

Potential for Tree Damage Due to Glenwood Hills Reservoir 2 Access Road Construction Project

Joran Viers, Senior Partner
Root to Shoot Urban Forestry Inc
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Situation Statement and Preliminary Observations

Reason for report: assessment of trees and likely impact was requested by design firm NV5, at the request of their client (ABCWUA), based on concerns expressed by neighbors with trees potentially impacted by the proposed two-track road construction project. This project is deemed necessary by ABCWA to allow vehicular access to the area around the manhole cover and reservoir itself, for maintenance purposes.

Known impacts of construction on tree roots and tree survival: the arboricultural literature, both scientific and professional, has many instances of descriptions of the potential damage to trees from construction projects. Generally, these fall into the following categories: actual physical damage to the trunk and/or branches; actual physical damage (cutting, breaking) to the root system; soil property changes due to compaction, grade changes and changes to surface and sub-surface water flow.

While damage to the above-ground parts of a tree is certainly harmful, they are at least more visible than damage to roots and to soil environment. Most tree decline and death following close construction activities is linked to negative impacts on root systems and the surrounding soil environment. Adding even a couple of inches of dense soil on top of existing grade can lead to significant root damage; certainly, taking away the top layer of soil similarly damages roots by removing many of the fine, water-and-nutrient absorbing roots. Soil compaction above 80% proctor is known to cause root system failure and decline.

Best practices for construction around trees to be kept involve establishing **Critical Root Zone (CRZ)** areas that are safe from all impact (including grade changes, compaction and even traffic). Minimal CRZ guidelines call for all areas directly under a tree's canopy to be in the CRZ. It must be understood that tree roots grow shallowly under the soil (roughly 4-16 inches deep) and horizontally for long distances, far beyond the edge of tree canopies, and that much of their water and nutrient uptake begins well outside the tree's own canopy footprint. Thus, the CRZ is a minimal protection zone and not a description of the entire root zone.

Where violations of the CRZ are necessary, expect those trees to struggle and perhaps not survive. Additional irrigation where feasible can offset some of this damage, and in time some trees will recover. Some trees will not, however, depending on the ability of pre-existing roots to take in the remedial irrigation. New roots will grow but that will take some few years.

The importance of preserving root zone area and tree roots themselves cannot be overstated, where tree preservation is the goal. Obviously, trunk and branch damage should be avoided or done with skill and intention (clearance pruning), but the ability of the

root system to continue functioning adequately is what makes or breaks the recovery process.

Pruning terminology:

Reduction cuts take length out of a branch by removing main leader back to a side branch. When this leaves enough foliage to keep the branch functional, it is the preferred cut to make, as it removes less tissue and makes a smaller wound.

Removal cuts take out an entire branch by cutting back at the parent branch or trunk. These are less desirable from a tree health perspective (more lost tissue, bigger wound) but are used when there is nothing to reduce a branch back to.

Thinning cuts remove side branches in outer canopy, do not reduce canopy envelope size but do reduce branch density and weight, causing limb to rise higher above ground.

Hydrological concerns: it is not clear to this observer how the new road will impact water infiltration into the arroyo bed. Ideally, this infiltration rate can be kept high, allowing the soil to store storm water for eventual use by the surrounding trees and other vegetation. Where the roadway runs in the arroyo bottom, the designed compaction will likely reduce that infiltration and lead to more, and faster, surface flow. I assume the engineers have consulted knowledgeable persons regarding impacts to water flow and infiltration.

Potential for water harvesting to desired trees: a number of these trees may be able to benefit from well-conceived passive water harvesting approaches; this appears to already be the case with the Arizona cypress trees near the top of the project. ABCWUA may want to offer consultation to neighbors regarding this potential, a very important tool moving into a hotter, drier future climate.

Overlay of climate change impacts: we are demonstrably moving into a time of hotter, drier, and more erratic weather and climate. This will have a negative impact on all these trees, regardless of project impact. Teasing apart the primary cause of decline and death may be difficult, but it is expected that most project related negative impact will play out in 3-7 years.

Consideration of alternatives: is a road really needed? What are the maintenance activities that require such access; how were those accomplished in the past? What is the anticipated lifespan of the existing pipeworks and how soon does ABCWUA expect to be needing to repair same? How often is access expected to be needed?

Protocol

To assess the trees and potential impacts, I spent parts of three days walking the area and taking systematic notes on the trees and the likely impacts, with appropriate photo documentation. These notes were then used to generate this report.

Qualifications: I, Joran Viers, have the following qualifications for this project: Master's degree in Botany/Plant Ecology; International Society of Arboriculture (ISA) Board Certified Master Arborist (RM7080BM), ISA Tree Risk Assessment Qualified; past City Forester with

Albuquerque Parks Department; past County Program Director and Horticulture Agent with NMSU's Cooperative Extension Service; over 2 decades of horticultural/arboricultural assessment and consultation in the Albuquerque area. I am currently one of two Senior Partners with Root to Shoot Urban Forestry Inc.

