



**Tangerine Road Corridor Project, Phase I
(La Cañada to Dove Mountain Boulevard)
Project No. ST021
Wildlife Linkages Structure Construction
RTA Wildlife Linkages Project Funding Proposal**

1. NAME/ORGANIZATION

Town of Marana

2. PROJECT TITLE

Tangerine Road Corridor Project, Phase I, La Cañada to Dove Mountain Boulevard, Project No. ST021, Wildlife Linkages Structure Construction

3. INTRODUCTION

Proposal Purpose

The purpose of this proposal is to request RTA Wildlife Linkages funding for construction of wildlife linkage structures along Tangerine Road between 1,450 feet west of Dove Mountain Boulevard and La Cañada Drive (Appendix A). The project location is shown in Exhibit A. Specifically; the project will involve the installation of five medium-sized mammal crossings that will accommodate mammals such as bobcats and cougars. Locations for recommended crossings were identified in the report from the Arizona Game and Fish Department (AZGFD) entitled *Tangerine Road and La Cholla Boulevard Wildlife Mortality and Hotspot Evaluation* (2011; available on the RTA website). The Tangerine Road Technical Advisory Committee prioritized culverts for up-sizing to accommodate wildlife based on open space connectivity, considering existing and future development on either side of the structures, traffic signals, necessary hydraulic design, and fill restrictions.

Project Background

This is the first half of a larger project, which totals approximately 10 miles of Tangerine Road, from the Interstate 10 east to La Cañada Drive. Phase I is approximately 5 miles long. Most of the entire Tangerine Corridor Project is located within the Town of Marana's jurisdiction, with approximately 0.5 mile in unincorporated Pima County and 2.0 miles in the Town of Oro Valley. The proposal for the entire Tangerine Road Project was presented to the RTA Wildlife Linkages Subcommittee in 2012, and was given initial approval for funding.

Phase I of the Tangerine Road Corridor Project consists of widening Tangerine Road in the section from 1,450 feet west of Dove Mountain Boulevard to La Cañada Drive. The first stage of construction will include installation of a new joint-utility trench, the outlet halves of all cross drainage features and wildlife crossings. The second stage of construction will include installation of the inlet halves of all cross drainage features and wildlife crossings, and construction of the new westbound roadway including drainage channels, fencing, and

landscaping. The third stage will include construction of the new eastbound roadway including drainage channels and wildlife structures, fencing, and landscaping.

Wildlife Linkages Background

The Tortolita Mountain alluvial fan has been a critical area for wildlife linkages. The project area is included on the RTA Wildlife Linkages committee's "Wildlife Priority Corridors List" as a priority project for funding. The Tangerine Road wildlife corridors are integral to maintaining wildlife linkages between the Tortolita and Tucson Mountains.

The Town of Oro Valley, Town of Marana and Pima County contracted with the AZGFD to study the project area to ensure that wildlife crossings were located in the best locations and incorporated in the design as it moved through the process. The AZGFD (2011) study identified "hotspots" where wildlife-vehicle collisions were most frequent. The report recommended that the structures for the medium-sized mammals be at least 6.0 ft. in height, with an Openness Index of 0.40 (calculated as the height x width / length, in meters). Recommendations in the report included a final habitat establishment report to determine whether any adjustments need to be made to improve effectiveness of the crossing structures and fencing.

The project proponents then created a technical team of planners, engineers, biologists, hydrologists, and construction professionals to evaluate each crossing to determine its functionality based on several criteria. The team looked at adjacent future development, drainage needs, topography, and connectivity to determine where the crossings should be located and how they should be designed.

There were several challenges related to the design of inlet and outlet structures that are wildlife-friendly and also satisfy drainage constraints, and in creating a system that allows culverts with concrete bottoms to collect sediment and maintain a natural feel for wildlife to move through.

