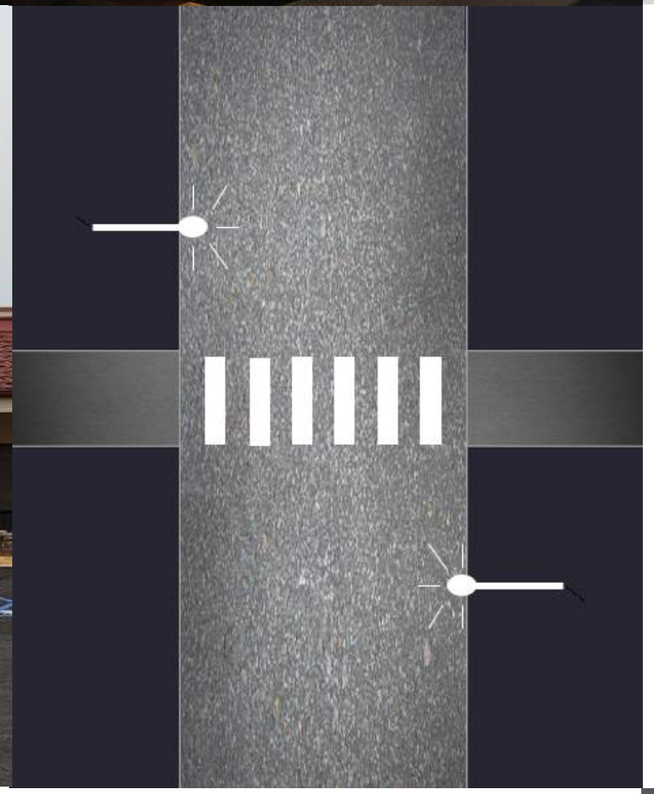


Streetlight Safety Plan
For City of Rio Communities

Final Report - April 2022

2155 Louisiana Blvd NE, Suite 9500
Albuquerque, NM 87710-5483
505.830.5400

RIO COMMUNITIES STREETLIGHT SAFETY PLAN

APRIL 2022

Prepared for:

Prepared by:

Sanjay Paul, PhD, PE, PTOE

Antonio Nunez, PE

Manmith Kunduru, PE

Miranda Sundblom, EIT

Michael Barton, PE, PTOE

Subhankar Dey

ACKNOWLEDGMENT

This study was funded by and conducted for the City of Rio Communities. The project team would like to thank the members of the Project Technical Committee (TAC) for their input, comments, suggestions, and direction throughout this project. Their assistance made the successful completion of this study possible. The authors would like to thank the following personnel for their input on this study:

- Joshua Ramsell, City Mayor
- Martin D. Moore, PhD, City Manager
- Gordon Reeves, Public Works Director

EXECUTIVE SUMMARY

Background and Objectives

The City of Rio Communities (City) commissioned HDR to perform a comprehensive study and develop safety streetlight plan for the City. The project team, as the subject matter expert and trusted advisor to the City, inventoried the existing roadway condition, collected vehicular and pedestrian and bicyclist volumes, analyzed the data and identified the need for safety streetlights at intersections and trail crossings, prioritized the list of locations for lighting improvements, developed lighting guidelines, and managed the project scopes and planning-level costs for the top priority intersections for inclusion in the City's Capital Improvement Program (CIP).

Study Area and Existing Conditions

The City of Rio Communities was incorporated on May 16, 2013, from Valencia County in New Mexico. The residents' diverse backgrounds, exceptional makeup, and independent spirit make the City a unique community. There are approximately 4,750 people living in the City, according to 2020 census records. The two main roadways that provide mobility for long distance travel to and from the community are Manzano Expressway, which carries approximately 2,500 vehicles per day (vpd), and NM 47/Rio Communities Blvd, which carries approximately 5,700 vpd. The remaining roads within the project area are local streets that provide multimodal connectivity throughout the community. Based on discussions with City personnel and a review of planning documents, the project team identified 38 intersections for initial review. After a detailed assessment, the following 10 intersections were identified for short-term improvements to enhance lighting-related safety:

- Manzano Expressway & Hillandale Avenue
- Rio Communities Boulevard & De Haan Loop
- Hillandale Avenue & Horner Street
- Goodman Avenue & Damon Street
- Goodman Avenue & Horner Street
- Horner St. & Kaghan Loop Drive
- Goodman Avenue & Hillman Street
- Kaghan Loop Drive & Trailhead
- Horner Street & Walking Trail
- Nancy Lopez Boulevard & Lee Trevino Boulevard

Evaluation and Prioritization

As part of the existing conditions inventory, the project team collected vehicular, pedestrian, and bicyclist volumes, and inventoried existing roadway features for the 10 intersections identified for short-term improvements. The project team utilized three methods to evaluate the intersections for prioritization of lighting improvements:

- Comparison by independent attributes
- Pair-wise comparisons among intersections
- Measles Chart qualitative comparison

The project team analyzed the collected roadway geometric and operational attributes to rank the intersections by priority level.

