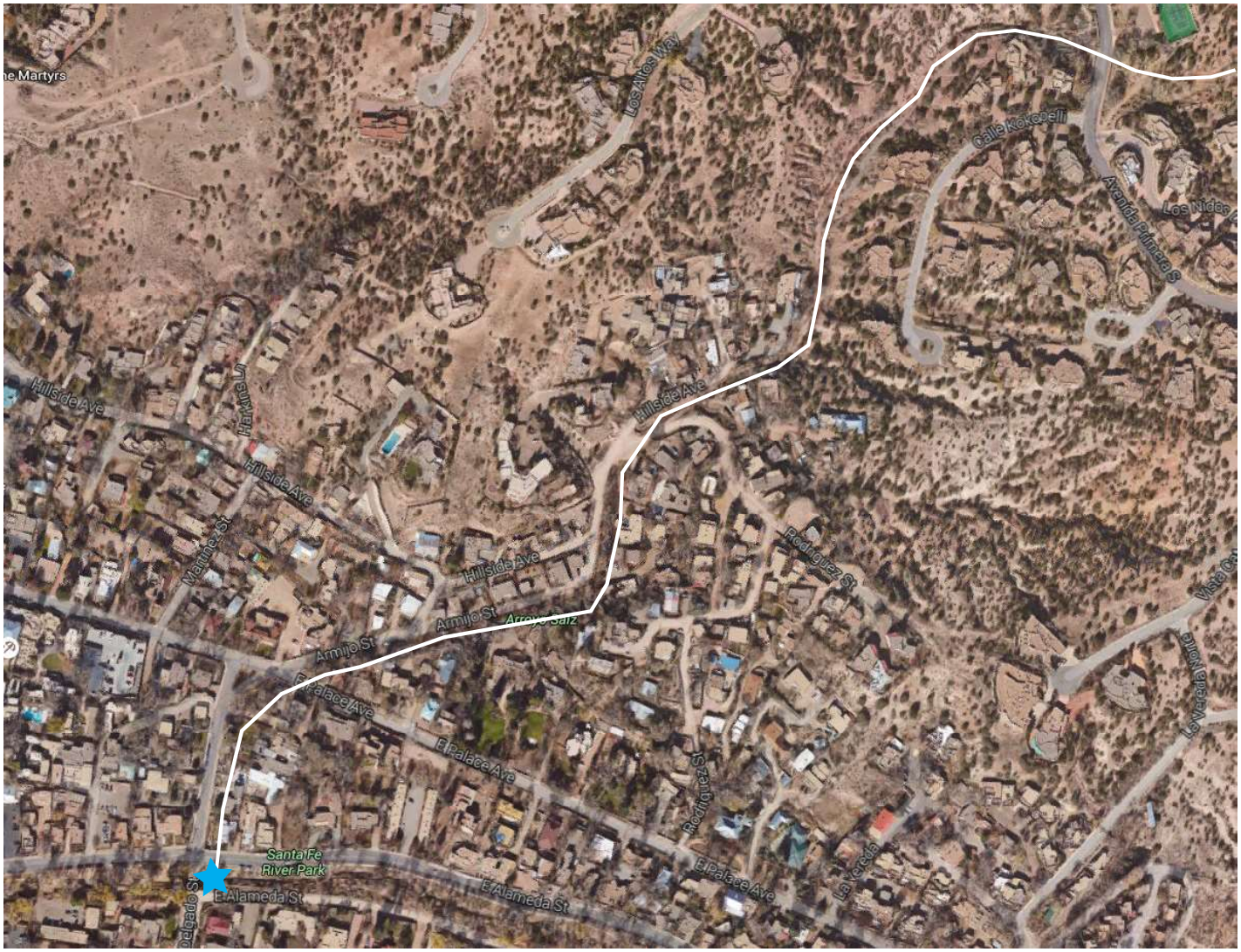

Figure 2  Segment E / Birds eye view of eroded west bank and culvert shoulder, 2016




Segment E / East bank recessed, blocked storm outlet, 2016.

**Segment E/ Mature elms hold banks in place, Arroyo Rosario, 2016**.


Arroyo Saiz Map 1




Arroyo Saiz Map 2

★ River connection

# III. Arroyo Saiz- Hyde Park Road/Gonzalez Road – The Santa Fe River

**Valuable for recreation, wildlife corridor, historical rock work, teaching model.**

**Notes:** Arroyo Saiz begins at the intersection of Gonzales and Hyde Park roads. The main channel is fed by a network of small tributaries that flow through piñon/juniper. Great attention in the past was put into this network of incised drainages running both parallel and opposite of Hyde Park Road by the placement of silt fences and superbly built stone check dams. Storm water run-off from Hyde Park road is eroding the road shoulder (arroyo bank) noted in 2012.

Old silt fencing in the upper Arroyo Saiz, 2016.

Erosion of f Hyde Park road into the Arroyo Saiz, 2016.

Casual recreational trails frequented by walkers and mountain bikers appear above the Avenida Primavera road arroyo crossing continuing through other areas of the arroyo and ending at Rodrigeuz Street. Wildlife such as deer, coyote and rabbit were represented by tracks found throughout this arroyo.

Two separate areas in the arroyo have been fenced off. These fences span the arroyo which may impede storm water flow and are questionable regarding public/private right of ways.

Fencing across the Arroyo Saiz,2016.

Before arriving at the Avenida Primavera crossing, one of these two fences has been erected across the channel twice. Inside the fence boundaries and in the arroyo channel, a grove of large cottonwoods thrive. From this grove of cottonwoods to the second Primavera crossing are intermittent zones of riparian vegetation.

Below the last Avenida Primavera crossing the Arroyo Saiz passes through the City Storm Water Infiltration Gardens built by Earthworks. Below the gardens, the arroyo begins to cut through hard, sandstone like substrate. As a result, the channel switches from a wide, sandy channel to a severely constricted, incised, corrido. Rock run downs and willows are common through this stretch.  The most dramatic vertical walls dramatic appear in this section.

An incised area in the Arroyo Saiz, 2016.

The arroyo then drops down into the Lorenzo Road area. The existing culverts and bridges are silted in. Again, the arroyo is constricted as it passes between homes. One culvert remains restricted however it may no longer be in service.

**Silt clogged culvert in the Arroyo Saiz, 2016.**


Arroyo Mora Map

★River connection

# IV. Arroyo Mora – South of Calle Militar to the Santa Fe River

**Valuable wildlife corridor.**

**Notes:** The narrow Arroyo Mora begins above Apodaca Hill where it flows closely between homes that have been built on either side of it. Many property owners have extended their borders into the arroyo with buildings, dumped earth, yard trash and trimmings, fences and drainage pipes.

Questionable drainage below residence in Arroyo Mora, 2016.

Questionable drainage below residence in Arroyo Mora, 2016.

Running water with algae, Arroyo Mora, 2016.

Deer track in arroyo bed, Arroyo Mora, 2016.

The Mora quickly ends on the banks of the Santa Fe River. At the time of the field assessment in the early spring of 2016, running water with algal blooms was present at the time as were the presence of game trails. The arroyo Mora's channel can be characterized as a narrow, constricted, occasionally deeply incised arroyo with intermittent vertical walls. An iron pipe remains in the same condition that was noted in 2012. The dumps along the steep hillsides of the Arroyo Mora have remained the same and in some cases have been enlarged. The impacts of the arroyo used as a dumping ground of solid and liquid materials effects the quality of the water that enters the Santa Fe River.


Arroyo Cabra Map

River connection

---------- arroyo

## V. Arroyo Cabra- Apodaca Hill – Santa Fe River

**Valuable as a wildlife corridor.**

**Notes:** The Arroyo Cabra and the Arroyo Mora join the Santa Fe River. Both arroyos are similar to each other in character. Storm water from the mountains above Apodaca Hill quickly drains through both arroyos into the Santa Fe River. Both arroyos are steep, moderately constricted and do not allow for any significant braiding to occur to slow excess water. They are also deeply incised in some areas and less in others. Although bank deterioration is minimal, some areas are punctuated with the occasional vertical wall, the banks have been enhanced with dumped construction materials or fencing crosses the arroyo. Pollution from household trash has not improved since 2012. Below Alameda, the vegetation in both arroyos changes from a juniper/piñon zone to a diverse riparian zone attracting local wildlife.

A bank along the Arroyo Cabra continues to rapidly deteriorate in the same location as noted in 2012. Storm water, directed into the arroyo through a culvert, falls onto a rip rap mat that is no longer supported by an earthen bank. The high flow from this water will continue to aid in the rapid deterioration of the bank. The lower arroyo has been officially adopted by Desert Montessori through an Adopt an Arroyo program with the Santa Fe Watershed Association.

Undercut rip rap 2012 and trash below a culvert off Camino Cabra vs 2016, Arroyo Cabra, 2016


Arroyo en Medio Map 1


Arroyo en Medio Map 2

# VI. Arroyo en Medio – Old Santa Fe Trail to Arroyo Chamisos

**Valuable as wildlife corridor, recreation.**

## **Segment A.** Old Santa Fe Trail to the Old Las Vegas Highway

**Notes:** The sandy upper section of the Arroyo en Medio flows through a sparsely populated juniper/piñon habitat. The shallow, narrow channel of the arroyo is mildly incised and braided. Bank deterioration in this area is minimal. Beyond an area heavily overgrown by chamisa, the arroyo loses elevation. At this point the arroyo moves quickly from a shallow waterway to a deep, moderately constricted gouge as it approaches Old Las Vegas Highway. Most of this segment is in good condition. The erosion measures taken behind the new housing subdivision in this area have remained effective.

Segment A/ Incising of Upper Arroyo en Medio, 2016.

## **Segment B.** Old Las Vegas Highway to Old Pecos Trail

**Notes:** Segment B of Arroyo en Medio is in good condition. Few problems were noted since thoughtfully engineered slopes in combination with mature vegetation have successfully prevented further expansion of the arroyo as it passes beneath a number of highways.

## **Segment C.** Old Pecos Trail to the Rodeo Road

**Notes:** This segment of the Arroyo en Medio is in the same stable condition as the previous section. Since 2012, the road shoulder below Old Pecos Trail Bridge has been improved. The steep bank and storm water runoff will continue to create problems in this area until surrounding vegetation matures.

## **Segment D:** Rodeo Road to Calle Pava

**Notes:** The Arroyo en Medio becomes the most constricted and incised between Rodeo Road and frontage road homes. Intermittent, vertical walls up to eight feet in height have developed in this segment. Erosion is affecting the condition of culverts, rip rap and out falls that were installed to allow residents to access their homes. These areas were marked with GPS coordinates for further examination. Also an exposed cable was located within this area.

Segment D/ Example of one of many undercut rip rap, banks, in Arroyo en Medio, 2012.

Segment D/ Exposed cable in Arroyo en Medio,2016.

## **Segment E:** Calle Pava to Sawmill Road

**Notes:** Minor erosion occurs in this winding section of the arroyo leaving infrastructure, mainly culverts, in good shape. Fences are built across the arroyo bed.

## **Segment F:** E. Sawmill Road to W. Sawmill Road

**Notes:** The sandy channel of the Arroyo en Medio broadens in this area. A variety of bank conditions appear in this area. Banks range from an average four feet to 20 feet in height. Along the highest banks, drainage pipes leading from residences have been installed to drain into the arroyo.

Segment F/Questionable drainage lines into Arroyo en Medio, 2016.

Segment F/Drain pipes in Arroyo en Medio, 2016.

## **Segment G:** W. Sawmill Road to S. St. Francis Drive

**Notes:** Infrastructure conditions in this segment are very poor in the Arroyo en Medio. Conditions noted in 2012 have since declined, further exposing a pipeline, exposing more cable, putting an important culvert out of service and dissolving a bank supporting a retaining wall and its system of rip rap and gabion walls. The breakdown of storm water infrastructure has caused major deterioration in this section of the arroyo. After passing S. St. Francis Drive the arroyo changes its name and becomes Arroyo Chaparral. Trash from the highway, surrounding properties (especially the shopping complex) and transient camps are common in this area.

Segment G/Undercut rip rap mat, Arroyo en Medio,2016

Segment G/A partially exposed pipeline, Arroyo en Medio, 2012

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Segment G/Disconnected storm culvert in Arroyo en Medio ,2016.

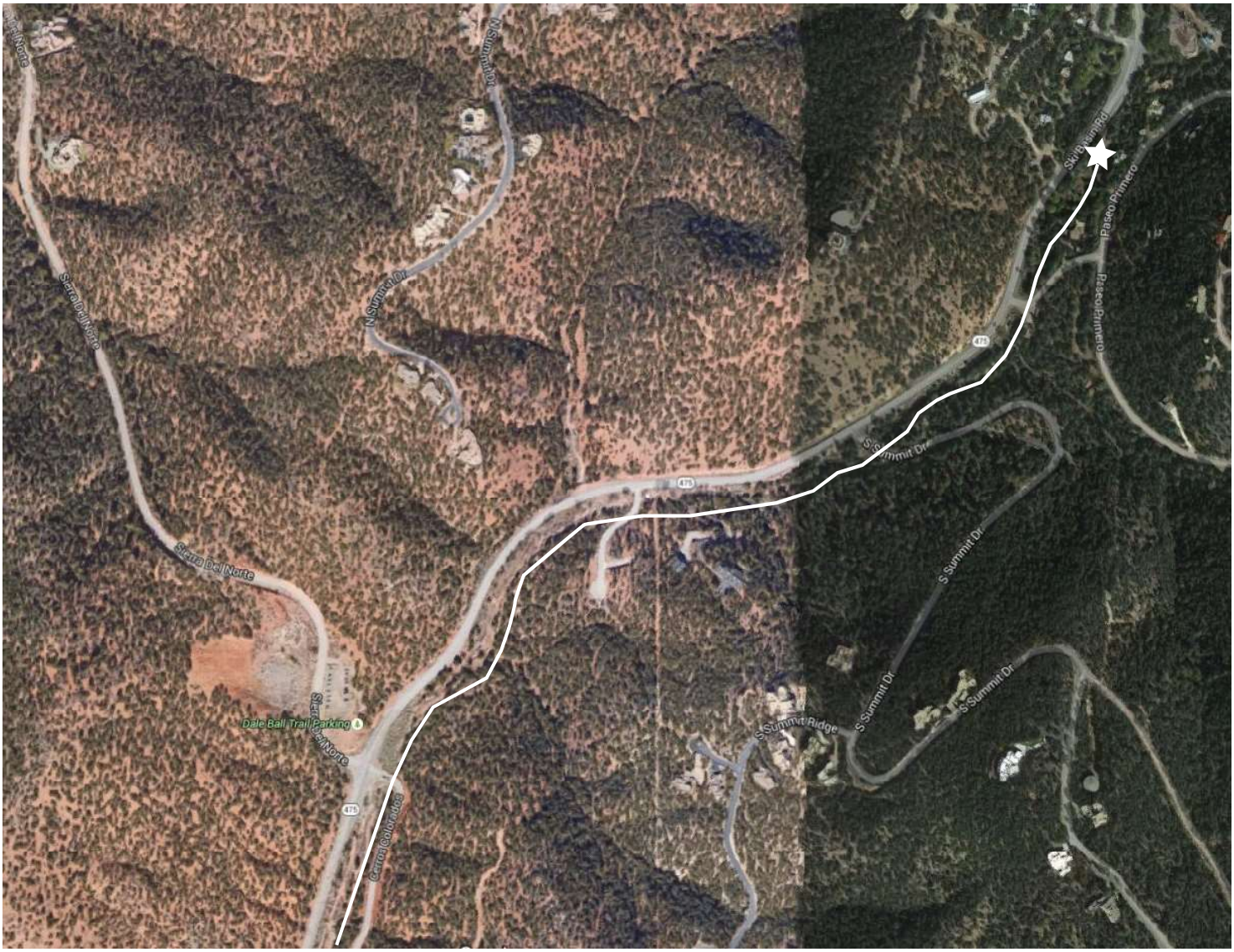
Segment G/Storm culvert in Arroyo en Medio 2012.

Segment G/Photo of the same storm culvert as pictured above in 2016, Arroyo en Medio.

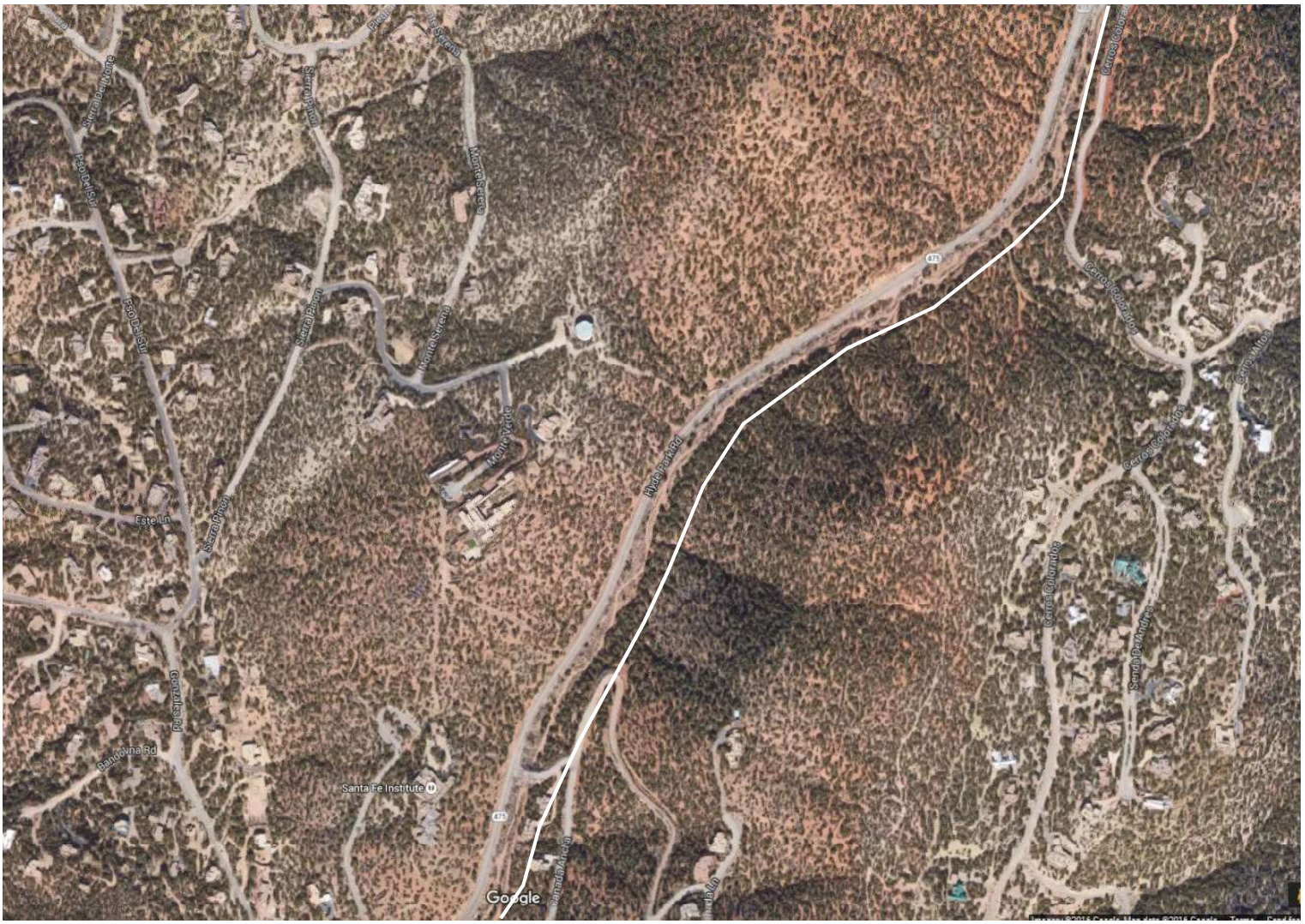
Segment G/Over view of multiple problems, Arroyo en Medio, 2016