Ramifications of No Action

The AZGFD *Tangerine Road and La Cholla Boulevard Wildlife Mortality and Hotspot Evaluation* report states on page 17 that

"The number of wildlife-vehicle collisions [WVC] and species detected on Tangerine Road and La Cholla Boulevard was far greater than documented in previous studies in Pima County....The proximity of these roads to the Tortolita Mountains, a large wild land block with high levels of biodiversity, is a likely driver for the levels of diversity documented in our WVC database" (AZGFD 2011).

AZGFD reported weekly road-kill numbers of 5,152 between May and September, 2010, with a total of 88 species identified. Six desert tortoise and two mule deer mortalities were located during the surveys. The desert tortoise is currently under consideration for listing as threatened or endangered by the US Fish and Wildlife Service. In addition to increased wildlife mortality,

motorist collisions with mule deer and javelina could lead to serious accidents involving injury and property damage.

If funding is not approved for this project, the ability of the Towns Marana and Oro Valley to incorporate wildlife linkage structures into the construction of this project would be extremely limited. The construction of this project, without the incorporation of the crossings would lead to further fragmentation of valuable wildlife habitat on the Tortolita Fan, reduced wildlife connectivity and increased wildlife-vehicle accidents as traffic continues to increase in the area.

Structures serving strictly a drainage function would be incorporated into the project; however, they would not accommodate all species, and wildlife-friendly inlet/outlet structures and funnel fencing would not be incorporated into the project as recommended in the AZGFD report (2011).

4. OBJECTIVES

The objectives of this construction project are to:

- Increase the size of five drainage structures and modify inlets/outlets to accommodate medium-sized mammals.
- Add funnel fencing at the crossings
- Conduct post-construction monitoring, for three seasons, beginning one year after project completion, to determine whether any adaptive management measures are necessary to improve the effectiveness of the wildlife crossing structures.

5. APPROACH

If the funding request is approved, the Town will be able to construct five wildlife crossing structures (Table 1) with specialized outlet treatments to make them wildlife-compatible, install wildlife funnel fencing, and have post-construction monitoring performed by AZGFD. The post-construction monitoring will include collection of road kill data, track counts, and tunnel cameras. Monitoring will be performed one year after construction and will continue for three seasons during that year. Post-construction monitoring ensures that the wildlife structures are functioning properly and allows for any adaptive management to improve their effectiveness.

Table 1. Dimensions of proposed wildlife crossing structures: Tangerine Road Project Phase I

Station	Wildlife Size	Dimensions for Wildlife	Height	Length	Calculated O.I. ¹
735+63.11	Medium	One cell: 20 ft. x 6 ft. x 152 ft.	6 ft.	152 ft.	0.12
772+32.00	Medium	Three cells: 24 ft. x 7 ft. x 138 ft.	7 ft.	138 ft.	0.37
828+05.50	Medium	Two cells: 20 ft. x 6 ft. x 122 ft.	6 ft.	122 ft.	0.15
855+03.06	Medium	Three cells: 1 cell - 36 ft. x 9 ft. and 2 cells - 32 ft. x 8 ft. x 179.6 ft.	9 ft. 8 ft.	179.6 ft.	0.60
885+40.00	Medium	Three cells – 20 ft. x 6 ft. x 156.7 ft.	6 ft.	156 ft.	0.13

1. These openness indices were approved by AZGFD (per meeting on April 23, 2012) based on the results from post-monitoring at Twin Peaks Road wildlife structures, which showed that a height of 6 ft is adequate to accommodate use by medium-sized species.

The inlet ramp structures will be sloped at a grade of less than 10:1, with no greater than a 4 foot change in elevation, to maintain line of sign for the animals entering the crossing structures and will be constructed of shotcrete to provide a stable platform. Wildlife has difficulty negotiating typical drop inlet surfaces such as riprap.

Due to drainage constraints, the medium-sized mammal crossings will have bottoms; however, they will be designed so that some silt builds up on the bottoms to provide a natural look and feel for wildlife, by adding 4 inch-high baffles at 10 ft. spacing within the culverts (Figure 1).