Field assessment: I walked the area with notepad and camera, recording the relevant trees either in the easement proper, or immediately adjacent trees growing in back yards on both south and north sides of the easement. I noted tree species, species desirability, estimated size (diameter at breast height [DBH], height), general condition, relative degree of potential root zone impact, mitigation options, and pruning guidelines when appropriate to provide vehicular clearance.

Report writing: following field work, I compiled and organized the notes and information into this report. The report includes numerous photos and other images to assist in correctly identifying the specific trees and issues noted.

Impact Statement and Mitigation Options

I numbered the trees being assessed/discussed, starting at the top of the drainage area, and working downstream to the west. Images 1-4 (at back of report) show the location and relative size of the numbered trees.

1. Peach tree: desirable, 3 main stems at 6" diameter or less, 12 feet tall. Good condition; sits astride the drainage and its roots likely help stabilize same (see Image 5). Tree may be outside of area impacted, but it is very close and may be damaged. If a decision is made to extend the grub and clear area, the tree may need to be removed. Alternatively, if outside the work zone, it may suffer minimal to no negative impact and not need mitigation. Prune low dead and in-the-way branches to allow free access from parking area to manhole cover.



Image 5: peach tree straddling arroyo bed (middle) with small Russian olive on left side.

2. Russian olive: undesirable (except by wildlife), 2 main stems at 8" or less DBH, 20 feet tall. Good condition, in grub and clean area so will be cut down. Growing into power lines, may require PNM contractor to do initial pruning to clear the wires prior to contractor completing removal.
3. Apple: desirable, south side of wall on private property, approximately 14"DBH, 15 feet tall. Some of tree's north side root zone is in the area slated for grubbing and clearing. With care, the area can be minimally impacted that close to the fence. Continuing and perhaps augmenting irrigation on the private side is best mitigation option. Tree should have north-side branches pruned back from power line (Image 6).

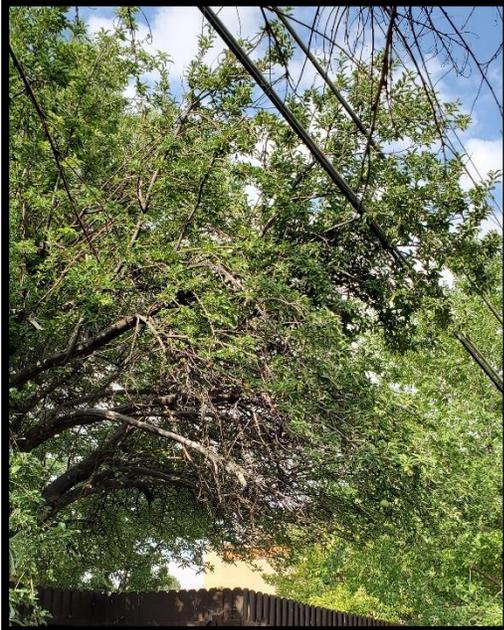


Image 6: prune dead and living branches back from power lines using reduction cuts to existing side branches well outside powerlines.



Image 7: Rio Grande cottonwood showing relatively healthy canopy, though dieback has begun on the north side of the tree due to lack of irrigation on that side.

4. Rio Grande cottonwood: desirable but out of place, 24" DBH, 25+ feet tall. In good condition though canopy is thin for species, indicating ongoing stress (lack of high soil moisture preferred by riparian trees like cottonwood). Much of this tree's root zone is outside the construction area but many roots will have grown down into and along the arroyo bed. All efforts should be made to avoid traffic, disturbance, and soil compaction on the north side of the arroyo adjacent to this tree. Additionally, the homeowner should begin regular and substantial irrigation on their side of the wall to (hopefully) prevent this tree sliding further into drought stress and perhaps going into decline and death (Image 7).
5. Peach: desirable, 5" DBH, 12 feet tall, good condition. Growing just on north side of north easement wall. Minimal root zone damage expected. Continued care and irrigation on north side of wall will mitigate any damage. Prune low branch with one 2" removal cut. (Image 8, on right: red line shows approximate location of pruning cut. Branch to remove has bird feeder hanging from it.)
6. Arizona cypress: desirable, 24" DBH, 20+ feet tall. Good condition. Areas just outside CRZ



and well within root zone will be impacted, on two sides (north side and east side). Construction plans do place the area to be grubbed and cleaned beyond the canopy, which at least preserves the CRZ. Water harvesting channel exists coming from uphill neighbor's back yard, providing additional water to this tree and the other 7 in the tight row (Image 9). This feature needs to be recognized and preserved. I have concerns for the permeability of the arroyo bottom post-construction, as that water harvesting feature feeds right into the bottom. Mitigate root damage through increased irrigation on south side of trees. Prune low branches on north side of canopy for vehicular clearance; reduction cuts may be applicable but those may need to be complete removal cuts (Image 9).



Image 9: line of Arizona cypress trees. Blue line indicates approximate path of water harvested from neighbor's property. Red oval indicates area where some pruning may be needed.