Segment G/Overview of multiple problems, Arroyo en Medio,2016

**Segment G/ Undercut retaining wall, Arroyo en Medio, 2016, as pictured above.**



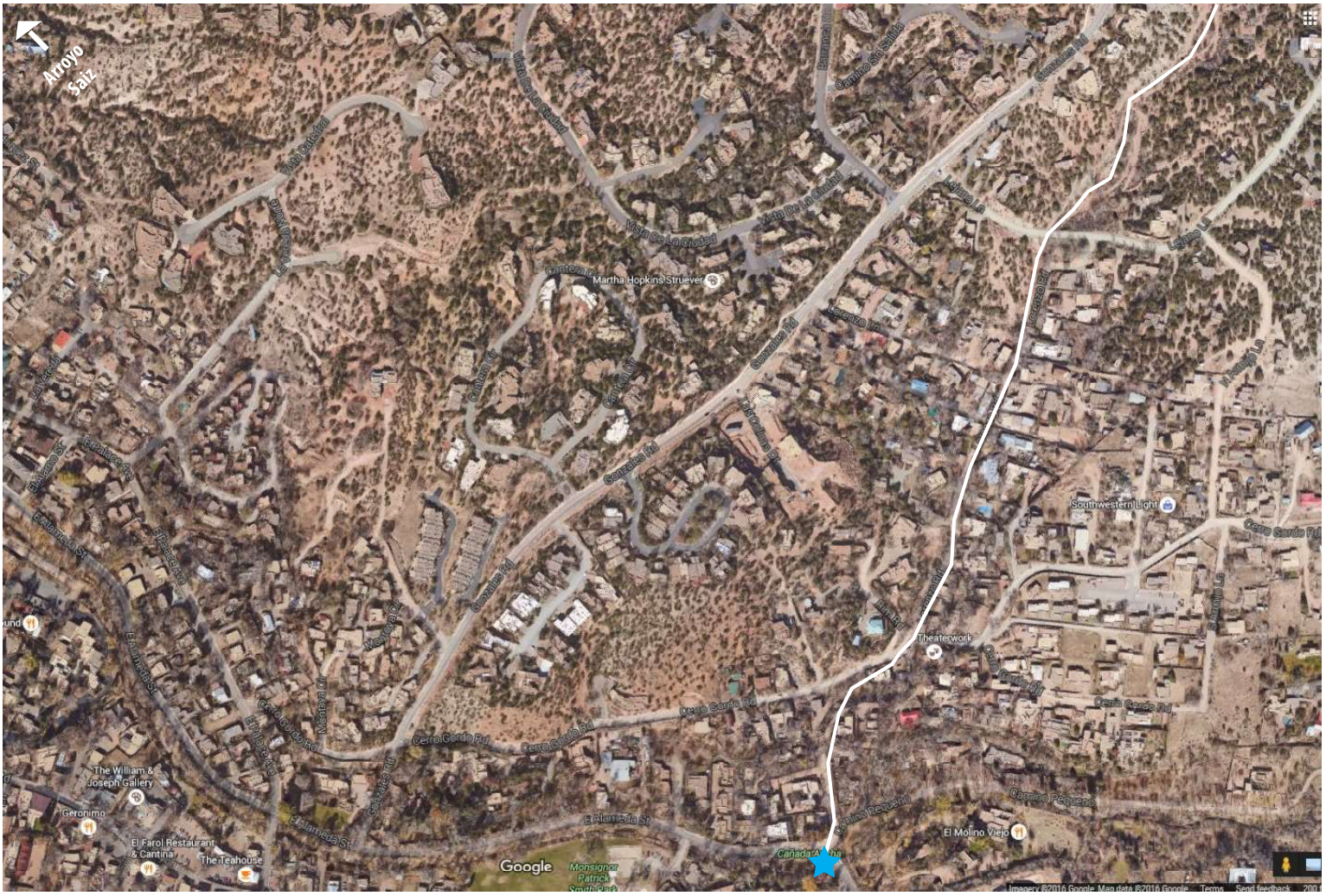

Arroyo Ancha Map 1



Arroyo Ancha Map 2


Arroyo Ancha Map 3

☆---------- Arroyo Saiz




Arroyo Ancha Map 4

River connection

# VII. Arroyo Ancha Headwaters to Cañada Sur

Valuable for a wildlife corridor and recreation.

## Segment A. Headwaters – Cañada Sur

**Notes:** Hyde Park Road follows the Arroyo Ancha, a narrow, constricted, rocky waterway that passes beneath a canopy of ponderosa, piñon, and juniper. The passage attracts wildlife, hikers, and mountain bikers. When the arroyo enters the La Entrada area, it remains constricted and incised. Many culverts placed to drain storm water off of Hyde Park Road to then empty into the Arroyo Ancha are restricted by sediment.

Segment A/Obstructed culvert, Arroyo Ancha, 2016

Segment A/Obstructed culvert, Arroyo Ancha, 2016

Segment A/Gabion askew, Arroyo Ancha, 2016.

Below Kachina Heights Drive, a gabion wall is hanging precariously off of the arroyo bank. Here water from the arroyo channel drops 10 feet below this culvert/gabion system expanding the arroyo bed in width and impacting infrastructure and channel characteristics.

From this point, the condition of the arroyo is very poor due to extreme erosion. The sewage outlets found above ground were all emanating a noxious odor. Nearby, an above ground pipe labeled sewer was found. Corrective actions to protect infrastructure in this area are highly recommended and may be urgent. Foot and bike traffic is also frequent in this area.

Segment A/One of four sewage outlets emanating noxious odors, Arroyo Ancha, 2016

Segment A/ Exposed sewer line in Arroyo Ancha, 2016

## Segment B. Cañada Sur – Santa Fe River

**Notes:** Segment B, as it continues to follow Hyde Park Road from Cañada Sur to the Santa Fe River, continues to be well traveled by hikers and wildlife. The arroyo crosses Dempsey Lane turns south and empties into the Santa Fe River. The arroyo's channel characteristics influenced by road crossings and high density housing are variable in this section. The channel which alternates between broad to constricted stretches is intermittently braided, incised and contains occasional vertical or collapsing banks.

Segment B/ Example of bank erosion in Arroyo Ancha, 2016.

Segment B/ Example of bank calving in Arroyo Ancha, 2016.

Segment B/ Bank erosion by check dam, Arroyo Ancha, 2016

Drainage from this arroyo continues to wear on infrastructure such as rip rap mats, footings around concrete check dams and private property. The sediment in the box culvert at the junction of the arroyo and the Santa Fe River has increased.

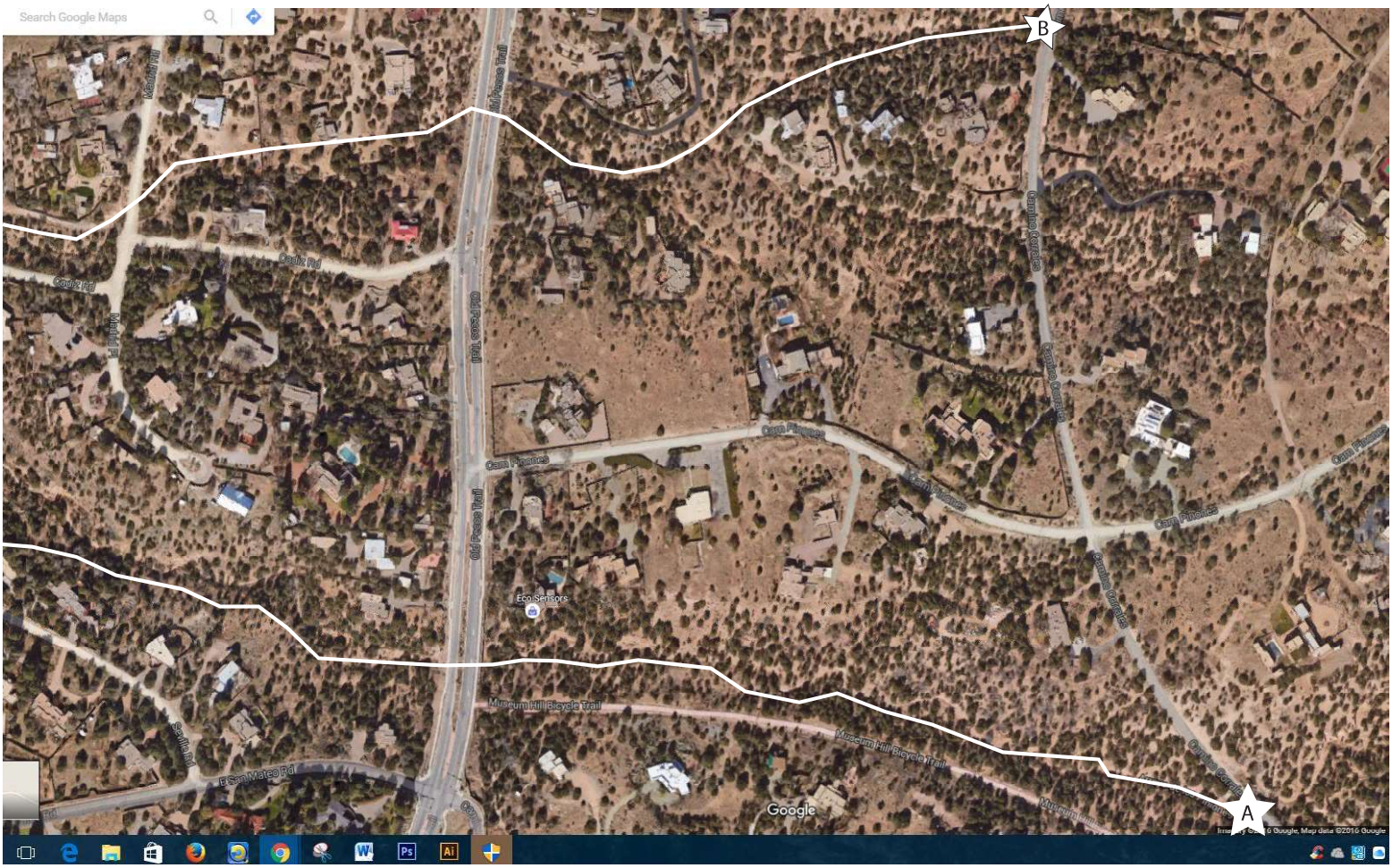
Segment B /Expose pipe at crest of bank, Arroyo Ancha 2016.

Segment B/Drain pipe with opening in the arroyo bed, Arroyo Ancha, 2016.

Segment B/ Utility line in bed of the arroyo, appears to be in the same condition,Arroyo Ancha 2012 – 2016 .

Segment B/ Sediment level rises beneath box culvert E. Alameda St. in Arroyo Ancha, 2016

Segment B/ Box culvert trapping sediment beneath E. Alameda St., Arroyo Ancha, 2012.




Upper Arroyo de los Pinos A&B Map 1


Upper Arroyo Pinos A & B Map 2

# VIII. Arroyo de los Pinos North

**Valuable for recreation.**

## Segment: A. Camino Corrales /Lejo to Galisteo

**Notes:** The Upper Segments of the Arroyo de los Pinos are located in a less populated section of the City of Santa Fe. It is with in an arid pinon juniper habitat. The upper arroyo differs from the lower channel in many ways. The upper arroyo is able to meander before reaching Old Pecos Trail. The channel character vacillates between constricted and braided, to braided. This upper branch passes under or over many roads. (Seville, Don Gaspar, Galisteo) A walking/ biking trail exists in the arroyo ending at Old Pecos Trail. A permanent trail, built for the Santa Fe Botanical Gardens, also parallels the arroyo to Old Pecos Trail. The residential density increases at the lower end of this segment.

After 2012, structures like one rock dams and step downs have been placed in the arroyo and at intersections with smaller drainages in the arroyo between Galisteo and Old Pecos Road. At this time the condition of these additions appear to be functional.

The infrastructure in this area seems secure. The obstructed culvert noted in 2012 remains obstructed. Residential density increases at the lower end of this segment.

Segment A/ Obstructed culvert, Old Pecos Trail, Upper Arroyo Pinos North, 2016

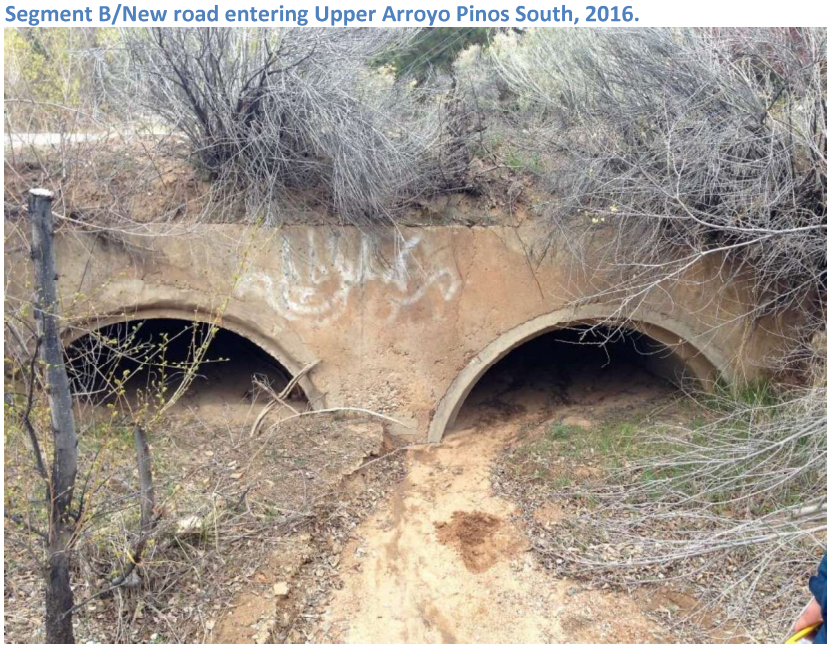
**Segment A. One rock check dams, Upper Arroyo Pinos North, 2016.**

# VIII. Arroyo de los Pinos South

## Segment: B. Camino Corrales /Lejano to Don Gaspar South Fork

**Notes:** The two upper branches of Arroyo de los Pinos converge near Don Gaspar. As with Segment A, Upper Pinos South, the channel of the arroyo and vegetative zone are very similar. Obstructed culverts are the most common problem to be found within the infrastructure located in this arroyo. An unofficial walking trail along the banks and in the arroyo until can also be found here. Since 2012, a road has been made, leading from one property to another. Trash is present in this segment as well as the previous segment.

Segment B/New road entering Upper Arroyo Pinos South, 2016.



Segment B /Obstructed culvert Upper Arroyo Pinos South, 2016.

**Segment B /Vertical banks Upper Arroyo Pinos South, 2016.**


Lower Arroyo de los Pinos Map 4

Ditch

Ditch connection

# VIII. Arroyo de los Pinos DITCH St. Michaels Drive to La Farge Library

**Notes:** The entrance into this segment of arroyo is poorly drained due to an occluded, culvert. This culvert remains in its 2012 condition. An infiltration basin located here could be successful. The channel characteristics in this location are constricted yet shallow. Segment X is an engineered ditch that empties into the Lower Arroyo Pinos below La Farge Library. New to the landscape is the recently built HEC building. The "ditch" is used as a pathway between Santa Fe High and the campus of the School for Art and Design. Trash accumulation is prevalent along the entire ditch as are many transient camps with in the ditch and below the La Farge library.

Segment X/ Restricted, sunken culvert, Lower Arroyo Pinos, 2016.


Segment X/ Storm outlet , Lower Arroyo Pinos, 2016.

Segment X/ Debris caught in storm outlet , Lower Arroyo Pinos, 2016.


Lower Arroyo de los Pinos Map 1


Lower Arroyo de los Pinos Street Map 2


Lower Arroyo de los Pinos Map 3

---------- ditch


Lower Arroyo de los Pinos Map 4

Ditch

Ditch connection


Lower Arroyo de los Pinos Map 5

Ditch connection


Lower Arroyo Pinos Map 6

----------◯ Arroyo Chamisos connection

# VIII. Lower Arroyo de los Pinos

## Segment A. Galisteo Street to St. Francis Drive

**Notes:** Arroyo de los Pinos flows from Galisteo Street culverts into a wide, densely wooded area. This segment, along with the rest of the Arroyo Pinos, flows through a densely populated area.

Next the arroyo transforms into a long narrow constricted channel as it meets St. Francis Drive passing between homes. The impacts from erosion begin to be more apparent once the arroyo picks up below Luisa Street before flowing under St. Francis Drive.

A well-worn pedestrian path appears from Galisteo Street to Luisa. Pedestrians and bicyclists use the bank of the arroyo as a recreational path to access the bike trail near Second Street Brewery. Rip rap, outfalls, and storm culverts in various states of wear, are located throughout the arroyo.

Segment A/Arroyo Pinos culvert located below St. Francis Drive, 2016

## Segment B. St.Francis to 6th Street

**Notes:** Arroyo de los Pinos flows beneath large shade trees growing between residential and commercial buildings. Segment B of this arroyo begins at the St. Francis culverts where storm water continues to scour a basin beneath them, further incising and undercutting existing vertical banks. Near these steep banks, gabion and rip rap mats have been used to control erosion. Located beneath the Pacheco street culverts are existing basins that deepen by the scouring action of storm water. Infiltration basins located at these culverts may encourage more growth of riparian species. The banks remain steep. Since 2012, the utility pipe seen below has been further exposed in the arroyo bed. Transient camps are popular in the area as were noted in 2012 resulting in unusually large amounts of trash and bio hazards.

Segment A /Left photo 2012 bank erosion ; photo right 2016 bank erosion same location. Lower Arroyo de los Pinos,2016.

Segment B/Exposed pipe, Lower Arroyo Pinos, 2012.

Segment B/ Exposed pipe same location, Lower Arroyo Pinos, 2016.

The stretch between St. Francis Drive and the Rail Runner crossing near Second Street is covered with dense ground vegetation and mature deciduous trees. In several areas beneath the trees, the arroyo is shallow and opens into a wide bed, later returning to an incised channel after passing under the Rail Runner tracks. The culverts beneath the tracks in 2012 were clear of sediment. These culverts are now no longer sediment free. A perpendicular ditch runs into the arroyo from the railroad property. Soils eroding from this ditch may be contributing to extra sedimentation in the culverts and has uncovered a conduit pipe that services rail infrastructure.