Figure 1. Example of a baffle in a box culvert

The three project proponents met with AZGFD biologists, hydrologists, and engineers to design outlet structures that would function hydrologically with little scour and would not extend the right-of-way, but would still be suitable for wildlife access (Figure 2).

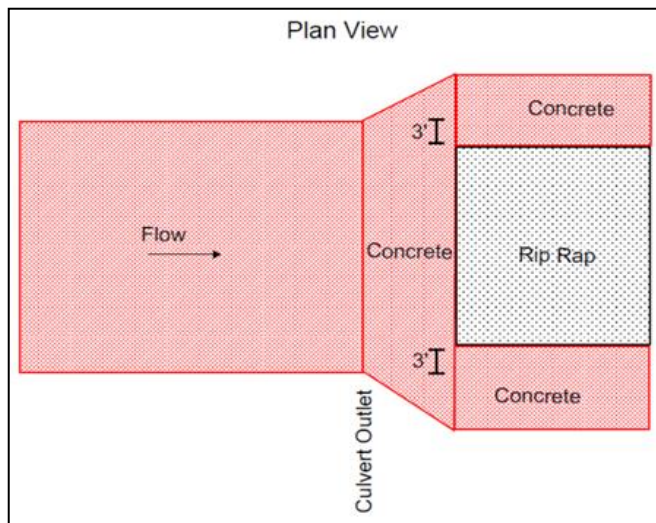


Figure 2. Outlet design to decrease scouring and allow wildlife “sidewalks” along the sides

The Town of Marana is also working internally with other departments and with adjacent property owners in the area to ensure that the connections to this corridor are maintained for wildlife movement and that natural open space habitat is maintained.

Studies have shown that wildlife crossing structures are most effective when used in conjunction with fencing to deter wildlife from crossing the road in places other than the wildlife crossing. Figure 3 provides an example of wildlife fencing tied into the crossing structure (from the Twin Peaks Road Project).



Figure 3. Example of wildlife fencing tied into culvert at Twin Peaks Road

6. FINAL DELIVERABLES

The final deliverables for Phase I of this project are: to upsize five box culverts for medium-sized mammals and modify their inlet/outlet structures for wildlife accessibility; and to provide funnel fencing as recommended by the AZGFD report (2011). The Town of Marana will also furnish An Arizona Game and Fish Department final report once construction is completed.

7. TIMETABLE

Table 2. Phase I construction timing

Phase	Schedule
Design of Roadway Plans Completed	November 2015
Anticipated Phase I Construction Start Date	Early 2016
Anticipated Phase I Construction Duration	18-24 Months

8. BUDGET SUMMARY

The following design, construction, and material costs have been provided from the engineering estimates prepared for this project. The costs include approximately 2.5% in contingency funding.

Table 3. Cost estimate for additional expenses for wildlife structures, above drainage deeds

Item	Cost
Medium Wildlife Crossing Structure @ Sta. 735+63.11 (One cell: 20' x 6' x 152' long) Reinforced Concrete Box Culvert Additional Design Cost Additional Construction and Materials Cost for Oversizing Sub-total	 \$3,226.00 <u>\$143,378.00</u> \$146,604.00
Medium Wildlife Crossing Structure @ Sta. 772+32.00 (Three cells: 24' x 7' x 138') Reinforced Concrete Arch Culvert Additional Design Cost Additional Construction and Materials Cost for Oversizing Sub-total	 \$11,951.00 <u>\$531,147.00</u> \$543,098.00
Medium Wildlife Crossing Structure @ Sta. 828+05.50 (Two cells: 20' x 6' x 122') Reinforced Concrete Box Culvert Additional Design Cost Additional Construction and Materials Cost for Oversizing Sub-total	 \$3,625.00 <u>\$161,104.00</u> \$164,729.00
Medium Wildlife Crossing Structure @ Sta. 855+03.06 (Three cells: 1 cell -36' x 9' and 2 cells -32' x 8'x 179.6') Reinforced Concrete Arch Culvert Additional Design Cost Additional Construction and Materials Cost for Oversizing Sub-total	 \$13,144.00 <u>\$584,186.00</u> \$597,330.00
Medium Wildlife Crossing Structure @ Sta. 885+40.00 (Three cells: 20' x 6' x 156.7') Reinforced Concrete Box Culvert Additional Design Cost Additional Construction and Materials Cost for Oversizing Sub-total Subtotal - Structure Costs	 \$5,738.00 <u>\$255,003.00</u> \$260,741.00 \$1,712,502.00