7. Arizona cypress: desirable, 22" DBH, 20 feet tall, good condition. Outer root zone damage will occur on north side of tree, outside of CRZ. Mitigate with increased irrigation on south side and maintenance of water harvesting flow. Prune with 3 reduction cuts of 2" or less to low branch on north side; due to difficulty in getting clear photo to show such cuts, they are not pictured. I am available to show crew how/where to make cuts if needed.
8. Arizona cypress: desirable, 18" DBH, 20 feet tall, fair to good condition. Root zone impact as above tree, no pruning required.
9. Arizona cypress: desirable, 16" DBH, 20 feet tall, fair to good condition. Root zone impact as above tree, no pruning required.

10. Arizona cypress: desirable, 18" DBH, 20 feet tall, good condition. Root zone impact as above tree, no pruning required.
11. Arizona cypress: desirable, 8" DBH, 20 feet tall, poor to fair condition. This tree has lost the larger of two main leaders and is overwhelmed by its neighbors on either side. Root zone impact as above tree, no pruning required.
12. Arizona cypress: desirable, 18" DBH, 20 feet tall, good condition. Root zone impact as above tree. One 3" reduction cut to longest low side branch on north side, plus removal of two adjacent smaller dead branches.
13. Arizona cypress: desirable, 18" DBH, 20 feet tall, good condition. Root zone impact as above tree. One removal cut to lowest branch on north side.
14. Goldenraintree: desirable, 3" DBH, 15 feet tall, good condition. Small self-seeded tree on edge of arroyo. With care and moving road a few feet north at that spot, this tree can be retained and will help stabilize the bank of the arroyo. Roots on north side will be damaged but are likely denser on south side. Four to six <1" removal cuts to provide clearance on north side of tree.
15. Mimosa: desirable, 16" DBH, 25 feet tall, fair condition. large for species, showing signs of water stress already (dead branches, thin canopy; see Image 10). Roadway will touch outer part of root zone; damage should be minimal (***tree is already showing decline and may be/become infected with verticillium wilt***). If owner wants to keep tree they will need to irrigate appropriately. No pruning required for clearance.

15.a. Mimosa sapling: desirable species, bad location – directly north of tree 15, growing very close to cinderblock wall, should be removed to prevent infrastructure damage; it is also growing with a strong lean to south, putting it on growth path into roadway space (Image 11).

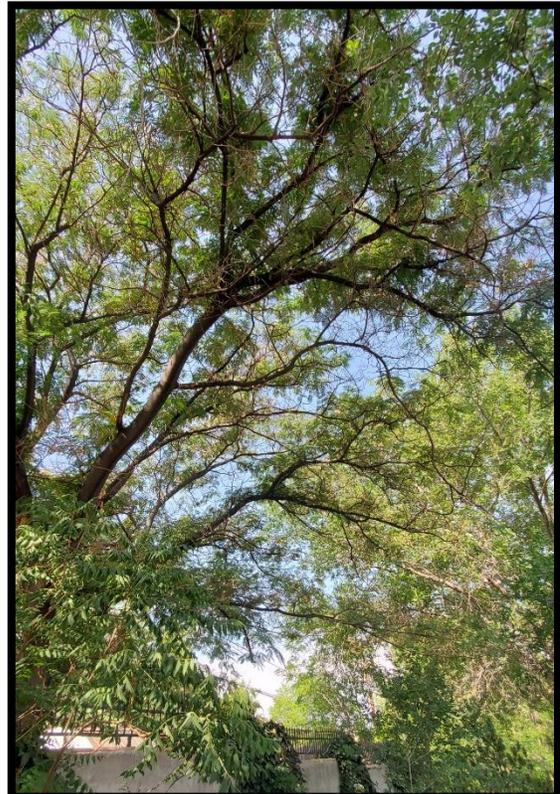


Image 10: mimosa tree showing thin canopy, dead branches due to ongoing water stress.

16. Siberian elm: neutral, 16" DBH, 45+ feet tall, good condition. Species is very invasive but grows well in our difficult environment. This tree has been selected to remain but will suffer serious, potentially catastrophic root zone damage both at roadway (completely violates CRZ, large surface roots present now, see image 12) and around outflow area (due to extensive cutting and grade reduction below/around outflow). Damage to large size and large number of roots will almost certainly lead to canopy decline due to lack of water, internal decay due to wounds on root system, and quite possibly to destabilization of the entire tree – wind fall chances will increase dramatically with close root damage. Given the closeness of root damage to the trunk, this tree is one that may present a stem failure potential several years post-construction, when root decay has advanced enough to destabilize the stem. Consider removal.