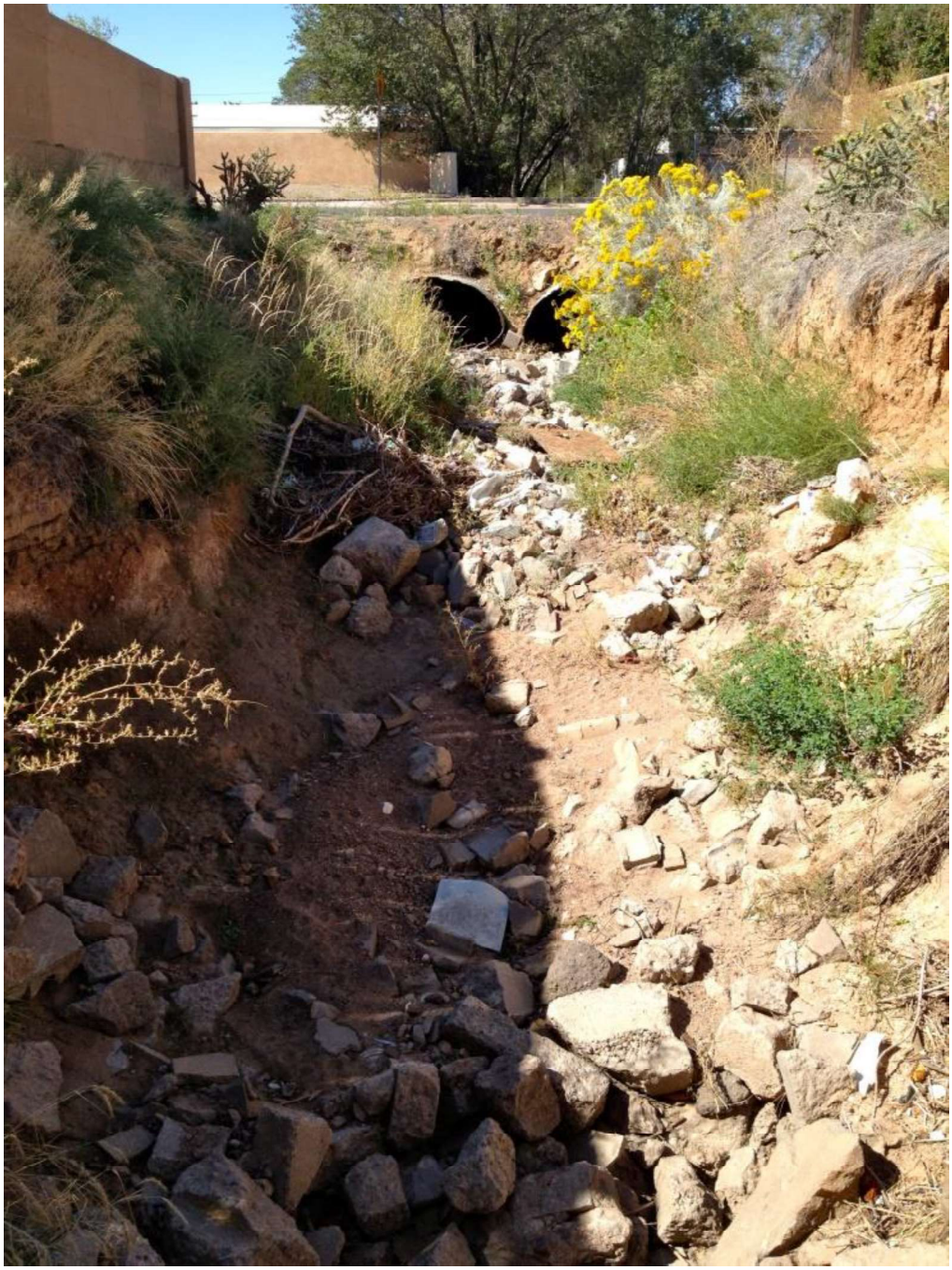
Segment B/ Heavy erosion on RR property into the Pinos,2016.

Segment B/ Culverts under Rail Runner tracks, Lower Arroyo Pinos, 2016.

Segment B /Volunteers after Arroyo Pinos trash clean up Lower Arroyo Pinos, 2016,.

From Hopewell Street to 6th Street Arroyo de los Pinos transforms into a long, constricted ditch traveling through several neighborhoods. It is strewn with trash and concrete. Banks are undercut and are usually high in areas. The arroyo is encroaching on private property at the 5th street crossing.

Segment B /Bank erosion below private property, Lower Arroyo Pinos, 2016.



**Segment B /Bank erosion below private property, Lower Arroyo Pinos, 2012.**

## Segment C. St. Michaels Drive to Camino Carlos Rey

**Notes:** A severely constricted, incised, channel with vertical banks either sheathed with gabion or bare walls define the arroyo from St. Michael's Drive to Camino Carlos Rey. Gabion walls and rip rap are in various states of disrepair throughout this section.

The arroyo is not heavily used as a recreational path. The amount of trash throughout this area is high. Much of the rip rap mats beneath check dams are damaged or missing. Storm water flow has also scoured out deep basins below these features resulting in an increase of water retention. The slow evaporation of storm water is left standing for weeks during the mosquito season. Often transient camps can be found on the camps below La Farge Library as well as along the arroyo banks below the old Greyhound station. These camps manufacture large quantities of trash and biohazards.

Segment C/, Gabion walls sagging, Lower Arroyo Pinos, 2016.

Segment C/ Water standing in deep scour below undercut rip rap mat, Lower Arroyo Pinos, 2016.

As in 2012, erosion is the leading cause of infrastructure deterioration in this segment of the Arroyo de los Pinos. Banks around gabion walls, culverts, rip rap, and box culverts are in various states of erosion. Severe erosion conditions are present along Siringo Road where the arroyo banks are extremely high and vertical. An arroyo bank off Llano Street is working its way towards a manhole located near a sidewalk. Some culverts in the Arroyo de los Pinos system are either restricted or occluded by debris.  A section from Llano Street to Alumni drive has been adopted by Santa Fe High School through the Santa Fe Watershed Association's Adopt an Arroyo program.

**Segment C/ Bank erosion to right of manhole, Lower Arroyo Pinos, 2016.**

**Segment C/ Bank erosion ~2 feet from manhole, Lower Arroyo Pinos, 2016**.

Segment C/Cracked concrete pipeline, Lower Arroyo Pinos, 2016.

Segment C/ Trash caught in tire check dam, Lower Arroyo Pinos, 2016.

## Segment D. Camino Carlos Rey to Richards

**Notes:** There are no changes in the arroyo's channel characteristics in Segment D. The arroyo continues to be a constricted, incised, channel with vertical banks that are either sheathed with gabion walls or remain bare. Outfalls and rip rap continue to deteriorate, while culverts are compromised by restrictions or occlusions.

**Segment D/ Bank erosion; upper photo 2016, lower photos *2012*, Lower Arroyo Pinos.**

Segment D/ Damaged rip rap mat 2016, Lower Arroyo Pinos.

Segment D/ Damaged rip rap mat 2012, Lower Arroyo Pinos.

## Segment E. Richards to Arroyo de los Chamisos

**Notes:** The Arroyo de los Pinos continues to be constricted, incised, and eroded to its junction with the Arroyo Chamisos. Also the methods engineered to control flow are in various states of disrepair. Since 2012, the bank surrounding the sewage outlet located upstream above the Kachina Ridge crossing near Richards has been repaired yet should be monitored. The arroyo continues to heavily erode the bank below it and the cracks in the concrete collar have enlarged. A fair amount of property is eroding into this arroyo as well. Transient camps are common with in the juniper/piñon banks located where the Arroyo Chamisos and Arroyo de los Pinos join producing extensive trash and biohazards.

Segment E/ Unprotected Sewer utility, Lower Arroyo Pinos, 2012.

Same sewer outlet with protection, Lower Arroyo Pinos, 2016 .

**Segment E/** Bank erosion, Lower Arroyo Pinos, 2016 .

**Segment E/** Bank erosion, Lower Arroyo Pinos, 2016 .

**Segment E/** Exposed utility, Lower Arroyo Pinos, 2016.

Segment E/ View of Lower Arroyo Pinos, 2016.

Segment E/ Young trees anchor bank stabilization materials, Lower Arroyo Pinos, 2016.


Arroyo Mascaras Map 1


# Arroyo Mascaras Map 2

River connection

Arroyo underground

Rosario connection

# IX. Arroyo Mascaras

Valuable for wildlife corridor and recreation.

## **Segment A.** Bishop's Lodge Road – Arroyo Barranca

**Notes:** The Arroyo Mascaras is separated only by name from Arroyo Piedra by Bishop's Lodge Road Bridge. Arroyos Barranca and Rosario discharge water into the arroyo Mascaras. The arroyo Mascaras delivers these combined waters to the Santa Fe River near St. Francis and W. Alameda. The part of the Arroyo Mascaras that flows within the boundaries of Ft. Marcy Park has been well maintained by the City's Park Division. The banks of the arroyo are steep and are sometimes reinforced with gabion walls in places. The entire arroyo is used for recreation.

## **Segment B.** Arroyo Barranca – Old Taos Highway Bridge

**Notes:** The arroyo channel in this segment widens and the banks are not steep.
The Old Taos Highway Bridge crosses the arroyo. The concrete underside of this bridge is decaying exposing rebar. Also the bridge provides shelter for transient populations. From this segment to the Santa Fe River numerous transient camps can be found. Trash is common in this area as a result of these camps.

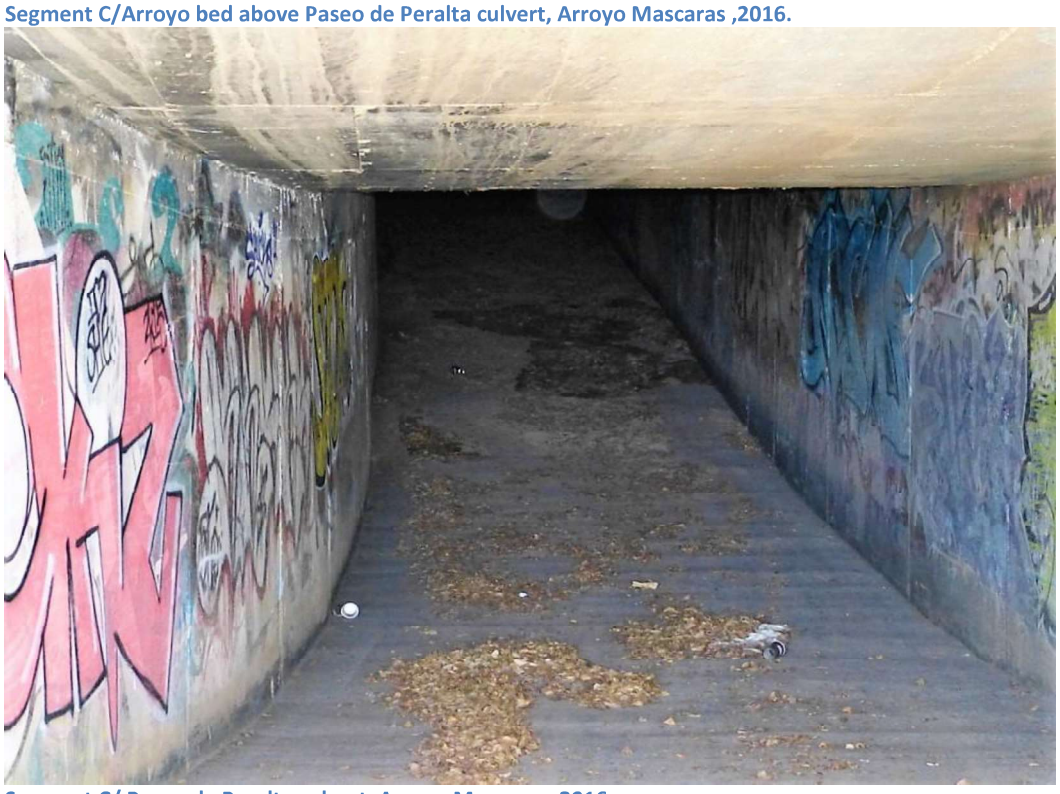
Segment B/Example of Upper Mascaras ,2016.

Segment B/Underside of concrete damage, Old Taos Bridge Arroyo Mascaras ,2016.

**Segment C.** Old Taos Highway Bridge-Paseo de Peralta/Guadalupe Street intersection.

**Notes:** Similar to the Lower Pinos Arroyo, devices engineered to direct water flow such as culverts, rip rap, and check dams are common in segment C. Next the arroyo flows beneath the Paseo de Peralta/Guadalupe intersection by way of a large box culvert. Transient camps are common along this section.

Segment C/Arroyo bed above Paseo de Peralta culvert, Arroyo Mascaras ,2016.



Segment C/ Paseo de Peralta culvert, Arroyo Mascaras, 2016.

## **Segment D.** Paseo de Peralta/Guadalupe Street intersection – St. Francis Road

**Notes:** Various types of engineering devisces to manage water flow are found throughout the arroyos system. The arroyo channel in segment D has been reinforced with concrete retaining walls to support its banks. This method of erosion prevention was not found in any other surveyed arroyo.

Since 2012, the majority of the arroyo has remained the same. Infrastructure in disrepair is found in the rip rap mats located beneath the culverts. Unique to this arroyo is an area that remains wet all year round. The cause for the unusual amount of standing water is not apparent in this area. The occurrence of bridges to shelter transient residents increases as does the amount of trash. Through the Santa Fe Watershed's Adopt an Arroyo program Santa Fe Prep has officially adopted this section of this arroyo.

**Segment D/Perineal wet area below culvert, Arroyo Mascara , 2016.**

**Segment D/Comparison of rip rap damage below culvert, Arroyo Mascaras , 2016.**

2016 2012

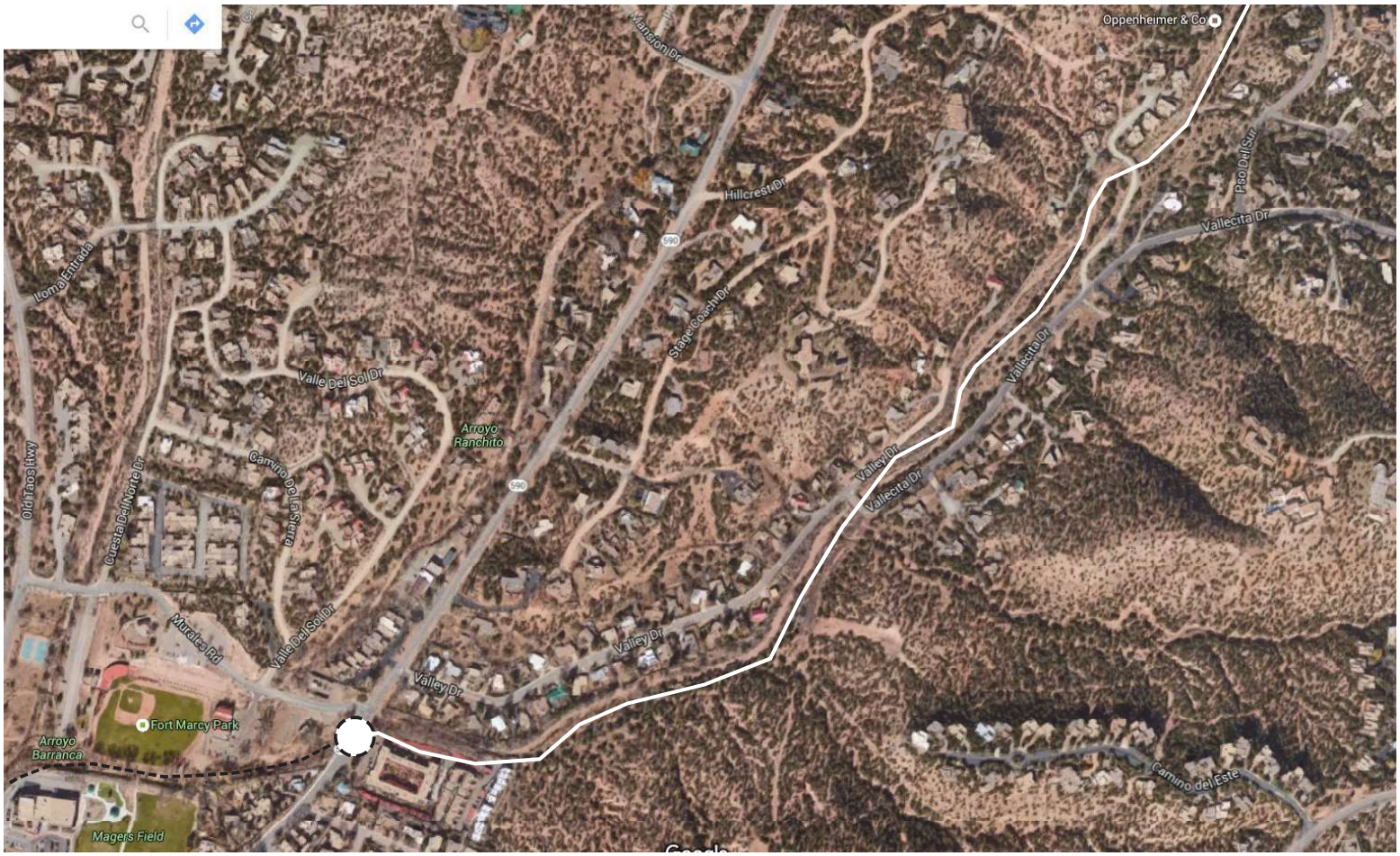
## **Segment E.** N St. Francis Road – Santa Fe River

There are five arroyos that deliver water to the Arroyo Mascaras; Arroyo Ranchitos, Arroyo Barranca, Arroyo Lovatos, Arroyo Rosario, and lastly the Arroyo Canada Rincon. The water load from these afore mentioned arroyos courses into the Santa Fe River. The last structure to cross the Arroyo Mascaras is the W. Alameda Bridge. Pollution from the combination of five arroyos enters the river at this spot.

**Segment D/ Entry way into the Santa Fe River for the Arroyo Mascaras , 2016.**


Arroyo de la Piedra West and East Map 1


Arroyo de la Piedras West and East Map 2




# Arroyo de la Piedra Map 3

Mascaras ----------○ Piedra

# X. Arroyo de la Piedra

**Valuable wetland and wildlife corridor.**

## Segment A. Piedra East from Conejo Rd – Camino Real

**Notes:** Arroyo de la Piedra, located in the foothills of the Sangre de Cristo Mountains, captures runoff from the north in either its east or west branches. These two branches meet near Paseo del Sur and Camino Real where water is conveyed into one channel that empties into the Santa Fe River. The name of this arroyo changes to Arroyo Mascaras Water at Bishop's Lodge Road.

The broad, rocky, sandy eastern fork of the Arroyo de la Piedra follows a winding path surrounded by piñon/ juniper habitat. An active game trail runs throughout this arroyo due to a large wetland found in the arroyo bed. No other arroyo in Santa Fe contains a wetland of this size. Along the route backyards, rip rap, gabion, culverts, and exposed pipes are crossed by the arroyo before it meets up with the west branch.