Table 3. Continued

Wildlife Fencing and Miscellaneous	
Additional Design Cost	\$4,146.00
Additional Construction and Materials Cost for Small Wildlife Fencing	\$11,511.00
Additional Construction and Materials Cost for Medium Wildlife Fencing	\$658,847.00
Additional Construction and Materials Cost for Wildlife Fencing Access Gates	\$41,415.00
Additional Construction and Materials Cost for Wildlife Crossings with Cattle Guards (at private drives)	\$117,413.00
Habitat establishment	\$50,917.00
Sub-total – Wildlife fencing	\$884,249.00
TOTAL RTA FUNDING REQUEST	\$2,596,751.00
Town of Marana staff time (Contracts, meetings, document reviews, etc.)	\$18,774.00
Town of Oro Valley cost (Contracts, meetings, document reviews etc.)	\$5,000.00
AZGFD staff time (Meetings and correspondence)	\$9,500.00
Pima County staff time (Contracts, meetings, document reviews etc.)	\$12,200.00
TOTAL IN-KIND CONTRIBUTION	\$45,474.00

9. Project Contributors

Evaluation:

Shawn Lowery, Arizona Game and Fish Department,
Scott Blackman, Arizona Game and Fish Department
Ray Schweinsburg, Arizona Game and Fish Department
David Grandmaison, Arizona Game and Fish Department

Technical Advisory Team

Keith Brann, Town of Marana Engineering
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Project Design:

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Alejandro Angel, PSOMAS Engineering
Sean Samsel, PSOMAS Engineering
Jim Schoen, Kittelson Engineering
Keith Brann, Town of Marana Engineering

Project Management:

Phil Trenary, Town of Oro Valley Public Works Department
Craig Civalier, Town of Oro Valley
Rick Ellis, Pima County Engineering
Jennifer Christelman, Town of Marana Engineering
Tom Houle, Town of Marana Engineering
Janine Spencer, Town of Marana

10. LIST OF COOPERATORS

The project is located in the Town of Oro Valley, Pima County and the Town of Marana. Pima County Department of Transportation has been involved with the formulation and discussion of this project. The Town of Marana will be taking the lead for the design and construction.

- Town of Oro Valley
11000 N. La Cañada Drive
Oro Valley AZ 85737
- Pima County Department of Transportation
201 N. Stone Ave., 3rd Floor
Tucson, AZ 85701-1207
- Arizona Game and Fish Department, Research Branch
5000 W. Carefree Hwy.
Phoenix, AZ 85066

11. REFERENCES

Beier, P., E. Garding, and D. Majka. 2006. Arizona Missing Linkages: Tucson – Tortolita – Santa Catalina Mountains Linkage Design. Report to Arizona Game and Fish Department. School of Forestry, Northern Arizona University.

Lowery, S .F.; S. T. Blackman, and D. D. Grandmaison. 2011. Tangerine Road and La Cholla Boulevard mortality hotspot evaluation. Prepared for Town of Oro Valley Public Works Operations Division and Town of Marana Environmental Engineering Division, Pima County, Arizona. AZ Game and Fish Dept. January 2011.

Recon Environmental. 2009. Marana public draft habitat conservation plan. Prepared for the U.S. Fish and Wildlife Service and the Town of Marana, Arizona.