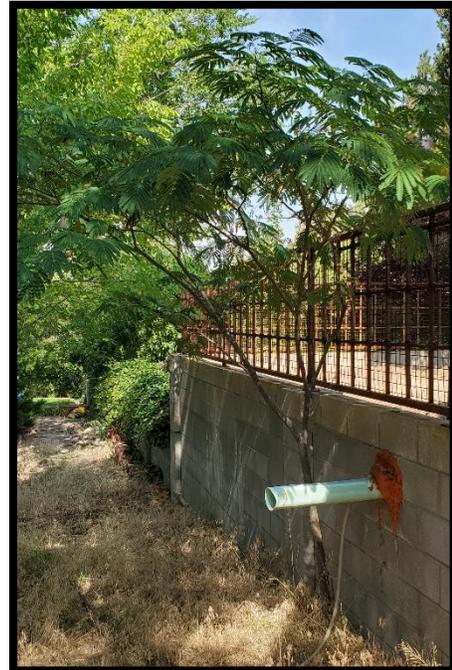


Image 11: mimosa sapling to be removed due to proximity to wall.

17. Locust, Raywood ash, plum, redbud, crabapple south of south wall by outflow: various sizes, young to mature, all in good condition but close to wall. The grade change at outflow will impact root zones significantly, leading to some potentially significant amount of decline/dieback. Cutting for riprap will likely expose/damage numerous roots of 2–4-inch diameter; if so, that will both reduce water and stability. Only mitigation option is increased irrigation on owner's side. NOTE: permeability of riprap allows future root growth into new situation, meaning replacement trees should have access to runoff if/when it occurs.

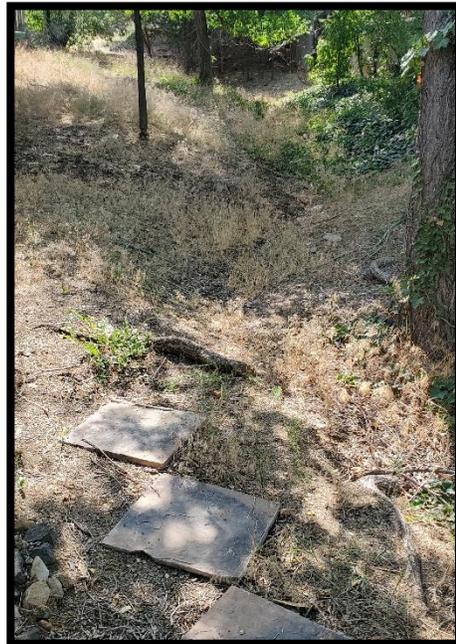


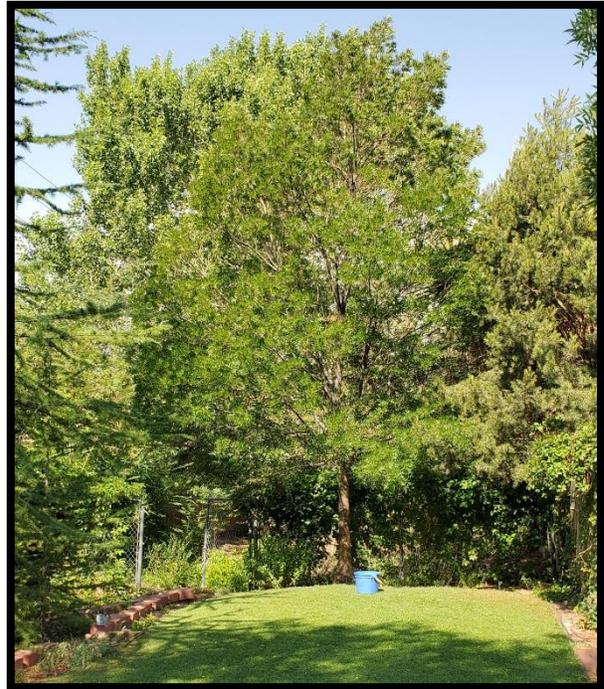
Image 12: Siberian elm roots at surface. Roadway to go right next to tree trunk and over these roots, damaging them severely. Roadway will impact drainage running adjacent to tree trunk.

18. Raywood ash: desirable, 6" DBH, 25 feet tall, good condition. This tree will suffer severe root zone damage within the CRZ on the south side. There will be significant dieback of branches on that side, and tree destabilization is a strong possibility due to proximity of root cuts that are very likely to occur (Images 13 &

14). The entire drainage and hydrology on the adjacent south side of the tree will be changed by the construction work. On the positive side, neighbor who planted the tree has been irrigating regularly in areas that will not be impacted by the work, including under the artificial turf. This turf product should be removed, and drip tubing installed such that the footprint of applied irrigation covers a large area east of the tree. This should then be covered up deeply with wood chips, 8-10 inches deep. That will protect the lines and the soil during construction. Post-construction, the wood chips can be spread out to a thinner, 3-inch-deep layer around the root zone to both east and west sides.

19. Pinyon pine: desirable, 3 trunks of 8" or smaller DBH, 20 feet tall. Good condition. Spoke with owner, we agreed that slow leaks in her little pond under the pinyon tree are probably its main water source. Minimal damage due to construction, but mitigation for Raywood ash will also help this tree.