The condition of the arroyo varies depending on location. Below the wetland the narrowing of the arroyo has incised the arroyo bed to create high vertical walls. The arroyo bed drops suddenly, approximately 10 feet below a gabion check dam. Impacts from erosion from this point south begin to increase as the arroyo nears the Paseo del Sur area. Multitudes of high cut banks, sediment filled culverts and exposed utilities exemplify the nature of erosion up to the west fork junction.

**Segment A/ Wetland located in Arroyo Piedra, 2016**.

**Segment A/ Bank erosion, Arroyo Piedra, 2016.**


Segment A/ Comparison of exposed iron pipe. Left 2016 condition/ Right 2012 condition, Arroyo Piedra, 2016.


Segment A/ Comparison of exposed green pipe. Photo left 2012 condition and photo right 2016 condition, Arroyo Piedra, 2016.

Eroded banks in Arroyo Piedra East, segment A.

## Segment B. Piedra West from Brownell - Howland to Arroyo Mascaras

Arroyo Piedra's west branch carries water along a narrow, sand filled drainage through a piñon, juniper, and ponderosa habitat. The arroyo narrows and continues to narrow as it flows south. Parts of the west branch were inaccessible since several fences were built across the arroyo. Similar to its east branch, the west branch passes through a lower density of residential properties which increases in the lower sections of the arroyo. As a result, the amount of infrastructure encountered rises. Erosion in this area is moderate to severe which has caused damage to culverts, banks, and utilities. Once the last man-made barrier is crossed, the arroyo broadens as it nears the border of Arroyo Mascaras. The west branch is both a corridor for wildlife and hikers.

Segment B/Fence across the arroyo bed, Arroyo Piedra, 2016.

Segment B/Bank deterioration below culverts, Arroyo Piedra, 2016.

Segment B/ Comparison of  culverts, Arroyo Piedra, 2016.

Segment B/ Comparison of culverts photo from 2012, Arroyo Piedra.

Segment B/ Rip rap mats undermined , Arroyo Piedra, 2016.

Segment B/ Exposed utility 2016 , Arroyo Piedra.

Segment B/ Exposed utility 2012 , Arroyo Piedra.

Segment B/ Upstream side of restricted culverts with sediment displacement , Arroyo Piedra, 2016.

Segment B/ Downstream side of restricted culverts , Arroyo Piedra, 2016.

**Segment B/ Incising of the arroyo bed and bank deterioration, Arroyo Piedra, 2016**.

Segment B/ Arroyo channel in 2012, Arroyo Piedra, 2016.

Segment B/ Retaining wall and gabion basket added to arroy channel, Arroyo Piedra, 2016

Segment B/ Gabion check dam in 2012, Arroyo Piedra.

Segment B/ Same gabion check dam with added retainig wall, Arroyo Piedra, 2016

Segment B/ Gabion check dam in 2012, Arroyo Piedra.

Segment B/ Same gabion check dam with added retainig wall, Arroyo Piedra, 2016


# Arroyo Foothills

Chamisos ------ Foothills

# XI. Foothills Arroyo

**Valuable for recreation, wildlife corridor, and teaching model.**

**Segment A.** Old Santa Fe Trail – Arroyo de los Chamisos

**Notes**: Located at the base of Moon Mountain, the Foothills Arroyo captures run off and delivers it to the Arroyo de los Chamisos. The narrow, sandy, constricted upper section passes through several large properties. Exposed utilities, drainage pipes from adjacent properties emptying into the arroyo, and obstructions by trees or yard trimmings were located.

Before the intersection of the arroyo and Calle Cacique, the arroyo passes over driveways and behind residential housing. The arroyo passes through a narrow constricted canyon with vertical walls which in places ,reach fifteen feet in height. Throughout this segment eroded banks reveal exposed utilities ranging from electrical lines to sewer lines. One of the sections of the Old Pecos Trail box culvert is severely obstructed by debris of one kind or another which may cause flooding in the surrounding area. The box culvert is commonly used as a shelter for the transients. Excessive trash is common due to the proximity of the arroyo to Old Pecos Trail.

Segment A/ Upper Foothills Arroyo, 2016.

Segment A/ Rip rap mat undermined, Foothills Arroyo, 2016.

Segment A/ Exposed cables, Foothills Arroyo, 2016.

Segment A/ Drain pipes protrude into arroyo from private property, Foothills Arroyo, 2016.

Segment A/ Exposed cables, deteriorating banks and sewer outlet, Foothills Arroyo, 2016.

Segment A/ Vertical walls with rip rap mat folded back from flooding, Foothills Arroyo, 2016.

Segment A/ Two exposed utilities, Foothills Arroyo, 2016.

**Segment A/ Obstructed box culvert with transient camp, Foothills Arroyo, 2016.**


Arroyo Cloudstone Map 1


Arroyo Cloudstone Map 2

Chamisos ---------- Cloudstone

# XII. Arroyo Cloudstone

**Valuable for recreation.**

**Segment A. Old Santa Fe to Old Pecos Trail**

**Notes**: Arroyo Cloudstone, located near the base of Moon Mountain, empties into the larger Arroyo Chamisos. Run off from precipitation flows through a Y shaped culvert under Old Santa Fe trail where dead and down wood collects on either side of the culvert. A fence located on the downstream side of the culvert causes the debris to build up and obstruct the culvert. The upper length of Arroyo Cloudstone meanders freely from a lightly populated area to that of a densely populated area. Although the channel is shallow it vacillates between constricted sections, to braided, sandy, broad, open spaces in the upper reaches. It is possible for upper sections of the arroyo to meander freely before reaching Old Pecos Trail. It is not possible for natural meanders to occur since development up to its banks has been allowed. Below this point the sandy channel of the arroyo becomes deep, narrow and constricted.

**Segment A/Upstream (left) and downstream right) of culvert, Old Santa Fe Trail, Arroyo Cloudstone, 2016**.

Segment A/Erosion of bank, Arroyo Cloudstone,2016.

Segment A/Exposed cable, Arroyo Cloudstone, 2016.

**Segment B. Old Pecos Trail to Arroyo Chamisos**

The highest concentration of damage to city infrastructure is located in this arroyo's midsection. This area begins near Quail Run and ends in the area below Old Pecos Trail Road. Beyond this point, heavy erosion has collapsed tree covered banks into the channel of the arroyo.

Segment B/Erosion below gabion walls, Arroyo Cloudstone,2016.

Segment B/One of several tree obstructions in the narrow constricted section of Arroyo Cloudstone, 2016.

# XIII. Arroyo Nopal- East of Calle Nopal – W. Alameda

**Notes:** Arroyo Nopal begins at the crest of a hill northwest of W. Alameda Street. Calle Nopal, The High Road, Painted Sky Road, and W. Alameda border this arroyo. Also an easement road to access city sewer lines travels through the arroyo. Development of the surrounding hillside has changed this arroyo's natural drainage patterns. The soil type, surrounding hard top and new culverts contribute to a large volume of water passing quickly through Arroyo Nopal despite its short length. This excessive runoff has impacted homes in the area.
An upper and lower system of check dams and basins over filled with sediment, are unable to accommodate large volumes of water. Rather than slowing the water, these check dams are often by passed. As a result, damage to the arroyo channel and property has increased. Beyond the catch basins the arroyo becomes extremely incised as it flows toward W. Alameda.

Several culverts drain the west side of Calle Nopal, Arroyo Nopal, 2016.

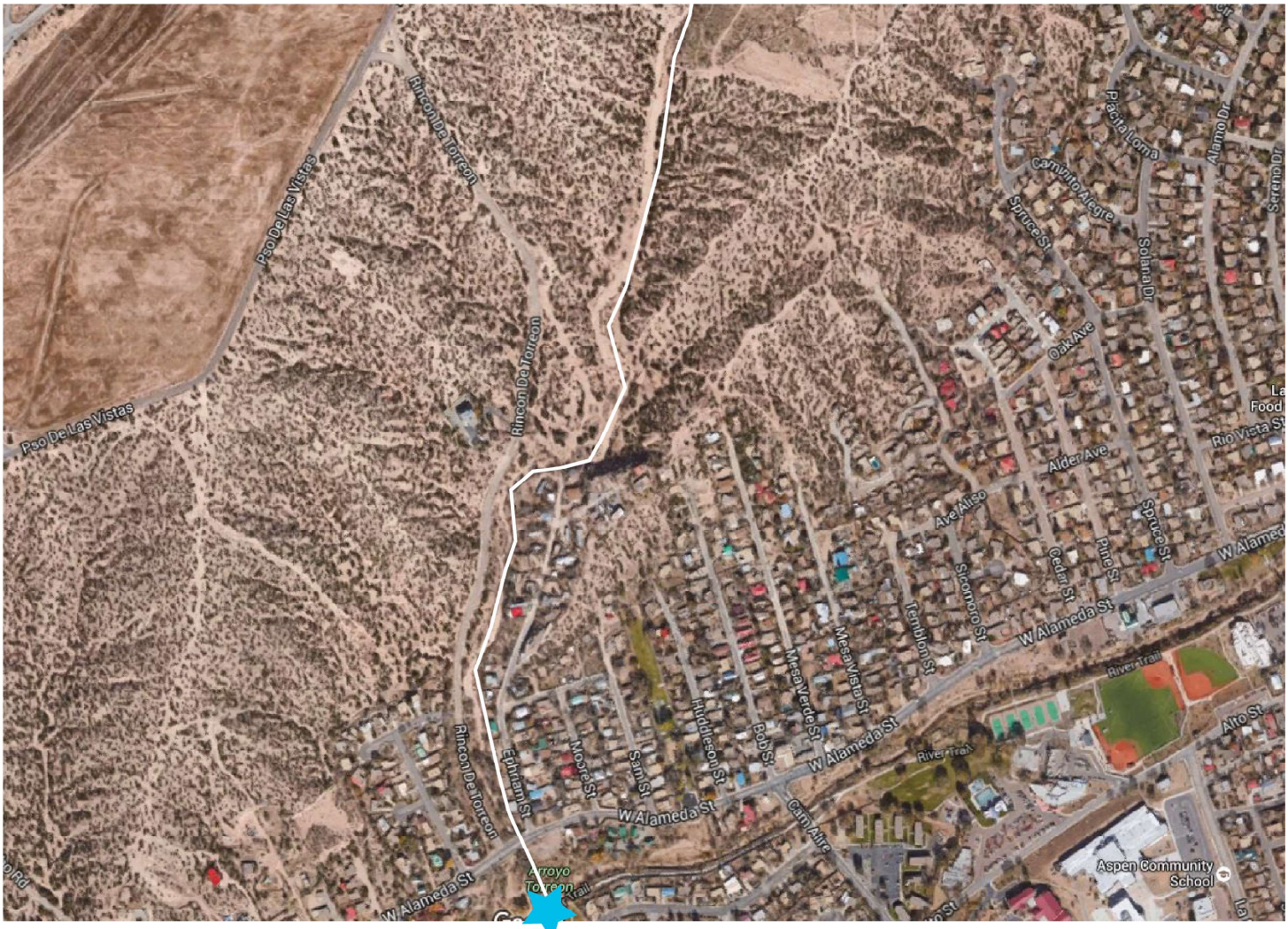
Detail of sewage outlet next to incised bank, Arroyo Nopal, 2016

Example of storm water bypassing upper catchment basin as it enters the lower basin, Arroyo Nopal, 2016.

Example of incision created by run off, Arroyo Nopal, 2016.


Aerial map of Arroyo Nopal describing the direction of water flow, catch basin locations and road locations. 2016

Arroyo Torreon Map 1




Arroyo Torreon Map 2

River connection

# XIV. Arroyo Torreon-East of Buckman Road - Santa Fe River

Valuable for recreation and wildlife corridor.

**Segment A.** Upstream from Buckman Road to Camino de las Crucitas

**Notes:** Piñon / juniper vegetation anchors Arroyo Torreon's upper two branches which begin south of Camino de los Montoyas, wind through heavy clay soils and join together at Buckman Road to create the main channel. The upper branches of Arroyo Torreon are deeply incised and narrow. Approximately 1.5 miles later, the arroyo ends at the Santa Fe River upstream from Frenchy's Field Park.

Segment A/Example of one of many trash sites in Arroyo Torreon, 2016.

Segment A/ Upper Arroyo Torreon, 2016.

Segment A/Silt trapped in culvert, Arroyo Torreon, 2016.

**Segment B.** Camino de las Crucitas to Santa Fe River

After the branches meet above Paseo de las Vistas Road, then the arroyo passes beneath the road and transitions to an engineered channel which has been lined with concrete and retaining walls built from tires and adobe. Beyond this man made channel the Arroyo Torreon begins to slowly widen into a sandy meandering channel which broadens until it arrives at the base of a steep hill. Evidence of damage to the arroyo banks caused by erosion is common as the arroyo nears the river.

Segment B/Two views of engineered walls made of tire and adobe with undercutting, Arroyo Torreon, 2016.

Segment B/Arroyo character below engineered channel, Arroyo Torreon, 2016.

Segment B/Collapsing debris from steep bank, Arroyo Torreon, 2016.

Segment B/Collapsing bank against Rincon de Torreon, Arroyo Torreon, 2016.

Segment B/Collapsing gabion and bank collapse (far right), Arroyo Torreon, 2016.


# Arroyo Chaparral Map 1

Chamisos

Chaparral

Medio connection

# XV. Arroyo Chaparral

**Valuable for recreation, wildlife corridor, teaching model,**

**Segment A.** Old Pecos Trail – Galisteo Rd.

**Notes**: Arroyo Chaparral is the lower extension of Arroyo en Medio. Several bridges cross the upper reach of segment A. A sandy, wide, shallow channel disappears through a culvert beneath Galisteo Rd. Damage to infrastructure and the channel bed from erosion is not significant in this area. However, significant amounts of trash have accumulated in the area from transient homes and passing traffic.

Segment A/Rip rap below culvert, Arroyo Chaparral, 2016.

**Segment B.** Galisteo Rd. - Esplendor St.

The arroyo below the culvert narrows to the width of an ATV track. The narrow sandy channel of the arroyo is enjoyed by locals since it provides easy access by foot to an elementary school, the Santa Fe Rail Trail, and green space along its banks. Impacts from erosion to both the channel and infrastructure are common to this area. Long intervals of vertical walls rising to approximately seven feet appear along north facing banks above the arroyo bed. Infrastructure such as check dams, rip rap and gabion walls are losing supportive soils.

Segment B/ View of upper arroyo with bank deterioration, Arroyo Chaparral ,2016.


Segment B/ Bank deterioration at check dam, Arroyo Chaparral ,2016.

Segment B/ Bank deterioration at gabion wall check dam, Arroyo Chaparral ,2016

**Segment C.** Esplendor St – Arroyo Chamisos

A sudden drop in arroyo bed elevation (head cut) near Chaparral Elementary School has caused storm water to undermine the soil from beneath rip rap and gabion structures placed to protect the arroyo bank and a nearby sewer line should be marked as a high priority area. Raw sewage was found leaking into the bed of the arroyo from this sewage outlet. Past this severely damaged infrastructure the arroyo passes through a highly incised canyon like segment until it flows beneath W. Zia Rd. into the Arroyo de los Chamisos.

**Segment B/ Erosion below sewer outlet, Arroyo Chaparral,2016**.

Segment B/ Leaking sewage outlet, Arroyo Chaparral, 2016

Segment B/ View of banks below leaking sewage outlet, Arroyo Chaparral, 2016

# Arroyo Documentation

| | | | | | |
|---|---|---|---|---|---|
| **Arroyo Name**: | Arroyo De Los Chamisos | Infrastructure Damage/Risk Avg : | **1.2** | Date: | 4/5/2016 |
| **Arroyo Segment:** | C | Channel Character/Drainage Avg: | **1.6** | Surveyed by: | KJK TN |
| **Start point:** | Conejo Road | | | | |
| **End point:** | St. Francis Drive | | | | |

| | INFRASTRUCTURE RISKS | | | | | | |
|---|---|---|---|---|---|---|---|
| **Trail point** | **Trail Deterioration** | **Bank Deterioration** | **Damaged/ Restricted Culverts** | **Foot/Bicycle Bridge** | **Vehicle Bridge** | **Endangered Utilities** | **Overall Score** |
| **C1**[1] | | | | | | 1 | **0.9** |
| **C2**[2] | | 1.5 | | | | | **1.4** |
| **C3** | | | | | | | **NA** |
| **C4**[3] | | | | | | 3 | **2.9** |
| **C5** | | | | | | 1.5 | **NA** |
| **C5b**[4] | | 1 | | | | | **0.9** |
| **C6** | | 1.5 | | | | | **1.4** |
| **C7** | | | | | | | **NA** |
| **C8**[5] | | | | | | | **NA** |
| **C9** | | 2 | | | | | **1.9** |
| **C10** | | | | | | | **NA** |
| **C11** | | | | | 1 | | **0.9** |

Graded Scoring System A=4 B=3 C=2 D=1

## Arroyo Documentation

| | CHANNEL CHARACTERISTICS | | | | | | |
|---|---|---|---|---|---|---|---|
| | Incised channel | Incised + braided | Constricted | Collapsed Banks | Vertical Banks | Rip Rap | Overall Score |
| **C1** | | | | | | | **NA** |
| **C2** | | | | 2 | | 1.5 | **1.5** |
| **C3** | 2 | | 1.5 | | | 3 | **1.7** |
| **C4** | | | 2.5 | | | 2.5 | **2.2** |
| **C5** | | | 2 | | | 3 | **2.2** |
| **C5b** | | | 2 | 2 | 1.5 | | **1.4** |
| **C6** | | | 2.5 | | 1.5 | | **1.7** |
| **C7** | | | | | 1.5 | | **1.4** |
| **C8** | | | | | 1.5 | | **1.4** |
| **C9** | | | | | | | **NA** |
| **C10** | | | | | | 1 | **0.9** |
| **C11** | | | | | | | **NA** |

Graded Scoring System A=4 B=3 C=2 D=1

# Arroyo Documentation

| | | | | | |
|---|---|---|---|---|---|
| **Arroyo Name**: | Arroyo De Los Chamisos | Infrastructure Damage/Risk Avg: | **1.4** | Date: | 4/5/2016 |
| **Arroyo Segment:** | D | Channel Character/Drainage Avg: | **0.8** | Surveyed by: | KJK TN |
| **Start point:** | South St. Francis Drive | | | | |
| **End point:** | Yucca Street | | | | |

**INFRASTRUCTURE RISKS**

| Trail point | Trail Deterioration | Bank Deterioration | Damaged/ Restricted Culverts | Foot/Bicycle Bridge | Vehicle Bridge | Endangered Utilities | Overall Score |
|---|---|---|---|---|---|---|---|
| **D1** | | 1 | | | | | **0.9** |
| **D2** | | 1 | | | | | **0.9** |
| **D3**[6] | | 1 | | | | | **0.9** |
| **D4**[7] | | | | | 3.5 | | **3.4** |
| **D5**[8] | | | | | 3 | | **2.9** |
| **D6**[9] | | 1 | | | | | **0.9** |
| **D7**[10] | | 1 | | | | | **0.9** |
| **D8**[11] | | | 2 | | | | **1.9** |
| **D9**[12] | | 1.5 | | | | | **1.4** |
| **D10**[13] | | | | | | 1 | **0.9** |
| **D11**[14] | | 1 | | | 2.5 | | **1.5** |
| **D12**[15] | | 1 | | | 1 | 1 | **0.5** |
| **D13**[16] | | | 1 | | | | **0.9** |
| **D14** | | 1 | | | | 1 | **0.7** |

Graded Scoring System A=4 B=3 C=2 D=1

## Arroyo Documentation

| | CHANNEL CHARACTERISTICS | | | | | | |
|---|---|---|---|---|---|---|---|
| | Incised channel | Incised + braided | Constricted | Collapsed Banks | Vertical Banks | Rip Rap | Overall Score |
| **D1**[17] | 1 | | 1.5 | 2 | | 1 | **0.8** |
| **D2** | 1 | | 1.5 | 1.5 | | 1 | **0.6** |
| **D3** | | | | 2 | | | **1.9** |
| **D4** | | | | | | | **NA** |
| **D5** | | | | | | 1 | **0.9** |
| **D6** | 1 | | 1 | | | 1 | **0.5** |
| **D7** | 1 | | 1 | | | 1 | **0.5** |
| **D8** | | | | | | | **NA** |
| **D9** | | | | | | | **NA** |
| **D10** | | | | | | | **NA** |
| **D11** | | | | | | | **NA** |
| **D12** | | | | | | | **NA** |
| **D13** | | | | | | 1 | **0.9** |
| **D14**[18] | 1 | | 1.5 | 2 | | | **1** |

Graded Scoring System A=4 B=3 C=2 D=1

# Arroyo Documentation

| | | | | | |
|---|---|---|---|---|---|
| **Arroyo Name**: | Arroyo De Los Chamisos | Infrastructure Damage/Risk Avg: | **2.4** | Date: | 4/5/2016 |
| **Arroyo Segment:** | E | Channel Character/Drainage Avg: | **1.7** | Surveyed by: | KJK JJ |
| **Start point:** | Yucca Street | | | | |
| **End point:** | Camino Carlos Rey | | | | |

**INFRASTRUCTURE RISKS**

| Trail point | Trail Deterioration | Bank Deterioration | Damaged/ Restricted Culverts | Foot/Bicycle Bridge | Vehicle Bridge | Endangered Utilities | Overall Score |
|---|---|---|---|---|---|---|---|
| **E1** | | 2.5 | | | | | **2.4** |
| **E2** | | | | | | | **NA** |
| **E3**[19] | | 2 | | | | | **NA** |

**CHANNEL CHARACTERISTICS**

| | Incised channel | Incised + braided | Constricted | Collapsed Banks | Vertical Banks | Rip Rap | Overall Score |
|---|---|---|---|---|---|---|---|
| **E1**[20] | | | 2 | | 2.5 | | **2** |
| **E2**[21] | | | 1 | | 1 | 1.5 | **0.7** |
| **E3** | | | 2.5 | | | | **2.4** |

Graded Scoring System A=4 B=3 C=2 D=1

# Arroyo Documentation

| | | | | | |
|---|---|---|---|---|---|
| **Arroyo Name**: | Arroyo De Los Chamisos | Infrastructure Damage/Risk : | **1.72** | Date: | 4/5/2016 |
| **Arroyo Segment:** | F | Channel Character/Drainage: | **1** | Surveyed by: | KJK JJ |
| **Start point:** | Camino Carlos Rey | | | | |
| **End point:** | Ave de Las Campanas | | | | |

**INFRASTRUCTURE RISKS**

| Trail point | Trail Deterioration | Bank Deterioration | Damaged/ Restricted Culverts | Foot/Bicycle Bridge | Vehicle Bridge | Endangered Utilities | Overall Score |
|---|---|---|---|---|---|---|---|
| **F1**[22] | | | | | | | **NA** |
| **F2**[23] | | | 3 | | | | **2.9** |
| **F3**[24] | | | 1 | | | | **0.9** |
| **F4**[25] | | 1 | | | | | **0.9** |
| **F5** | | | | | 3 | | **2.9** |
| **F6** | | 1 | | | 1.5 | | **1** |

**CHANNEL CHARACTERISTICS**

| | Incised channel | Incised + braided | Constricted | Collapsed Banks | Vertical Banks | Rip Rap | Overall Score |
|---|---|---|---|---|---|---|---|
| **F1** | 1 | | 2 | | | | **1.2** |
| **F2** | | | | | | | **NA** |
| **F3** | | | | | | | **NA** |
| **F4** | | | | 1 | | | **NA** |
| **F5** | | | | | 1 | | **0.9** |
| **F6**[26] | | | 1 | | | | **0.9** |

Graded Scoring System A=4 B=3 C=2 D=1

# Arroyo Documentation

| | | | | | |
|---|---|---|---|---|---|
| **Arroyo Name**: | Arroyo De Los Chamisos | Infrastructure Damage/Risk Avg : | **1.7** | Date: | 4/5/2016 |
| **Arroyo Segment:** | G | Channel Character/Drainage Avg: | **1.3** | Surveyed by: | KJK JJ |
| **Start point:** | Ave de Las Campanas | | | | |
| **End point:** | Rodeo Road | | | | |

**INFRASTRUCTURE RISKS**

| Trail point | Trail Deterioration | Bank Deterioration | Damaged/ Restricted Culverts | Foot/Bicycle Bridge | Vehicle Bridge | Endangered Utilities | Overall Score |
|---|---|---|---|---|---|---|---|
| G1[27] | | | | | | 1 | **0.9** |
| G2[28] | | 2 | 1.5 | | | | **1.5** |
| G3[29] | | 2 | | | | 1 | **1.2** |
| G4[30] | | 1 | | | | | **0.9** |
| G5 | | | | | | | **NA** |
| G6[31] | | | 3.5 | | | | **3.4** |
| G7 | | 2.5 | | | | | **2.4** |

**CHANNEL CHARACTERISTICS**

| | Incised channel | Incised + braided | Constricted | Collapsed Banks | Vertical Banks | Rip Rap | Overall Score |
|---|---|---|---|---|---|---|---|
| G1 | | | | | | | **NA** |
| G2 | | | | | | | **NA** |
| G3 | | | | 1 | | | **0.9** |
| G4 | | | | 1 | 1 | | **0.7** |
| G5[32] | | | | 1 | 1 | | **0.7** |
| G6 | | | | | | | **NA** |
| G7[33] | | | 2.5 | | | 3.5 | **2.7** |

Graded Scoring System A=4 B=3 C=2 D=1

# Arroyo Documentation

| | | | | | |
|---|---|---|---|---|---|
| **Arroyo Name**: | Arroyo De Los Chamisos | Infrastructure Damage/Risk Avg : | **1.4** | Date: | 3/25/2016 |
| **Arroyo Segment:** | H | Channel Character/Drainage Avg: | **1.9** | Surveyed by: | KJK TN |
| **Start point:** | Rodeo Road | | | | |
| **End point:** | Governor Miles | | | | |

## INFRASTRUCTURE RISKS

| Trail point | Trail Deterioration | Bank Deterioration | Damaged/ Restricted Culverts | Foot/Bicycle Bridge | Vehicle Bridge | Endangered Utilities | Overall Score |
|---|---|---|---|---|---|---|---|
| **H1**[34] | | 1 | | | | | **0.9** |
| **H2**[35] | | 1 | | | | | **0.9** |
| **H3**[36] | | 1 | | 3 | | | **NA** |
| **H4** | | | 2.5 | | | | **2.4** |
| **H5** | 3 | | | | | | **NA** |

## CHANNEL CHARACTERISTICS

| | Incised channel | Incised + braided | Constricted | Collapsed Banks | Vertical Banks | Rip Rap | Overall Score |
|---|---|---|---|---|---|---|---|
| **H1** | | | | | | | **NA** |
| **H2** | | | | | | | **NA** |
| **H3** | | | | | | | **NA** |
| **H4** | | | | | | | **NA** |
| **H5**[37] | | | | | | 2 | **1.9** |

Graded Scoring System A=4 B=3 C=2 D=1

# Arroyo Documentation

1 Photo point at exposed utility. Second point at Utility pole
2 Sewer located by vertical bank.
3 Utility encasement exposed.
4 Bank erosion/ private property impacted.
5 Active erosion.
6 Bridge in poor condition
7 Bank of arroyo acts as temporary buffer for SFHS bridge.
8 Minor erosion at bridge support. Buttress protected by arroyo bank.
9 Illustration of bank erosion at road level/ erosion removes soil away from buttress.
10 Corridor of vertical banks and parallel to bike trail.15ft + plunge from trail to arroyo bed.
11 15ft + vertical walls with ONLY 6 ft. margin for operator error: DANGER
12 Bent culvert
13 New addition added to retaining wall is unstable / erosion on bank
14 East side/ upstream/ erosion at Votech bridge buttress
15 East side/ upstream/ erosion at Votech bridge buttress
16 point recorded btwn 2 west side bridge buttresses extensive undercutting b water photo 1 ,2= trai side /photo 3,4=west buttress
17 Support structure of culvert exposed, supporting soil absent.
18 Start of deep canyon like corridor -End point D2
19 1=exposed utility 2=vertical walls by bike trail 3= severe erosion impact on arroyo by new source.
20 Impacts of erosion have increased since 2012.
21 Constriction in channel with fence eroding from bank.
22 Severe constriction in channel plus root ball obstructs channel/redirected water flow undercuts soil beneath rip rap.
23 Great location to capture water beneath culvert
24 Drainage pad severely damaged ; deflecting water
25 Active bank erosion - 150 yd.of vertical banks and tree uprooted
26 Constricted channel, check sediment levels
27 Exposed utility line; sewer outlet threatened by erosion; utility box endangered
28 Property line endangered by active erosion ; culvert threatened by high storm flow.
29 Active bank erosion; city irrigation system dislodged from bank.
30 Private property endangered by active bank erosion.
31 Possible location for storm water catchment basin.
32 Vertical banks appear
33 Point illustrates water events undercutting 1-2ft below rip rap rap

Graded Scoring System A=4 B=3 C=2 D=1

## Arroyo Documentation

34 Storm water from neighboring curb cut  drains into arroyo, incising the bank.
35 Erosion caused by secondary storm water drainage/ Check dam out of service/  bypassed check da
dam
36 Bridge footing was not exposed in 2012.
37 Exposed and undercut rip rap alongside trail.

ARROYO ASSESSMENT

| | | | | | |
|---|---|---|---|---|---|
| **Arroyo Name**: | Arroyo Rosario | Infrastructure Damage/Risk Avg: | **1** | Date: | 12/4/2015 |
| **Arroyo Segment:** | A | Channel Character/Drainage Avg: | **1.7** | Surveyed by: | KJK |
| **Start point:** | Below HWY 285-S | | | | |
| **End point:** | 373 Calle Loma Norte | | | | |

**INFRASTRUCTURE RISKS**

| Trail point | Trail Deterioration | Bank Deterioration | Damaged/ Restricted Culverts | Foot/Bicycle Bridge | Vehicle Bridge | Endangered Utilities | Overall Score |
|---|---|---|---|---|---|---|---|
| **A1**[1] | | | 1 | | | | **0.9** |
| **A2** | | | | | | | **NA** |
| **A3** | | | | | | | **NA** |
| **A4** | | 1 | | | | | **0.9** |
| **A5** | | 1 | | | | | **0.9** |
| **A6** | | 1 | | | | | **0.9** |
| **A7** | | 1.5 | | | | | **1.4** |

**CHANNEL CHARACTERISTICS**

| | Incised channel | Incised + braided | Constricted | Collapsed Banks | Vertical Banks | Rip Rap | Overall Score |
|---|---|---|---|---|---|---|---|
| **A1** | | | 4 | | | | **3.9** |
| **A2**[2] | | | | | | 1 | **0.9** |
| **A3**[3] | 3.5 | | 2 | | | | **2.5** |
| **A4** | 1 | | 2 | 1.5 | 1.5 | | **0.9** |
| **A5** | 2 | | 2.5 | | 2 | 2 | **1.5** |
| **A6**[4] | | | | 1 | 1 | | **0.7** |
| **A7**[5] | | | | 1.5 | 1.5 | | **1.5** |

Graded Scoring System A=4 B=3 C=2 D=1

ARROYO ASSESSMENT

| | | | | | | |
|---|---|---|---|---|---|---|
| **Arroyo Name**: | Arroyo Rosario | Infrastructure Damage/Risk Avg : | **2.4** | Date: | 12/4/2016 | |
| **Arroyo Segment:** | B | Channel Character/Drainage Avg: | **2.4** | Surveyed By: | KJK | |
| **Start point:** | 373 Calle Loma Norte | | | | | |
| **End point:** | 388 Calle Loma Norte | | | | | |

**INFRASTRUCTURE RISKS**

| Trail point | Trail Deterioration | Bank Deterioration | Damaged/ Restricted Culverts | Foot/Bicycle Bridge | Vehicle Bridge | Endangered Utilities | Overall Score |
|---|---|---|---|---|---|---|---|
| **B1** | | 2.5 | | | | | **2.4** |

**CHANNEL CHARACTERISTICS**

| | Incised channel | Incised + braided | Constricted | Collapsed Banks | Vertical Banks | Rip Rap | Overall Score |
|---|---|---|---|---|---|---|---|
| **B1**[6] | | | | | 2.5 | | **2.4** |

| | | | | | | |
|---|---|---|---|---|---|---|
| **Arroyo Name**: | Arroyo Rosario | Infrastructure Damage/Risk Avg : | **NA** | Date: | 12/4/2016 | |
| **Arroyo Segment:** | C | Channel Character/Drainage Avg: | **0.9** | Surveyed by: | KJK REJ | |
| **Start point:** | 388 Calle Loma Norte | | | | | |
| **End point:** | Los Arboles | | | | | |

**INFRASTRUCTURE RISKS**

| Trail point | Trail Deterioration | Bank Deterioration | Damaged/ Restricted Culverts | Foot/Bicycle Bridge | Vehicle Bridge | Endangered Utilities | Overall Score |
|---|---|---|---|---|---|---|---|
| **C1** | | | | | | | **NA** |

**CHANNEL CHARACTERISTICS**

| | Incised channel | Incised + braided | Constricted | Collapsed Banks | Vertical Banks | Rip Rap | Overall Score |
|---|---|---|---|---|---|---|---|
| **C1**[7] | 1 | | | | | | **0.9** |

Graded Scoring System A=4 B=3 C=2 D=1

ARROYO ASSESSMENT

| | | | | | |
|---|---|---|---|---|---|
| **Arroyo Name**: | Arroyo Rosario | Infrastructure Damage/Risk Avg : | **2.2** | Date: | 12/4/2016 |
| **Arroyo Segment:** | D | Channel Character/Drainage Avg: | **1.4** | Surveyed by: | KJK |
| **Start point:** | Los Arboles | | | | |
| **End point:** | Rio Grand Street | | | | |

**INFRASTRUCTURE RISKS**

| Trail point | Trail Deterioration | Bank Deterioration | Damaged/ Restricted Culverts | Foot/Bicycle Bridge | Vehicle Bridge | Endangered Utilities | Overall Score |
|---|---|---|---|---|---|---|---|
| D1[8] | | 1.5 | | | | | **1.4** |
| D2[9] | | | 3 | | | | **2.9** |

**CHANNEL CHARACTERISTICS**

| | Incised channel | Incised + braided | Constricted | Collapsed Banks | Vertical Banks | Rip Rap | Overall Score |
|---|---|---|---|---|---|---|---|
| D1 | | | | | 1.5 | | **1.4** |
| D2 | | | | | | | **NA** |

Graded Scoring System A=4 B=3 C=2 D=1

ARROYO ASSESSMENT

| | | | | | |
|---|---|---|---|---|---|
| **Arroyo Name**: | Arroyo Rosario | Infrastructure Damage/Risk Avg: | **2** | Date: | 12/4/2016 |
| **Arroyo Segment:** | E | Channel Character/Drainage Avg: | **2** | Surveyed by: | KJK |
| **Start point:** | Rio Grand Street | | | | |
| **End point:** | Paseo de Peralta | | | | |

**INFRASTRUCTURE RISKS**

| Trail point | Trail Deterioration | Bank Deterioration | Damaged/ Restricted Culverts | Foot/Bicycle Bridge | Vehicle Bridge | Endangered Utilities | Overall Score |
|---|---|---|---|---|---|---|---|
| **E1** | | | | | | | **NA** |
| **E2** | | | 1 | | | | **NA** |
| **E3**[10] | | | 1 | | | | **NA** |
| **E4** | | 1.5 | 3 | | | | **2** |
| **E5**[11] | | | | | | 1 | **0.9** |
| **E6** | | | 3 | | | | **2.9** |
| **E7** | | 2.5 | 2.5 | | | | **2.2** |

**CHANNEL CHARACTERISTICS**

| | Incised channel | Incised + braided | Constricted | Collapsed Banks | Vertical Banks | Rip Rap | Overall Score |
|---|---|---|---|---|---|---|---|
| **E1** | | | | | | | **NA** |
| **E21**[12] | | | | | | 3 | **2.9** |
| **E3** | | | | | | | **NA** |
| **E4** | | | | | | | **NA** |
| **E5** | | | | | | | **NA** |
| **E6** | | | | | | | **NA** |
| **E7**[13] | | | | | | 1 | **1** |

Graded Scoring System A=4 B=3 C=2 D=1

ARROYO ASSESSMENT

FOOTHILLS

1 Arroyo assessment starts at culvert outlet
2 Rip rap perimeter eroded , 2.5 ft. No structural settling.
3 Channel constricted not incised.
4 Collapsed banks ,tree dam /possible water backup and lead to future bank erosion.
5 Collapsed banks and fallen trees will create dams.
6 Cemetery retaining wall behind vertical walls
7 Culverts fine high erosion impact/ rain garden possible location
8 Hard right turn.
9 No change in culverts since 2012
10 Box culvert filled with sediment approximately 2.5 ft. head space left .
11 Possibly gas line locator
12 Rip rap to left of culvert deteriorated
13 Behind recent concrete culvert: foot traffic impacts soil stability arround poured footing

Graded Scoring System A=4 B=3 C=2 D=1

# Arroyo Documentation

| | | | | | |
|---|---|---|---|---|---|
| **Arroyo Name**: | Arroyo Saiz | Infrastructure Damage/Risk Avg : | **1.7** | Date: | 4/5/2016 |
| **Arroyo Segment:** | A | Channel Character/Drainage Avg: | **1** | Surveyed by: | KJK TR |
| **Start point:** | Hyde Park Rd. / Gonzalez Rd. | | | | |
| **End point:** | Santa Fe River | | | | |

**INFRASTRUCTURE RISKS**

| Trail point | Trail Deterioration | Bank Deterioration | Damaged/ Restricted Culverts | Foot/Bicycle Bridge | Vehicle Bridge | Endangered Utilities | Overall Score |
|---|---|---|---|---|---|---|---|
| **A1**[1] | | 2 | | | | | **1.9** |
| **A2**[2] | | 1.5 | | | | | **1.4** |
| **A3**[3] | | | | | | | **NA** |
| **A4** | | | | | | | **NA** |
| **A5** | | | 1 | | | | **NA** |
| **A6**[4] | | 2 | | | | | **1.9** |

**CHANNEL CHARACTERISTICS**

| | Incised channel | Incised + braided | Constricted | Collapsed Banks | Vertical Banks | Rip Rap | Overall Score |
|---|---|---|---|---|---|---|---|
| **A1** | | | | | | | **NA** |
| **A2** | | | | | | | **NA** |
| **A3** | | | | | | | **NA** |
| **A4**[5] | 1.5 | | 2 | | 1 | | **1** |
| **A5** | | | | | | | **NA** |
| **A6** | | | 1 | | | | **0.9** |

Graded Scoring System A=4 B=3 C=2 D=1

# Arroyo Documentation

FOOTNOTES

1 Bank adjacent to Hyde Park Rd.
2 Erosion impact on arroyo adjacent to Hyde park road ~ 7 feet from bank to shoulder
3 Erosion impact on arroyo adjacent to Hyde park road ~ 7 feet from bank to shoulder
4 Erosion adjacent to shoulder of bank
5 Incised and constricted area starts below earth works rain garden.