20. Chitalpa: neutral – once a popular ornamental, no longer available in the local marketplace due to inevitable infection by *Xylella fastidiosa*, a plasmid pathogen that causes summer leaf scorch. 8" DBH, 20 feet tall. Tree is in poor condition due to *Xylella* infection (see Image 15). Neighbor wants to keep tree despite chronic illness. There will be significant root zone impact on south side of tree, including within the CRZ. There are significant clearance pruning needs on that side of the tree as well (which to some uncertain degree balances the loss of



Images 13 (above) & 14 (below): Raywood ash that will have massive root damage to south side. Clearance pruning will be required approximately along the red line.



roots on that side): one 4” removal cut of low branch on southwest side, 3 thinning cuts of about 1.5 inches, and 3 reduction cuts to upright laterals (Images 16 & 17).



Image 15, top left: chitalpa leaves showing summer leaf scorch symptoms due to Xylella infection.

Image 16, above: whole tree showing thin canopy and discoloration due to Xylella; tree will likely continue declining.

Image 17, left: placement of some of the pruning cuts that need to be done for clearance.

NOTE: as it is very difficult to illustrate on a photo exactly where cuts should be made, I am willing to meet with crew onsite to direct.

21. Pinyon pine: desirable, 8” DBH, 20 feet tall. Good condition. There should be minimal root zone damage to this tree. Owner irrigates on their side. No pruning needed.

22. Ponderosa pine: desirable, 24” DBH, 50 feet tall. Good condition. There should be minimal root zone damage to this tree. Owner irrigates on their side. No pruning needed.

23. Hybrid poplar: neutral (fast growing, quick shade; high water, short lifespan, prone to large branch failure), 26" DBH, 65+ feet tall. Good condition, large tree with multiple long, tall branches typical of species (Image 18). Root zone damage to this tree will be catastrophic: root sprouts coming up at least 50' away in arroyo and multiple large roots in and crossing arroyo, up to 8" diameter (Image 19). No irrigation on south side of tree in owner's yard, so this tree gets almost all its water from the arroyo and the neighboring yards on the north side of the arroyo. Many large, long roots will be cut, buried, compacted, broken and otherwise damaged. Poplar trees (cottonwood relative) do NOT protect their wood well against decay or disease organisms, and once the root damage is done, the tree will quickly decline, die, and begin falling apart. This may take a long as 5-7 years but may be quicker.

I STRONGLY RECOMMEND REMOVAL OF THIS TREE AT THE START OF THE PROJECT. IT WILL BE MUCH MORE COMPLICATED IF LEFT TO DECLINE AND THEN DEALT WITH. IF THE NEIGHBOR IS NOT AGREEABLE, UNDERSTAND THAT COURT PRECEDENT ALLOWS EASEMENT OWNER TO ADDRESS ANY LIMBS OR BRANCHES ON THEIR SIDE OF BOUNDRY.

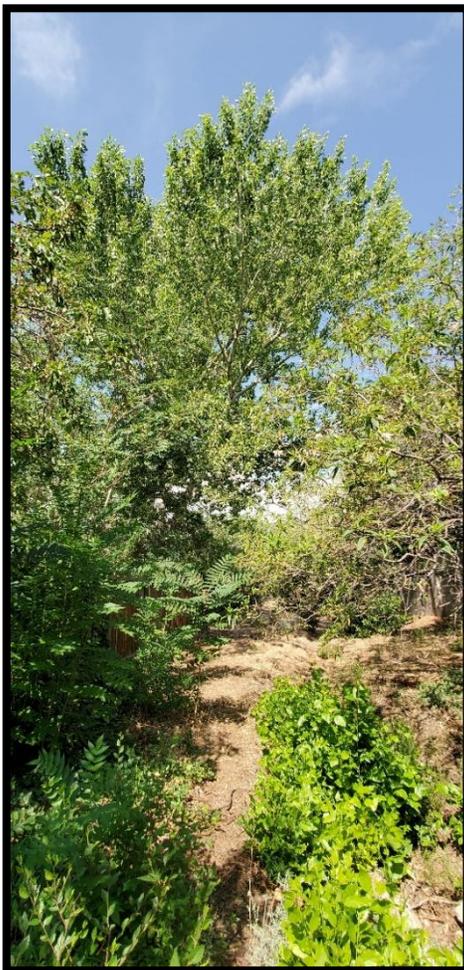


Image 18, left: hybrid poplar in background, root sprouts growing from 3" roots in foreground, near Tree #18.

Image 19, above: large surfacing root crossing channel and growing to neighbor's property. Blue pen for scale.

24. Honeylocust: desirable, 2” DBH, 8 feet tall. Good condition. With care, should not suffer any significant root zone disturbance. Mitigation is not needed, though neighbor (who planted tree) should increase the area being irrigated and the amount of water applied (Image 20).
25. Pinyon pine: desirable, 16” DBH, 20 feet tall. Good condition. Minimal root zone damage expected, minimal impact. Pruning might be done on one long, low branch – one 3.5” reduction cut on lower limb (Image 21).