# Arroyo Documentation

| | | | | | |
|---|---|---|---|---|---|
| **Arroyo Name**: | Arroyo Mora | Infrastructure Damage/Risk Avg : | **NA** | Date: | 3/29/2016 |
| **Arroyo Segment:** | A | Channel Character/Drainage Avg: | **1.9** | Surveyed by: | KJK REJ |
| **Start point:** | South of Calle Militar | | | | |
| **End point:** | Santa Fe River | | | | |

**INFRASTRUCTURE RISKS**

| Trail point | Trail Deterioration | Bank Deterioration | Damaged/ Restricted Culverts | Foot/Bicycle Bridge | Vehicle Bridge | Endangered Utilities | Overall Score |
|---|---|---|---|---|---|---|---|
| **A1** | | | | | | | **NA** |

**CHANNEL CHARACTERISTICS**

| | Incised channel | Incised + braided | Constricted | Collapsed Banks | Vertical Banks | Rip Rap | Overall Score |
|---|---|---|---|---|---|---|---|
| **A1** | | | 2 | | | | **1.9** |

Graded Scoring System A=4 B=3 C=2 D=1

# Arroyo Documentation

| | | | | | |
|---|---|---|---|---|---|
| **Arroyo Name**: | Arroyo Cabra | Infrasructure Damage/Risk Avg : | **NA** | Date: | 3/29/2016 |
| **Arroyo Segment:** | A | Channel Character/Drainage Avg: | **1.9** | Surveyed by: | KJK REJ |
| **Start point:** | Apodaca Hill | | | | |
| **End point:** | Santa Fe River | | | | |

**INFRASTRUCTURE RISKS**

| Trail point | Trail Deterioration | Bank Deterioration | Damaged/ Restricted Culverts | Foot/Bicycle Bridge | Vehicle Bridge | Endangered Utilities | Overall Score |
|---|---|---|---|---|---|---|---|
| **A1** | | | | | | | **NA** |

**CHANNEL CHARACTERISTICS**

| | Incised channel | Incised + braided | Constricted | Collapsed Banks | Vertical Banks | Rip Rap | Overall Score |
|---|---|---|---|---|---|---|---|
| **A1** | 3 | | 2 | | | 2 | **1.9** |

[1] Rip rap deteriorating; supporting soil absent

Graded Scoring System A=4 B=3 C=2 D=1

# Arroyo Documentation

| | | | | | |
|---|---|---|---|---|---|
| **Arroyo Name**: | Arroyo en Medio | Infrastructure Damage/Risk Avg : | **1.4** | Date: | 3/31/2016 |
| **Arroyo Segment:** | A | Channel Character/Drainage Avg: | **1.3** | Surveyed by: | KJK REJ |
| **Start point:** | Old Santa Fe Trail Bridge | | | | |
| **End point:** | Arroyo Chamisos at Yucca Street | | | | |

**INFRASTRUCTURE RISKS**

| Trail point | Trail Deterioration | Bank Deterioration | Damaged/ Restricted Culverts | Foot/Bicycle Bridge | Vehicle Bridge | Endangered Utilities | Overall Score |
|---|---|---|---|---|---|---|---|
| **A1** | | 3 | | | | | **2.9** |
| **A2** | | 1.5 | | | | | **1.4** |
| **A3** | | | | | | 1 | **0.9** |
| **A4a** | | | | | | 1 | **0.6** |
| **A4b** | | | | | | | **NA** |
| **A4c** | | | 1 | | | | **0.9** |
| **A4d**[1] | | 1 | | | | | **0.9** |
| **A4g** | | | 1 | | | | **0.9** |
| **A5** | | 1.5 | | | | | **1.4** |
| **A6**[2] | | | | | | | **NA** |
| **A7**[3] | | | | | | | **NA** |
| **A8**[4] | | | | | | | **NA** |
| **A9** | | | | | | 1 | **0.9** |
| **A10** | | | | | | | **NA** |
| **A11** | | | | | | | **NA** |
| **A12** | | 3 | | | | | **2.9** |

Graded Scoring System A=4 B=3 C=2 D=1

## Arroyo Documentation

| | CHANNEL CHARACTERISTICS | | | | | | |
|---|---|---|---|---|---|---|---|
| | Incised channel | Incised + braided | Constricted | Collapsed Banks | Vertical Banks | Rip Rap | Overall Score |
| **A1** | | | | | | 2 | **1.9** |
| **A2**[5] | 2 | | | | | 2 | **1.7** |
| **A3** | | | | | | | **NA** |
| **A4a** | | | | | | | **NA** |
| **A4b** | | | | | | 1 | **0.9** |
| **A4c** | | | | | | | **NA** |
| **A4d** | | | | | | | **NA** |
| **A4e** | 1 | | | | 1 | | **0.7** |
| **A4g** | 1 | | | | | 1 | **0.7** |
| **A5** | | | | | | 1.5 | **1.4** |
| **A6** | | | | | | | **NA** |
| **A7** | | | | | | | **NA** |
| **A8** | | | | | | | **NA** |
| **A9** | | | | | | | **NA** |
| **A10** | | | | | | 2.5 | **2.4** |
| **A11**[6] | | | | | | 1 | **0.9** |
| **A12** | | | | | | | **NA** |

Graded Scoring System A=4 B=3 C=2 D=1

# Arroyo Documentation

FOOTNOTES

1 Endangered infrastructure

2 Questionable fence built across arroyo

3 Questionable culvert

4 Questionable culvert

5 Adjacent channel bypassing rip rap which is undercut.

6 Rip rap mat gone.

# Arroyo Documentation

| | | | | | |
|---|---|---|---|---|---|
| **Arroyo Name**: | Arroyo Ancha | Infrasructure Damage/Risk Avg : | **0.9** | Date: | 4/14/2016 |
| **Arroyo Segment:** | A | Channel Character/Drainage Avg: | **NA** | Surveyed by: | KJK REJ |
| **Start point:** | 200 feet below Ten Thousand Waves on Hyde Park Rd | | | | |
| **End point:** | Cañada Sur | | | | |

**INFRASTRUCTURE RISKS**

| Trail point | Trail Deterioration | Bank Deterioration | Damaged/ Restricted Culverts | Foot/Bicycle Bridge | Vehicle Bridge | Endangered Utilities | Overall Score |
|---|---|---|---|---|---|---|---|
| **A1** | | | | | | | **NA** |
| **A2** | | 1 | | | | | **0.9** |
| **A3** | | 1 | | | | | **0.9** |

**CHANNEL CHARACTERISTICS**

| | Incised channel | Incised + braided | Constricted | Collapsed Banks | Vertical Banks | Rip Rap | Overall Score |
|---|---|---|---|---|---|---|---|
| **A1** | | | | | | | **NA** |
| **A2** | | | | | | | **NA** |
| **A3** | | | | | | | **NA** |

**Graded Scoring System A=4 B=3 C=2 D=1**

# Arroyo Documentation

| | | | | | |
|---|---|---|---|---|---|
| **Arroyo Name**: | Arroyo Ancha | Infrasructure Damage/Risk Avg: | **1.2** | Date: | 4/14/2016 |
| **Arroyo Segment:** | B | Channel Character/Drainage Avg: | **0.3** | Surveyed by: | KJK REJ |
| **Start point:** | Cañada Sur | | | | |
| **End point:** | Santa Fe River | | | | |

## INFRASTRUCTURE RISKS

| Trail point | Trail Deterioration | Bank Deterioration | Damaged/ Restricted Culverts | Foot/Bicycle Bridge | Vehicle Bridge | Endangered Utilities | Overall Score |
|---|---|---|---|---|---|---|---|
| **B1** | | | | | | | **NA** |
| **B2** | 2.5 | | | | 1 | | **1.5** |
| **B3** | | | | | 1 | | **0.9** |
| **B4** | 2.5 | | | | 1 | | **1.5** |
| **B5** | | | | | 2 | | **1.9** |
| **B6** | | 1.5 | | | | | **1.4** |

## CHANNEL CHARACTERISTICS

| | Incised channel | Incised + braided | Constricted | Collapsed Banks | Vertical Banks | Rip Rap | Overall Score |
|---|---|---|---|---|---|---|---|
| **B1** | | | | | 1.5 | 1 | **1** |
| **B2** | | | | | | | **NA** |
| **B3** | | | | | | | **NA** |
| **B4** | | | | | | | **NA** |
| **B5** | | | | | | | **NA** |
| **B6** | | | | | | | **NA** |

**Graded Scoring System A=4 B=3 C=2 D=1**

# Arroyo Documentation

| | | | |
|---|---|---|---|
| **Arroyo Name**: | Arroyo Ancha | Date: | 4/14/2016 |
| **Arroyo Segment:** | B continued | Surveyed by: | KJK REJ |
| **Start point:** | | | |
| **End point:** | Santa Fe River | | |

**INFRASTRUCTURE RISKS**

| Trail point | Trail Deterioration | Bank Deterioration | Damaged/ Restricted Culverts | Foot/Bicycle Bridge | Vehicle Bridge | Endangered Utilities | Overall Score |
|---|---|---|---|---|---|---|---|
| **B7** | | | | | | | **NA** |
| **B8** | | | | | | | **NA** |
| **B9** | 2.5 | | | | | | **2.4** |
| **B10** | | | | | 1.5 | | **1.1** |
| **B11** | | 1 | | | | | **0.9** |

**CHANNEL CHARACTERISTICS**

| | Incised channel | Incised + braided | Constricted | Collapsed Banks | Vertical Banks | Rip Rap | Overall Score |
|---|---|---|---|---|---|---|---|
| **B7** | | | | | | 1.5 | **1.4** |
| **B8** | | | | | | | **NA** |
| **B9** | | | | | | | **NA** |
| **B10** | | | | | | | **NA** |
| **B11** | | 1 | | | | | **0.9** |

**Graded Scoring System A=4 B=3 C=2 D=1**

# Arroyo Documentation

| | | | | | |
|---|---|---|---|---|---|
| **Arroyo Name**: | Arroyo Upper Pinos A | Infrastructure Damage/Risk Avg : | **NA** | Date: | 5/4/2016 |
| **Arroyo Segment:** | A | Channel Character/Drainage Avg: | **0.9** | Surveyed by: | KJK REJ |
| **Start point:** | Camino Corrales/Lejo | | | | |
| **End point:** | Galisteo Street | | | | |

**INFRASTRUCTURE RISKS**

| Trail point | Trail Deterioration | Bank Deterioration | Damaged/ Restricted Culverts | Foot/Bicycle Bridge | Vehicle Bridge | Endangered Utilities | Overall Score |
|---|---|---|---|---|---|---|---|
| **A1** | | | | | | | **NA** |

**CHANNEL CHARACTERISTICS**

| | Incised channel | Incised + braided | Constricted | Collapsed Banks | Vertical Banks | Rip Rap | Overall Score |
|---|---|---|---|---|---|---|---|
| **A1** | 1 | | | | | | **0.9** |

Graded Scoring System A=4 B=3 C=2 D=1

# Arroyo Documentation

| | | | | | |
|---|---|---|---|---|---|
| **Arroyo Name**: | Upper Pinos B | Infrastructure Damage/Risk Avg : | **2** | Date: | 5/4/2016 |
| **Arroyo Segment:** | A | Channel Character/Drainage Avg: | **1.1** | Surveyed by: | KJK REJ |
| **Start point:** | Camino Corrales/Lejano | | | | |
| **End point:** | Don Gaspar Street | | | | |

**INFRASTRUCTURE RISKS**

| Trail point | Trail Deterioration | Bank Deterioration | Damaged/ Restricted Culverts | Foot/Bicycle Bridge | Vehicle Bridge | Endangered Utilities | Overall Score |
|---|---|---|---|---|---|---|---|
| **A1**[1] | | 2 | | | | | **1.9** |
| **A2**[2] | | 1.5 | | | | | **1.4** |
| **A3** | | | 2.5 | | | | **2.4** |
| **A4** | | | 2.5 | | | | **2.4** |
| **A5** | | | | | | | **NA** |

**CHANNEL CHARACTERISTICS**

| | Incised channel | Incised + braided | Constricted | Collapsed Banks | Vertical Banks | Rip Rap | Overall Score |
|---|---|---|---|---|---|---|---|
| **A1** | | | | | | | **NA** |
| **A2** | | | | | 1.5 | | **1.4** |
| **A3** | | | | | | | **NA** |
| **A4** | | | 1 | | | | **0.9** |
| **A5** | | | | | | 1 | **0.9** |

Graded Scoring System A=4 B=3 C=2 D=1

# Arroyo Documentation

FOOTNOTES

1 Unauthorized road
2 Near shoulder of road

# Arroyo Documentation

| | | | | | |
|---|---|---|---|---|---|
| **Arroyo Name**: | Lower Pinos | Infrastructure Damage/Risk Avg : | **1.4** | Date: | 2/1/2016 |
| **Arroyo Segment:** | Ditch | Channel Character/Drainage Avg: | **1.8** | Surveyed by: | KJK JL |
| **Start point:** | St. Michaels | | | | |
| **End point:** | Siringo Road | | | | |

**INFRASTRUCTURE RISKS**

| Trail point | Trail Deterioration | Bank Deterioration | Damaged/ Restricted Culverts | Foot/Bicycle Bridge | Vehicle Bridge | Endangered Utilities | Overall Score |
|---|---|---|---|---|---|---|---|
| **A1** | | | 1 | | | | **0.9** |
| **A2** | | | 2 | | | | **1.9** |
| **A3** | | | | | | | **NA** |

**CHANNEL CHARACTERISTICS**

| | Incised channel | Incised + braided | Constricted | Collapsed Banks | Vertical Banks | Rip Rap | Overall Score |
|---|---|---|---|---|---|---|---|
| **A1** | | | | | | | **NA** |
| **A2** | | | 2 | | | 3 | **2.2** |
| **A3** | 1.5 | | | | | 1.5 | **1.2** |

Graded Scoring System A=4 B=3 C=2 D=1

# Arroyo Documentation

| | | | | | |
|---|---|---|---|---|---|
| **Arroyo Name**: | Lower Pinos | Infrasructure Damage/Risk Avg: | **2.3** | Date: | 1/28/2016 |
| **Arroyo Segment:** | B | Channel Character/Drainage Avg: | **2.5** | Surveyed by: | KJK JL |
| **Start point:** | St. Francis Drive | | | | |
| **End point:** | 6th Street | | | | |

**INFRASTRUCTURE RISKS**

| Trail point | Trail Deterioration | Bank Deterioration | Damaged/ Restricted Culverts | Foot/Bicycle Bridge | Vehicle Bridge | Endangered Utilities | Overall Score |
|---|---|---|---|---|---|---|---|
| **B1** | | 2.5 | | | | | **2.4** |
| **B2**[1] | | 2.5 | | | | | **2.4** |
| **B3**[2] | | 2 | | | | | **1.9** |
| **B4**[3] | | | | | | 2.5 | **2.4** |
| **B5**[4] | | 3 | | | | | **2.9** |
| **B6** | | | | | | | **NA** |
| **B7**[5] | | 1.5 | 2 | | | 1.5 | **1.2** |
| **B8**[6] | | | | | | 3 | **2.9** |
| **B9** | | | | | | | **NA** |

**CHANNEL CHARACTERISTICS**

| | Incised channel | Incised + braided | Constricted | Collapsed Banks | Vertical Banks | Rip Rap | Overall Score |
|---|---|---|---|---|---|---|---|
| **B1** | | | | 3 | 3 | | **2.7** |
| **B2** | | | 3 | 2.5 | | | **2.5** |
| **B3** | | | | | | | **NA** |
| **B4** | | | | | | | **NA** |
| **B5** | | | | 3 | | | **2.9** |
| **B6** | | | | | | 2 | **1.9** |
| **B7** | | | | | | | **2.3** |
| **B8** | | | | | | | **NA** |
| **B9**[7] | 1 | | 1 | | 1 | | **NA** |

Graded Scoring System A=4 B=3 C=2 D=1

# Arroyo Documentation

| | | | | | |
|---|---|---|---|---|---|
| **Arroyo Name**: | Lower Pinos | Infrastructure Damage/Risk Avg: | **1.9** | Date: | 1/13/2016 |
| **Arroyo Segment:** | C | Channel Character/Drainage Avg: | **1.9** | Surveyed by: | KJK REJ |
| **Start point:** | St. Michaels Drive | | | | |
| **End point:** | Camino Carlos Rey | | | | |

**INFRASTRUCTURE RISKS**

| Trail point | Trail Deterioration | Bank Deterioration | Damaged/ Restricted Culverts | Foot/Bicycle Bridge | Vehicle Bridge | Endangered Utilities | Overall Score |
|---|---|---|---|---|---|---|---|
| C1[8] | | | | | | 2 | **1.9** |
| C2 | | | | | | | **NA** |

**CHANNEL CHARACTERISTICS**

| | Incised channel | Incised + braided | Constricted | Collapsed Banks | Vertical Banks | Rip Rap | Overall Score |
|---|---|---|---|---|---|---|---|
| C1 | | | | | | | **NA** |
| C2 | | | | | | 2 | **1.9** |

Graded Scoring System A=4 B=3 C=2 D=1

# Arroyo Documentation

| | | | | | |
|---|---|---|---|---|---|
| **Arroyo Name**: | Lower Pinos | Infrastructure Damage/Risk : | **2.7** | Date: | 1/13/2016 |
| **Arroyo Segment:** | D | Channel Character/Drainage: | **2.2** | Surveyed by: | KJK JL |
| **Start point:** | Camino Carlos Rey | | | | |
| **End point:** | Richards Avenue | | | | |

**INFRASTRUCTURE RISKS**

| Trail point | Trail Deterioration | Bank Deterioration | Damaged/ Restricted Culverts | Foot/Bicycle Bridge | Vehicle Bridge | Endangered Utilities | Overall Score |
|---|---|---|---|---|---|---|---|
| **D1** | | | | | | | **NA** |
| **D2** | | | | | | | **NA** |
| **D3** | | 3 | 3 | | | | **2.7** |
| **D4** | | | | | | | **NA** |
| **D5** | | | 3 | | | | **2.9** |
| **D6** | | 3 | | | | | **2.9** |
| **D7** | | 2.5 | | 3 | | | **2.5** |
| **D8**[9] | | | | | | | **NA** |
| **D9**[10] | | 2.5 | | | | | **2.4** |
| **D10** | | | | | | | **NA** |

**CHANNEL CHARACTERISTICS**

| | Incised channel | Incised + braided | Constricted | Collapsed Banks | Vertical Banks | Rip Rap | Overall Score |
|---|---|---|---|---|---|---|---|
| **D1**[11] | 1.5 | | | | | | **2.6** |
| **D2**[12] | | | 1 | | | 1 | **0.7** |
| **D3** | | 3 | | | | | **2.9** |
| **D4**[13] | | | | | | 2.5 | **2.4** |
| **D5** | 1.5 | | | | | | **1.4** |
| **D6** | | | | | 3 | | **2.9** |
| **D7**[14] | 2.5 | | | 3 | | 3 | **2.4** |
| **D8** | | | | | | 1.5 | **1.4** |
| **D9** | | | | 3 | | 3 | **2.7** |
| **D10**[15] | | | | 3 | | 3 | **2.7** |

Graded Scoring System A=4 B=3 C=2 D=1

# Arroyo Documentation

| | | | | | |
|---|---|---|---|---|---|
| **Arroyo Name**: | Lower Pinos | Infrastructure Damage/Risk Avg : | **1.9** | Date: | 1/13/2016 |
| **Arroyo Segment:** | E | Channel Character/Drainage Avg: | **1.6** | Surveyed by: | KJK JL |
| **Start point:** | Richards Avenue | | | | |
| **End point:** | Arroyo de los Chamisos | | | | |

**INFRASTRUCTURE RISKS**

| Trail point | Trail Deterioration | Bank Deterioration | Damaged/ Restricted Culverts | Foot/Bicycle Bridge | Vehicle Bridge | Endangered Utilities | Overall Score |
|---|---|---|---|---|---|---|---|
| **E1** | | 2 | | | | | **1.9** |
| **E2** | | | | | | | **NA** |
| **E3** | | | | | | | **NA** |
| **E4** | | | | | | | **NA** |
| **E5** | | | 1 | | | | **0.9** |
| **E6** | | | | | | | **NA** |
| **E7**[16] | | | | | | 2 | **1.9** |
| **E8** | | | 2 | | | | **1.9** |
| **E9** | | | | | | 3 | **2.9** |
| **E10**[17] | | | | | | 2 | **1.9** |

**CHANNEL CHARACTERISTICS**

| | Incised channel | Incised + braided | Constricted | Collapsed Banks | Vertical Banks | Rip Rap | Overall Score |
|---|---|---|---|---|---|---|---|
| **E1** | | | | 2 | 2 | | **1.7** |
| **E2**[18] | 2 | | | | | 1 | **1.2** |
| **E3**[19] | | | | | | 1 | **0.9** |
| **E4**[20] | 1 | | | | | 1.5 | **1** |
| **E5** | | | | | | | **NA** |
| **E6** | | | | 2 | 1.5 | | **1.5** |
| **E7** | | | | | | | **NA** |
| **E8**[21] | 2 | | | 2.5 | 2.5 | | **1.9** |
| **E9**[22] | 2 | | | 3 | | | **2.2** |
| **E10** | | | | 2.5 | | | **2.4** |

Graded Scoring System A=4 B=3 C=2 D=1

# Arroyo Documentation

FOOTNOTES

1 Undercut bank.
2 Tributary stream eroding at junction near road and culvert
3 Exposed pipe
4 Wooden bank stabilization structure slightly undercut
5 bank failure above culvert threatening manhole
6 exposed sewer outlet
7 severe bank erosion
8 Pipe is cracking and exposed.
9 Uprooted gabion mat obstructing channel
10 Left bank of structure is eroding
11 Channel has incised below gabion mat.
12 Shopping cart obstruction.
13 concrete debris obstructing channel.
14 Channel has incised below gabion mat.
15 Shopping cart obstruction.
16 Exposed pipe
17 Damaged pipe or well casing. Arroyo encroaching on fence line.
18 Gabion wall structure failing.
19 Gabion mat is destroyed and remnants are in middle of channel.
20 Outfall is failing and channel is scoured below structure.
21 Section with endangered vertical banks and culvert due to hillslope failure.
22 End of E 9 tributary junction. Incising at junction.

# Arroyo Documentation

| | | | | | |
|---|---|---|---|---|---|
| **Arroyo Name**: | Arroyo Mascaras | Infrastructure Damage/Risk Avg : | **0.9** | Date: | 2/26/2016 |
| **Arroyo Segment:** | A | Channel Character/Drainage Avg: | **1.9** | Surveyed by: | KJK TR |
| **Start point:** | Bishop's Lodge Road | | | | |
| **End point:** | Arroyo Barranca | | | | |

**INFRASTRUCTURE RISKS**

| Trail point | Trail Deterioration | Bank Deterioration | Damaged/ Restricted Culverts | Foot/Bicycle Bridge | Vehicle Bridge | Endangered Utilities | Overall Score |
|---|---|---|---|---|---|---|---|
| **A1** | | | | | | 1 | **0.9** |
| **A2** | | | | | | | **NA** |
| **A3** | | | | | | | **NA** |

**CHANNEL CHARACTERISTICS**

| | Incised channel | Incised + braided | Constricted | Collapsed Banks | Vertical Banks | Rip Rap | Overall Score |
|---|---|---|---|---|---|---|---|
| **A1** | | | | | | | **NA** |
| **A2** | | | | | | 2.5 | **2.4** |
| **A3** | | | | | | 1.5 | **1.4** |

Graded Scoring System A=4 B=3 C=2 D=1

# Arroyo Documentation

| | | | | | |
|---|---|---|---|---|---|
| **Arroyo Name**: | Arroyo Mascaras | Infrastructure Damage/Risk : | **0.9** | Date: | 2/26/2016 |
| **Arroyo Segment:** | C | Channel Character/Drainage: | **0.7** | Surveyed by: | KJK TR |
| **Start point:** | Arroyo Barranca | | | | |
| **End point:** | Old Taos Highway | | | | |

**INFRASTRUCTURE RISKS**

| Trail point | Trail Deterioration | Bank Deterioration | Damaged/ Restricted Culverts | Foot/Bicycle Bridge | Vehicle Bridge | Endangered Utilities | Overall Score |
|---|---|---|---|---|---|---|---|
| C1[1] | | | | | 1 | | **0.9** |

**CHANNEL CHARACTERISTICS**

| | Incised channel | Incised + braided | Constricted | Collapsed Banks | Vertical Banks | Rip Rap | Overall Score |
|---|---|---|---|---|---|---|---|
| C1 | 1 | | | | | 1 | **0.7** |

Graded Scoring System A=4 B=3 C=2 D=1

# Arroyo Documentation

| | | | | | |
|---|---|---|---|---|---|
| **Arroyo Name**: | Arroyo Mascaras | Infrastructure Damage/Risk Avg : | **NA** | Date: | 2/26/2016 |
| **Arroyo Segment:** | D | Channel Character/Drainage Avg: | **1.2** | Surveyed by: | KJK TR |
| **Start point:** | Old Taos Highway | | | | |
| **End point:** | Paseo de Peralta Culvert | | | | |

**INFRASTRUCTURE RISKS**

| Trail point | Trail Deterioration | Bank Deterioration | Damaged/ Restricted Culverts | Foot/Bicycle Bridge | Vehicle Bridge | Endangered Utilities | Overall Score |
|---|---|---|---|---|---|---|---|
| **D1**[2] | | | | | | | **NA** |
| **D2** | | | | | | | **NA** |
| **D3** | | | | | | | **NA** |
| **D4** | | | | | | | **NA** |

**CHANNEL CHARACTERISTICS**

| | Incised channel | Incised + braided | Constricted | Collapsed Banks | Vertical Banks | Rip Rap | Overall Score |
|---|---|---|---|---|---|---|---|
| **D1** | | | | | | | **NA** |
| **D2** | | | | | | 2 | **1.9** |
| **D3**[3] | | | | | | 1 | **0.9** |
| **D4**[4] | | | | | | 1 | **0.9** |

Graded Scoring System A=4 B=3 C=2 D=1

# Arroyo Documentation

FOOTNOTES

1 Extensive rebar exposed underneath box culvert support at Old Taos Hwy
2 Possible location for storm water capture
3 Possible location for storm water capture
4 Storm water eroding bank. Locate water capturing system here.

Graded Scoring System A=4 B=3 C=2 D=1

# Arroyo Documentation

| | | | | | |
|---|---|---|---|---|---|
| **Arroyo Name**: | Arroyo Piedra West | Infrastructure Damage/Risk Avg : | **1.1** | Date: | 4/26/2016 |
| **Arroyo Segment:** | **B** | Channel Character/Drainage Avg: | **1.1** | Surveyed by: | KJK REJ |
| **Start point:** | Brownell - Howland | | | | |
| **End point:** | Arroyo Mascaras @ Hyde Park Road | | | | |

**INFRASTRUCTURE RISKS**

| Trail point | Trail Deterioration | Bank Deterioration | Damaged/ Restricted Culverts | Foot/Bicycle Bridge | Vehicle Bridge | Endangered Utilities | Overall Score |
|---|---|---|---|---|---|---|---|
| **A1**[1] | | | | | | | **NA** |
| **A2**[2] | | | | | | | **NA** |
| **A3**[3] | | 1.5 | | | | | **1.4** |
| **A4** | | 1 | | | | | **0.9** |
| **A5** | | | | | | 1 | **0.9** |
| **A6** | | | | | | 1 | **0.9** |
| **A7** | | 2 | | | | | **1.9** |
| **A8** | | | | | | | **NA** |
| **A9** | | | | | | 1 | **0.9** |
| **A10** | | 1.5 | | | | 1 | **1** |
| **A11**[4] | | 2 | 1 | | | | **1.2** |
| **A12**[5] | | | 1 | | | | **0.9** |
| **A13** | | 1 | | | | | **0.9** |
| **A14** | | 1 | | | | | **0.9** |

Graded Scoring System A=4 B=3 C=2 D=1

## Arroyo Documentation

| | CHANNEL CHARACTERISTICS | | | | | | |
|---|---|---|---|---|---|---|---|
| | Incised channel | Incised + braided | Constricted | Collapsed Banks | Vertical Banks | Rip Rap | Overall Score |
| A1 | | | | | | | NA |
| A2 | | | | | | | NA |
| A3 | | | | | | | NA |
| A4 | | | | | | | NA |
| A5 | | | | | | | NA |
| A6 | | | | | | | NA |
| A7 | | | | | | 2 | 1.9 |
| A8 | | | | | | | NA |
| A9 | | | | | | | NA |
| A10 | | | | | | | NA |
| A11 | | | | | | | NA |
| A12 | | | | | | | NA |
| A13 | 1 | | 1 | | | | 0.7 |
| A14 | | | 1 | | 1 | | 0.7 |

Graded Scoring System A=4 B=3 C=2 D=1

# Arroyo Documentation

| | | | | | |
|---|---|---|---|---|---|
| **Arroyo Name**: | Arroyo Piedra East | Infrastructure Damage/Risk Avg : | **NA** | Date: | 4/28/2016 |
| **Arroyo Segment:** | **A** | Channel Character/Drainage Avg: | **0.9** | Surveyed by: | KJK REJ |
| **Start point:** | Calle Conejo | | | | |
| **End point:** | Camio Real | | | | |

**INFRASTRUCTURE RISKS**

| Trail point | Trail Deterioration | Bank Deterioration | Damaged/ Restricted Culverts | Foot/Bicycle Bridge | Vehicle Bridge | Endangered Utilities | Overall Score |
|---|---|---|---|---|---|---|---|
| **A1** | | | | | | | **NA** |

**CHANNEL CHARACTERISTICS**

| | Incised channel | Incised + braided | Constricted | Collapsed Banks | Vertical Banks | Rip Rap | Overall Score |
|---|---|---|---|---|---|---|---|
| **A1** | 1 | | | | | | **0.9** |

FOOTNOTES

1 Fence blocking access
2 Fence obstructing flow
3 Erosion undercutting culverts
4 Displaced sediment
5 Filling up with sediment

Graded Scoring System A=4 B=3 C=2 D=1

# Arroyo Documentation

| | | | | | |
|---|---|---|---|---|---|
| **Arroyo Name**: | Arroyo Foothills | Infrastructure Damage/Risk Avg : | **1.2** | Date: | 4/21/2016 |
| **Arroyo Segment:** | A | Channel Character/Drainage Avg: | **1.2** | Surveyed by: | KJK REJ |
| **Start point:** | Old Santa Fe Trail | | | | |
| **End point:** | Arroyo de los Chamisos | | | | |

**INFRASTRUCTURE RISKS**

| Trail point | Trail Deterioration | Bank Deterioration | Damaged/ Restricted Culverts | Foot/Bicycle Bridge | Vehicle Bridge | Endangered Utilities | Overall Score |
|---|---|---|---|---|---|---|---|
| **A1** | | | | | | | **NA** |
| **A2**[1] | | | | | | 1 | **0.9** |
| **A3**[2] | | | | | | | **NA** |
| **A4** | | 1 | | | | | **0.9** |
| **A5** | | | 1 | | | | **0.9** |
| **A6** | | | | | | 2 | **1.9** |
| **A7** | | | | | | 1.5 | **1.4** |
| **A8** | | 1 | | | | 1 | **0.7** |
| **A9** | | | | | | | **NA** |
| **A10** | | | | | | 1.5 | **1.4** |
| **A11** | | | 2 | | | | **1.9** |
| **A12** | | | 1 | | | | **0.9** |

Graded Scoring System A=4 B=3 C=2 D=1

# Arroyo Documentation

| | CHANNEL CHARACTERISTICS | | | | | | |
|---|---|---|---|---|---|---|---|
| | **Incised channel** | **Incised + braided** | **Constricted** | **Collapsed Banks** | **Vertical Banks** | **Rip Rap** | **Overall Score** |
| **A1**[3] | 2 | | 2 | | | 2.5 | **1.7** |
| **A2** | | | | | | | **NA** |
| **A3** | | | | | | | **NA** |
| **A4** | 1 | | | | | 1.5 | **1** |
| **A5** | | | | | | | **NA** |
| **A6** | | | | | | | **NA** |
| **A7** | | | | | | | **NA** |
| **A8** | 1.5 | | | | 1 | 2.5 | **1.2** |
| **A10** | | | | | 1 | 1 | **0.7** |
| **A11** | 1 | | | | 2 | | **1.2** |
| **A12** | | | | | | | **NA** |

**FOOTNOTES**

1 Cables and pipecaptured in one photo
2 Questionable drain pipes leading from private homes to empty into arroyo.
3 Rip rap sagging.

Graded Scoring System A=4 B=3 C=2 D=1

# Arroyo Documentation

| | | | | | |
|---|---|---|---|---|---|
| **Arroyo Name**: | Arroyo Cloudstone | Infrastructure Damage/Risk Avg : | **0.8** | Date: | 5/4/2016 |
| **Arroyo Segment:** | A | Channel Character/Drainage Avg: | **0.5** | Surveyed by: | KJK REJ |
| **Start point:** | Old Santa Fe Trail | | | | |
| **End point:** | Old Pecos Trail | | | | |

**INFRASTRUCTURE RISKS**

| Trail point | Trail Deterioration | Bank Deterioration | Damaged/ Restricted Culverts | Foot/Bicycle Bridge | Vehicle Bridge | Endangered Utilities | Overall Score |
|---|---|---|---|---|---|---|---|
| **A1**[1] | | | 1 | | | | **0.9** |
| **A2**[2] | | 1 | | | | | **0.9** |
| **A3** | | 1 | | | | 1 | **0.7** |
| **A4** | | | | | | | **NA** |

**CHANNEL CHARACTERISTICS**

| | Incised channel | Incised + braided | Constricted | Collapsed Banks | Vertical Banks | Rip Rap | Overall Score |
|---|---|---|---|---|---|---|---|
| **A1** | | | 1 | | | | **NA** |
| **A2** | 1 | | 1 | 1.5 | 1.5 | | **0.6** |
| **A3**[3] | 1 | | 1 | 1.5 | | 1 | **0.5** |
| **A4** | 1 | | 1 | 1 | 1 | | **0.4** |

Graded Scoring System A=4 B=3 C=2 D=1

# Arroyo Documentation

| | | | | | |
|---|---|---|---|---|---|
| **Arroyo Name**: | Arroyo Cloudstone | Infrastructure Damage/Risk Avg: | **1.4** | Date: | 5/4/2016 |
| **Arroyo Segment:** | B | Channel Character/Drainage Avg: | **1** | Surveyed by: | KJK REJ |
| **Start point:** | Old Pecos Trail | | | | |
| **End point:** | Arroyo de los Chamisos | | | | |

## INFRASTRUCTURE RISKS

| Trail point | Trail Deterioration | Bank Deterioration | Damaged/ Restricted Culverts | Foot/Bicycle Bridge | Vehicle Bridge | Endangered Utilities | Overall Score |
|---|---|---|---|---|---|---|---|
| **B1** | | 1.5 | | | | | **1.4** |
| **B2** | | 1.5 | | | | | **1.4** |
| **B3** | | | | | | | **NA** |
| **B4** | | | | | | | **NA** |
| **B5** | | 1 | | | | | **0.9** |
| **B6** | | | 2 | | | | **1.9** |

## CHANNEL CHARACTERISTICS

| | Incised channel | Incised + braided | Constricted | Collapsed Banks | Vertical Banks | Rip Rap | Overall Score |
|---|---|---|---|---|---|---|---|
| **B1** | | | | | | 1.5 | **1.4** |
| **B2**[4] | | | | 2.5 | | | **2.4** |
| **B3**[5] | | | 1 | 1.5 | | | **1** |
| **B4**[6] | | | 1 | 1 | 2.5 | | **NA** |
| **B5**[7] | | | | | | | **NA** |
| **B6** | 1 | | 1 | 1 | 1 | | **0.4** |

Graded Scoring System A=4 B=3 C=2 D=1

# Arroyo Documentation

FOOTNOTES

1 Fence created obstruction by trapping debris against fence.
2 Collapsing bank beneath private property.
3 Gabion basket tumbled into arroyo bed creating obstruction
4 Fallen fence obstructing arroyo.
5 Tree obstruction
6 Large tree obstructing flow.
7 Tree obstructing channel

Graded Scoring System A=4 B=3 C=2 D=1

# Arroyo Documentation

| | | | | | |
|---|---|---|---|---|---|
| **Arroyo Name**: | Arroyo Nopal | Infrastructure Damage/Risk Avg : | **1.9** | Date | 4/7/2016 |
| **Arroyo Segment:** | A | Channel Character/Drainage Avg: | **2.4** | Surveyed by: | KJK REJ |
| **Start point:** | East of Calle Nopal | | | | |
| **End point:** | W. Alameda Rd | | | | |

**INFRASTRUCTURE RISKS**

| Trail point | Trail Deterioration | Bank Deterioration | Damaged/ Restricted Culverts | Foot/Bicycle Bridge | Vehicle Bridge | Endangered Utilities | Overall Score |
|---|---|---|---|---|---|---|---|
| A1[1] | | | | | | 2 | **1.9** |
| A2 | | | | | | | **NA** |
| A3 | | | | | | | **NA** |

**CHANNEL CHARACTERISTICS**

| | Incised channel | Incised + braided | Constricted | Collapsed Banks | Vertical Banks | Rip Rap | Overall Score |
|---|---|---|---|---|---|---|---|
| A1 | | | | | | | **NA** |
| A2[2] | | | | | | | **NA** |
| A3 | 2.5 | | | | | | **2.4** |

FOOTNOTES

1 run off from culvert may impact home; near utility.