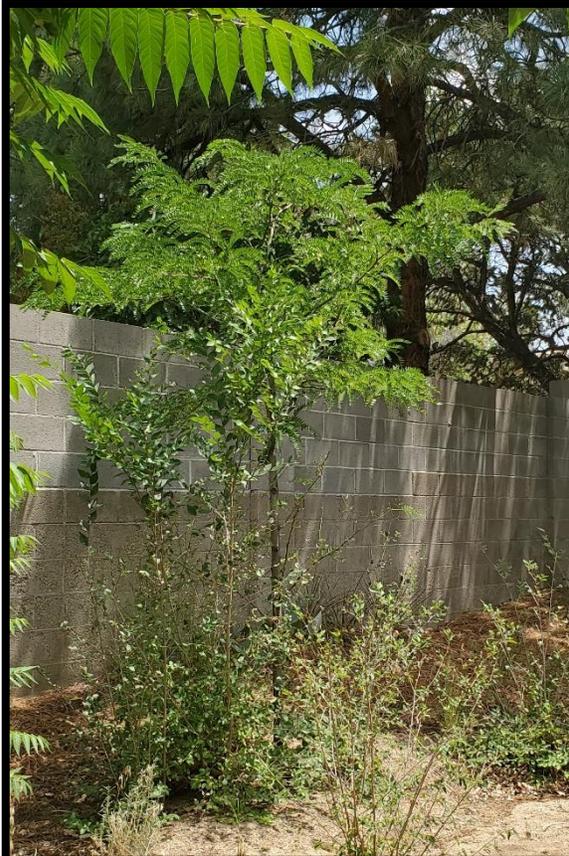


Image 20: young honeylocust, well out of work zone.

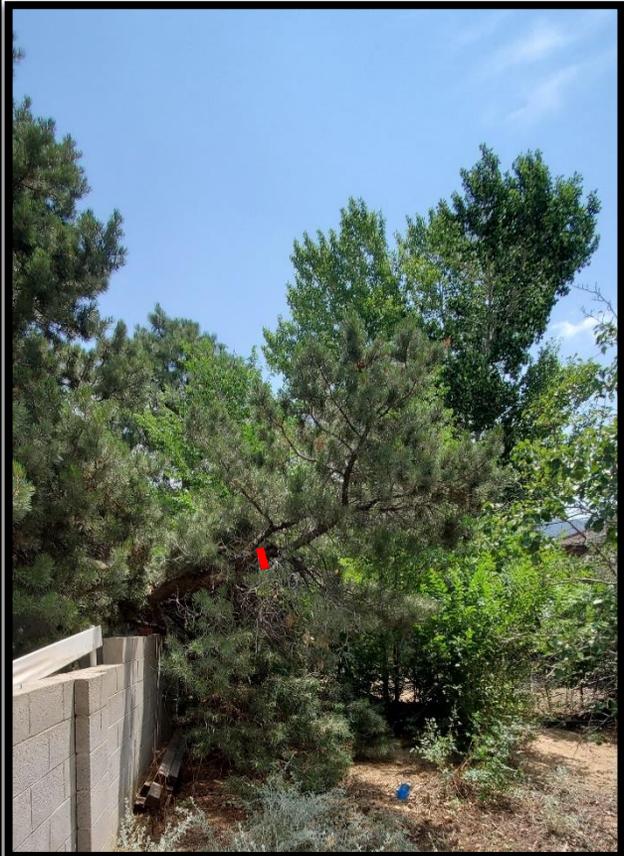


Image 21: pruning cut could be made at red line, if needed.

26. Ash (Modesto, most likely): desirable, 18” DBH, 25 feet tall, fair to good condition. Edge of CRZ within impact area on south side; as this is the arroyo bottom, disturbance here is likely to impact roots. Most of CRZ remains intact, however. Mitigate with increased irrigation on north side of wall and consider irrigation on south side of wall as well, out under canopy. Prune for clearance with two removal cuts, one 3” and one 5”, of major low limbs on south side of tree.
27. Siberian elm: neutral (tough survivor, but weedy opportunist), 12” DBH, 30 feet tall, good condition. Many important roots and root zone area will be impacted by construction. Trees do not appear to get intentional irrigation on south side, so rely entirely on arroyo for survival. Fence in close to trees will be removed – care must be taken to avoid physical damage to

branches, trunk, and roots. This is a tough species, but long-term viability of these trees is questionable. They will likely live long but may never look like much. Prune one 2.5" low branch on north side of tree.

28. Siberian elm: 7" DBH, 25 feet tall, fair to good condition. Situation same as tree above. Prune 3 low dead branches on north side of tree.
29. Siberian elm: 9" DBH, 20 feet tall, good condition. Situation same as tree above. Prune one 3" removal and above that one 1" thinning cut.
30. Ponderosa pine: desirable, 14" DBH, 30 feet tall, fair condition. This tree is showing some drought stress through browning needle tips. Does not appear to be irrigated on owner's side. Road will cut through moist part of root zone but outside CRZ. Mitigate by irrigating on both sides of boundary wall.
31. Ponderosa pine: desirable, 18" DBH, 45 feet tall, good condition. Road as shown will cut across edge of CRZ, with some but not strong negative impacts. Mitigate by swinging road out farther from the drip line/CRZ, as shown by red lines on Image 4, and with continued irrigation by owner.

Conclusion:

Most of the trees assessed have a good chance of surviving, with moderate to slight impact. A few are more likely to decline, such as the Raywood ash #18, but with care may recover. A few others should be removed at the start of the project, as experience shows that massive root damage close in will lead to decline and death; the hybrid poplar and Siberian elm #16 are examples. Trees in the vicinity of the outflow area will suffer the greatest amount of major root damage.

As the climate warms, even small disturbances to water balance may push trees into decline; especially if coupled with very hot temperatures as seen in other parts of the Western US this year. Putting a road, even a dirt two-track, through this narrow ephemeral riparian zone will be more than a small disturbance. All due diligence should be done to determine if this project is really needed, or merely convenient.

Neighbors might be informed of the need to be more diligent with irrigation to keep the trees they are concerned about healthy. ABCWUA has outreach experts who can assist with thinking through options and methods to improve the efficacy of applied irrigation; perhaps they can also look at water harvesting opportunities where applicable.

Respectfully yours,
Joran Viers, Senior Partner
Root to Shoot Urban Forestry Inc.

Image 1: Numbered Trees 1- 13

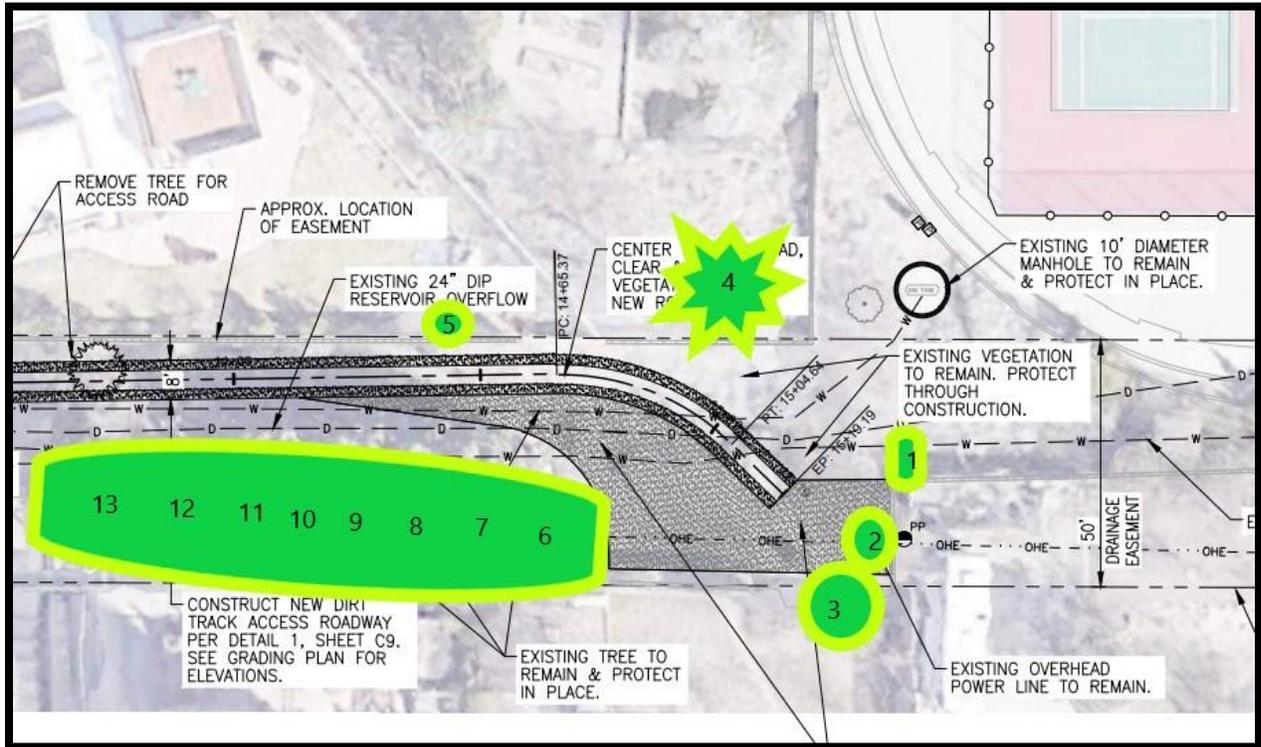


Image 2: Numbered Trees 14 – 19

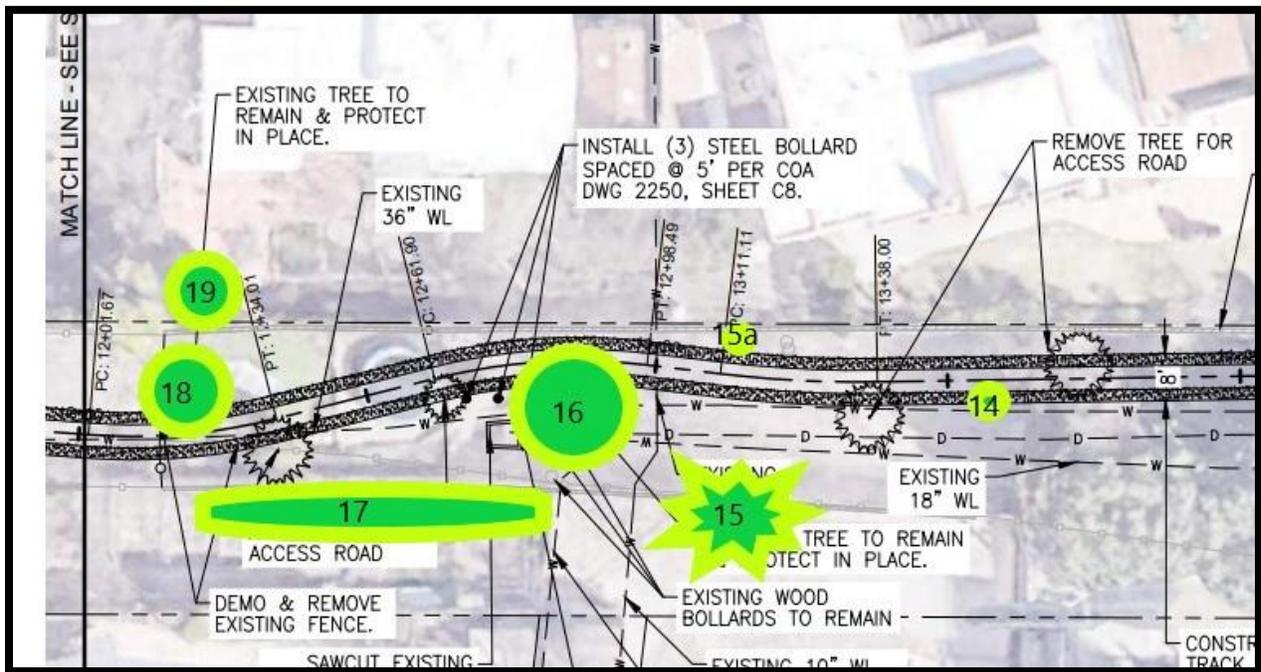


Image 3: Numbered Trees 20 – 30

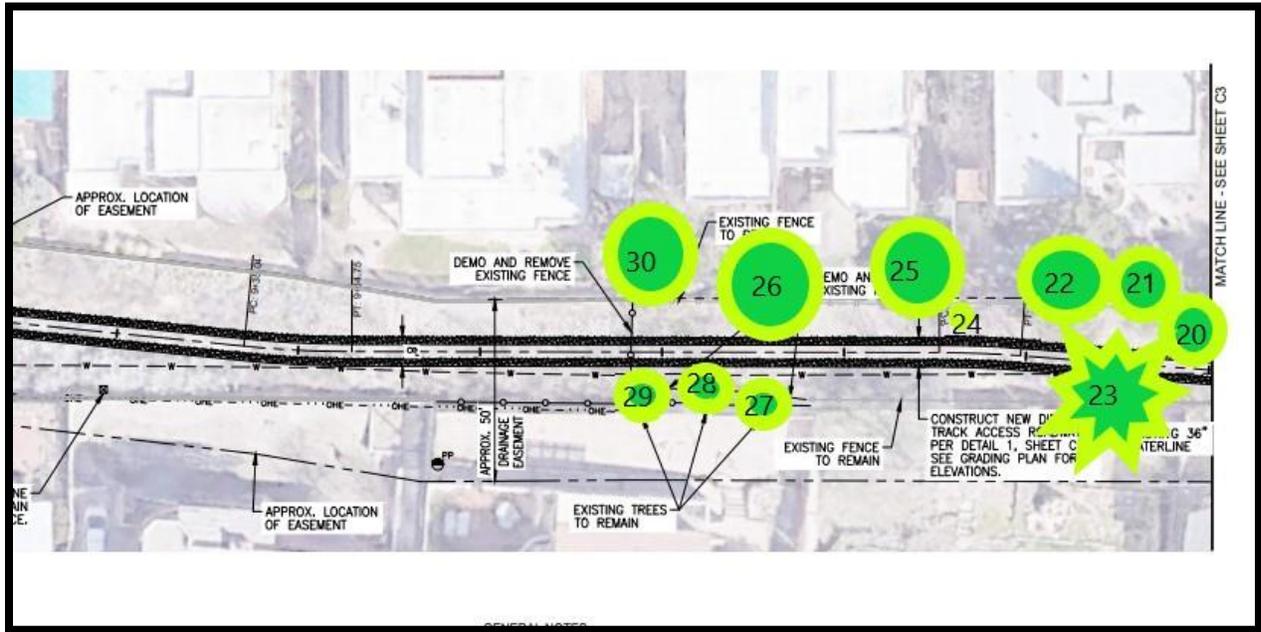


Image 4: Numbered Tree 31