2 Storm water backing up behind home.

Graded Scoring System A=4 B=3 C=2 D=1

# Arroyo Documentation

| | | | | | |
|---|---|---|---|---|---|
| **Arroyo Name**: | Arroyo Torreon | Infrastructure Damage/Risk Avg : | **1.2** | Date: | 4/7/2016 |
| **Arroyo Segment:** | A | Channel Character/Drainage Avg: | **1.1** | Surveyed by: | KJK REJ |
| **Start point:** | E of Buckman Rd | | | | |
| **End point:** | Camino de las Crucitas | | | | |

**INFRASTRUCTURE RISKS**

| Trail point | Trail Deterioration | Bank Deterioration | Damaged/ Restricted Culverts | Foot/Bicycle Bridge | Vehicle Bridge | Endangered Utilities | Overall Score |
|---|---|---|---|---|---|---|---|
| A1[1] | | 1.5 | | | | | **1.4** |
| A2 | | | 1 | | | | **0.9** |

**CHANNEL CHARACTERISTICS**

| | Incised channel | Incised + braided | Constricted | Collapsed Banks | Vertical Banks | Rip Rap | Overall Score |
|---|---|---|---|---|---|---|---|
| A1 | | 1.5 | | | 1.5 | | **1.2** |
| A2[2] | | | 1 | | | | **0.9** |

Graded Scoring System A=4 B=3 C=2 D=1

# Arroyo Documentation

| | | | | | |
|---|---|---|---|---|---|
| **Arroyo Name**: | Arroyo Torreon | Infrastructure Damage/Risk Avg: | **0.9** | Date: | 4/7/2016 |
| **Arroyo Segment:** | B | Channel Character/Drainage Avg: | **0.7** | Surveyed by: | KJK REJ |
| **Start point:** | Camino de las Crucitas | | | | |
| **End point:** | Santa Fe River | | | | |

## INFRASTRUCTURE RISKS

| Trail point | Trail Deterioration | Bank Deterioration | Damaged/ Restricted Culverts | Foot/Bicycle Bridge | Vehicle Bridge | Endangered Utilities | Overall Score |
|---|---|---|---|---|---|---|---|
| **B1** | | 2.5 | 1.5 | | | | **1.7** |
| **B2** | | | 1 | | | | **0.9** |
| **B3** | | | | | | | **NA** |
| **B4** | | 2 | | | | | **1.9** |
| **B5** | | 1 | | | | | **0.9** |

## CHANNEL CHARACTERISTICS

| | Incised channel | Incised + braided | Constricted | Collapsed Banks | Vertical Banks | Rip Rap | Overall Score |
|---|---|---|---|---|---|---|---|
| **B1** | | | 1 | 1.5 | | | **1** |
| **B2** | | | 1 | | | | **0.9** |
| **B3** | 1 | | 1 | | 1 | 2 | **0.6** |
| **B4** | 2 | | | 1 | 1 | | **0.9** |
| **B5** | | | 1 | 1 | 1 | | **0.5** |

Graded Scoring System A=4 B=3 C=2 D=1

# Arroyo Documentation

| | | | |
|---|---|---|---|
| **Arroyo Name**: | Arroyo Torreon | Date: | 4/7/2016 |
| **Arroyo Segment:** | B continued | Surveyed by: | KJK REJ |
| **Start point:** | | | |
| **End point:** | Santa Fe River | | |

**INFRASTRUCTURE RISKS**

| Trail point | Trail Deterioration | Bank Deterioration | Damaged/ Restricted Culverts | Foot/Bicycle Bridge | Vehicle Bridge | Endangered Utilities | Overall Score |
|---|---|---|---|---|---|---|---|
| **B6** | | | | | | | **NA** |
| **B7**[3] | | 1 | | | | | **0.9** |
| **B8**[4] | | 1 | | | | | **0.9** |
| **B9**[5] | | 1 | | | | | **0.9** |
| **B10** | | 1 | | | | | **0.9** |
| **B11** | | 2.5 | | | | | **0.9** |

**CHANNEL CHARACTERISTICS**

| | Incised channel | Incised + braided | Constricted | Collapsed Banks | Vertical Banks | Rip Rap | Overall Score |
|---|---|---|---|---|---|---|---|
| **B6** | | | | | | | **NA** |
| **B7** | | | | | | | **NA** |
| **B8** | | | | | | | **NA** |
| **B9** | | | | | 1 | | **0.9** |
| **B10** | 2 | | | | 1.5 | | **1.5** |
| **B11** | | | | | | 1.5 | **1.4** |

Graded Scoring System A=4 B=3 C=2 D=1

# Arroyo Documentation

FOOTNOTES

1 Trash
2 Culvert restricted by sediment
3 3.5 feet between road shoulder and arroyo bank
4 Endangered property line.
5 Arroyo bank next to road shoulder.

Graded Scoring System A=4 B=3 C=2 D=1

# Arroyo Documentation

| | | | | | |
|---|---|---|---|---|---|
| **Arroyo Name**: | Arroyo Chaparral | Infrastructure Damage/Risk Avg: | **1.7** | Date: | 4/5/2016 |
| **Arroyo Segment:** | B | Channel Character/Drainage Avg: | **2** | Surveyed by: | KJK REJ |
| **Start point:** | Galisteo Rd | | | | |
| **End point:** | Esplendor St | | | | |

**INFRASTRUCTURE RISKS**

| Trail point | Trail Deterioration | Bank Deterioration | Damaged/ Restricted Culverts | Foot/Bicycle Bridge | Vehicle Bridge | Endangered Utilities | Overall Score |
|---|---|---|---|---|---|---|---|
| **B1** | | | | | | | **NA** |
| **B2** | | 2.5 | | | | | **2.4** |
| **B3** | | 1.5 | | | | | **1.4** |
| **B4**[1] | | 1.5 | | | | | **0** |
| **B5**[2] | | 1.5 | | | | | **0** |
| **B6** | | 2 | | | | | **1.9** |

**CHANNEL CHARACTERISTICS**

| | Incised channel | Incised + braided | Constricted | Collapsed Banks | Vertical Banks | Rip Rap | Overall Score |
|---|---|---|---|---|---|---|---|
| **B1** | | | | | | 1 | **0.9** |
| **B2** | | | 3 | | | | **2.9** |
| **B3** | | 3 | 3 | | | | **2.7** |
| **B4** | 3 | | 3 | | 3 | 2 | **2.1** |
| **B5** | 2 | | 2.5 | | 2 | 2 | **1.5** |
| **B6**[3] | 2 | | 2 | | 2.5 | | **2** |

Graded Scoring System A=4 B=3 C=2 D=1

# Arroyo Documentation

| | | | | | |
|---|---|---|---|---|---|
| **Arroyo Name**: | Arroyo Chaparral | Infrastructure Damage/Risk Avg: | **0.9** | Date: | 4/5/2016 |
| **Arroyo Segment:** | C | Channel Character/Drainage Avg: | **1** | Surveyed by: | KJK REJ |
| **Start point:** | Esplendor St | | | | |
| **End point:** | Arroyo de los Chamisos | | | | |

## INFRASTRUCTURE RISKS

| Trail point | Trail Deterioration | Bank Deterioration | Damaged/ Restricted Culverts | Foot/Bicycle Bridge | Vehicle Bridge | Endangered Utilities | Overall Score |
|---|---|---|---|---|---|---|---|
| **C1** | | | | | | | **NA** |
| **C2** | | 1 | | | | | **0.9** |
| **C3**[4] | | 1 | | | | 1 | **0.7** |
| **C4** | | 1 | | | | | **0.9** |
| **C5** | | 1 | | | | | **0.9** |
| **C6** | 1 | | | | | | **0.9** |

## CHANNEL CHARACTERISTICS

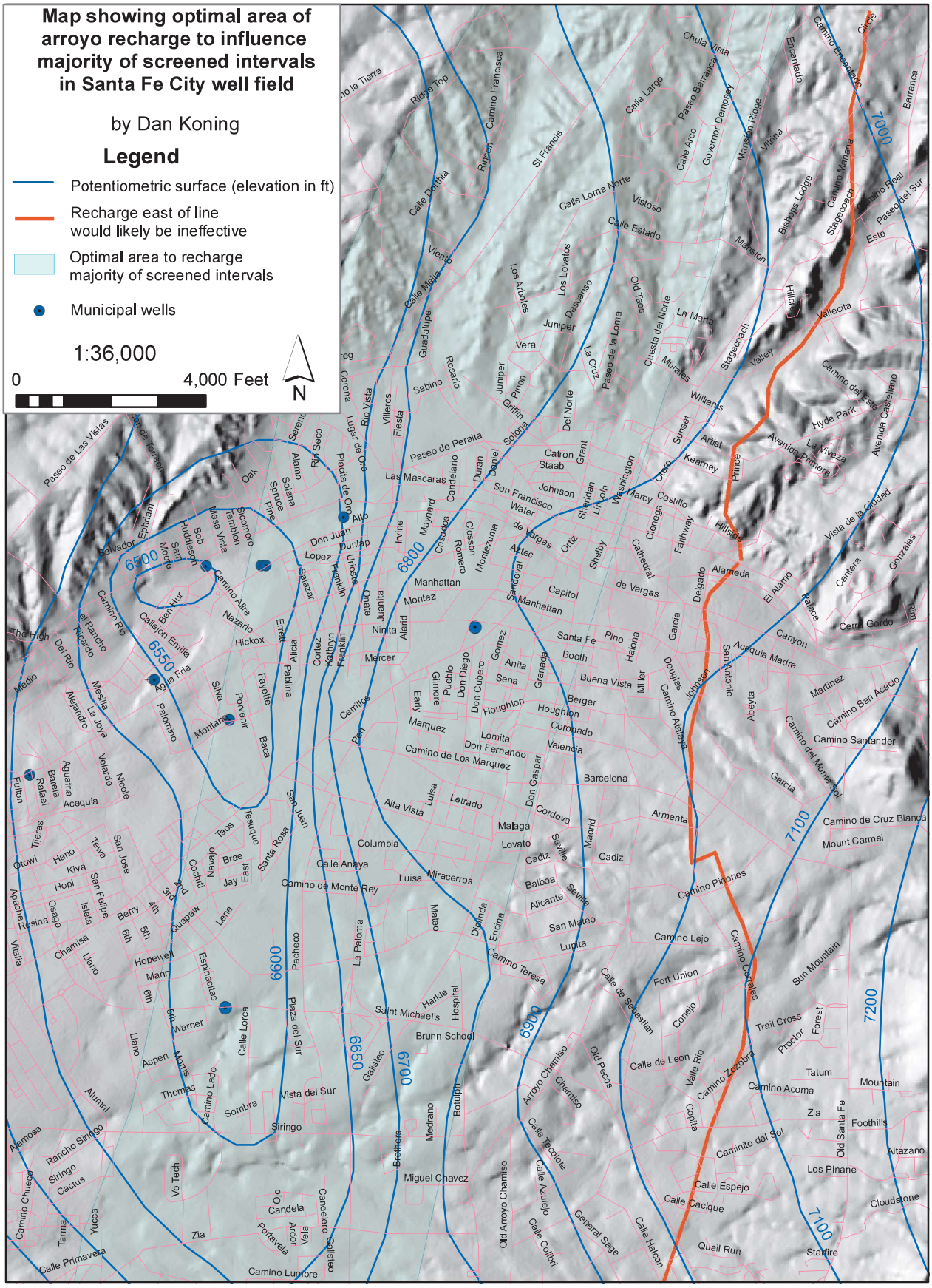
| | Incised channel | Incised + braided | Constricted | Collapsed Banks | Vertical Banks | Rip Rap | Overall Score |
|---|---|---|---|---|---|---|---|
| **C1** | 1 | | | | | | **0.9** |
| **C2** | 1 | | 1 | | 1 | 2 | **0.6** |
| **C3** | 1 | | 1 | 1 | 1 | | **0.9** |
| **C4** | 1.5 | | 1 | | 1.5 | | **0.9** |
| **C5** | 1.5 | | 1.5 | | 1.5 | | **1.4** |
| **C6**[5] | 1.5 | | 1.5 | | 1.5 | | **1** |

Graded Scoring System A=4 B=3 C=2 D=1

# Arroyo Documentation

1 Concrete check dam and spillway eroding
2 Unstable handmade foot bridge
3 corridor of bank erosion and incision between b5 to b6
4 sewage actively seeping into arroyo
5 Incised corridor from C5-C6

Graded Scoring System A=4 B=3 C=2 D=1


Map showing optimal area of arroyo recharge to influence majority of screened intervals in Santa Fe City well field
by Dan Koning
Legend
Potentiometric surface (elevation in ft)
Recharge east of line would likely be ineffective
Optimal area to recharge majority of screened intervals
Municipal wells
1:36,000
0
4,000 Feet
N

ACKNOWLEDGEMENTS

The successful completion of Santa Fe Watershed Association's Arroyo Threat Assessment Surveys of 15 Major Arroyos in the Santa Fe Watershed project would not be possible without the support of many accomplished, talented, and enthusiastic people.

We would like to thank, executive director Andy Otto for his vision, guidance, encouragement, and support throughout the entirety of this project; Raquel Baca-Tompson, for her input, editorial attention to detail and for her assistance producing this document.

We would also like to thank field assistant, Rebecca Johnson, whose spirit for adventure saw her through weeks negotiating rough terrain with a Juno 3b Trimble and long hours entering complex data in order to help this project come together.

We are also indebted to the many knowledgeable field volunteers whose invaluable insight, time and field observations contributed to the completion of this arroyo assessment: former SFWA board members Dr. Jerry Jacobi and Tom Noble, current board member Dr. Tony Ricketts and graduate student, Jake Lyons as well as Aaron Kauffman's timely input; all of whom contributed valuable time to help complete this project.

And finally, with much gratitude, we would like to thank the City of Santa Fe's GIS analyst, David Barsanti, for his constructive guidance and for creating the interactive visual map.

*Keely Jackson-Kennemore*

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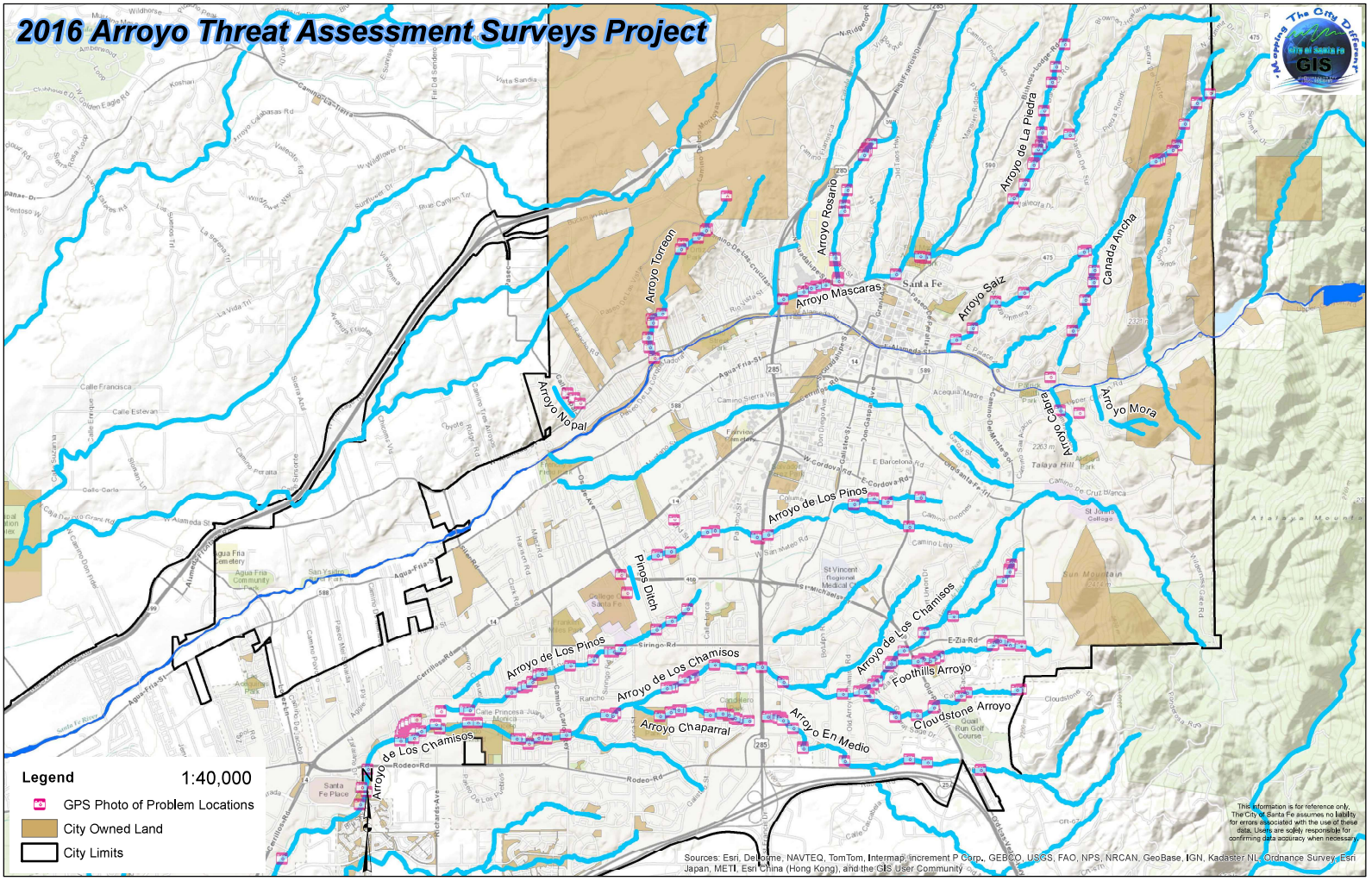
2016 Arroyo Threat Assessment Surveys Project
Arroyo Torreon
Arroyo Rosario
Arroyo de La Piedra
Canada Ancha
Arroyo Mascaras
Arroyo Saiz
Arroyo Nopal
Arroyo Cabra
Arroyo Mora
Arroyo de Los Pinos
Pinos Ditch
Arroyo de Los Chamisos
Foothills Arroyo
Cloudstone Arroyo
Arroyo Chaparral
Arroyo En Medio
Santa Fe
Legend
1:40,000
GPS Photo of Problem Locations
City Owned Land
City Limits
N
Sources: Esri, DeLorme, NAVTEQ, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), and the GIS User Community
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