- **Prioritized Intersection #1:** Manzano Expressway and Hillandale Avenue
- **Prioritized Intersection #2:** Rio Communities Boulevard and De Haan Loop
- **Prioritized Intersection #3:** Goodman Avenue and Damon Street
- **Prioritized Intersection #4:** Goodman Avenue and Hillman Street
- **Prioritized Intersection #5:** Horner Street and Hillandale Avenue
- **Prioritized Intersection #6:** Horner Street and Walking Trail
- **Prioritized Intersection #7:** Horner Street and Kaghan Loop Drive/Suncrest Boulevard
- **Prioritized Intersection #8:** Kaghan Loop Drive and Trailhead
- **Prioritized Intersection #9:** Horner Street and Goodman Avenue
- **Prioritized Intersection #10:** Nancy Lopez Boulevard and Lee Trevino Boulevard

Safety Streetlight Design Guidelines

The team used the American Association of State Highway and Transportation Officials (AASHTO) Roadway Lighting Design Guide 2018, the American National Standards Institute (ANSI) / Illuminating Engineering Society (IES) RP-8-21 Recommended Practice for Lighting Roadway and Parking Facilities, and the New Mexico Department of Transportation (NMDOT) Standard Drawings for Highway and Bridge Construction 2019 to develop guidelines for intersection lighting criteria. The criteria considered included design light levels, (minimum, maximum, and average values), uniformity ratios, potential pole placements at the intersections, luminaire wattage, and other relevant lighting criteria to enhance multimodal nighttime safety.

The team recommends referring to NMDOT Standard Drawing 707L-07-2/10, for Roadway lighting type V poles with a mounting height of 30 feet and a luminaire mast arm length of 10 feet. It is also recommended for all luminaires with fixtures exceeding 500 lumens operating overnight to be shielded. The team suggests using light emitting diode (LED) fixtures, color temperature for all fixtures not to exceed 3,000K, luminaire wattage to be as minimal as possible, and to utilize a light loss factor of 0.7 while performing photometric analysis. After extensive city-wide intersection review, the project team developed detailed guidelines for five typical types of intersections found throughout the City:

- Four-legged intersection: local street vs local street
- T-intersection: local street vs local street
- T-intersection: local street vs collector street
- T-intersection: local street vs major street
- Intersection of local street vs designated trail crossing

Rio Communities Streetlight Projects for CIP

The prioritized list of intersections and planning level budgetary costs for the safety streetlight costs are as follows for the inclusion to the City's CIP project lists:

- **#1:** Manzano Expressway and Hillandale Avenue - $89,000
- **#2:** Rio Communities Boulevard and De Haan Loop - $83,000
- **#3:** Goodman Avenue and Damon Street - $91,500
- **#4:** Goodman Avenue and Hillman Street - $87,000
- **#5:** Horner Street and Hillandale Avenue - $85,500
- **#6:** Horner Street and Walking Trail - $98,000
- **#7:** Horner Street and Kaghan Loop Drive/Suncrest Boulevard - $132,000
- **#8:** Kaghan Loop Drive and Trailhead - $111,500
- **#9:** Horner Street and Goodman Avenue - $87,000
- **#10:** Nancy Lopez Boulevard and Lee Trevino Boulevard - $148,500

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

1. INTRODUCTION

1.1 Background

The City of Rio Communities (City) is located in Valencia County, New Mexico. Rio Communities is part of the Albuquerque Metro area and is approximately 30 miles south of downtown Albuquerque. The City is located along the east side of the Rio Grande River in central-southeastern Valencia County and consists of mainly residential developments. Figure 1 shows the vicinity map of Rio Communities.

Figure 1: Rio Communities Vicinity Map in New Mexico

Prior to its incorporation on May 16, 2013, the City was a census-designated place and there were approximately 4,750 people living in the City according to 2020 census records. Figure 2 shows the City boundary. The residents of Rio Communities have diverse backgrounds and come to the City from all over the US and the world. This diverse makeup and independent spirit make Rio Communities a unique community on the Rio Grande that sets it apart from its neighbors.

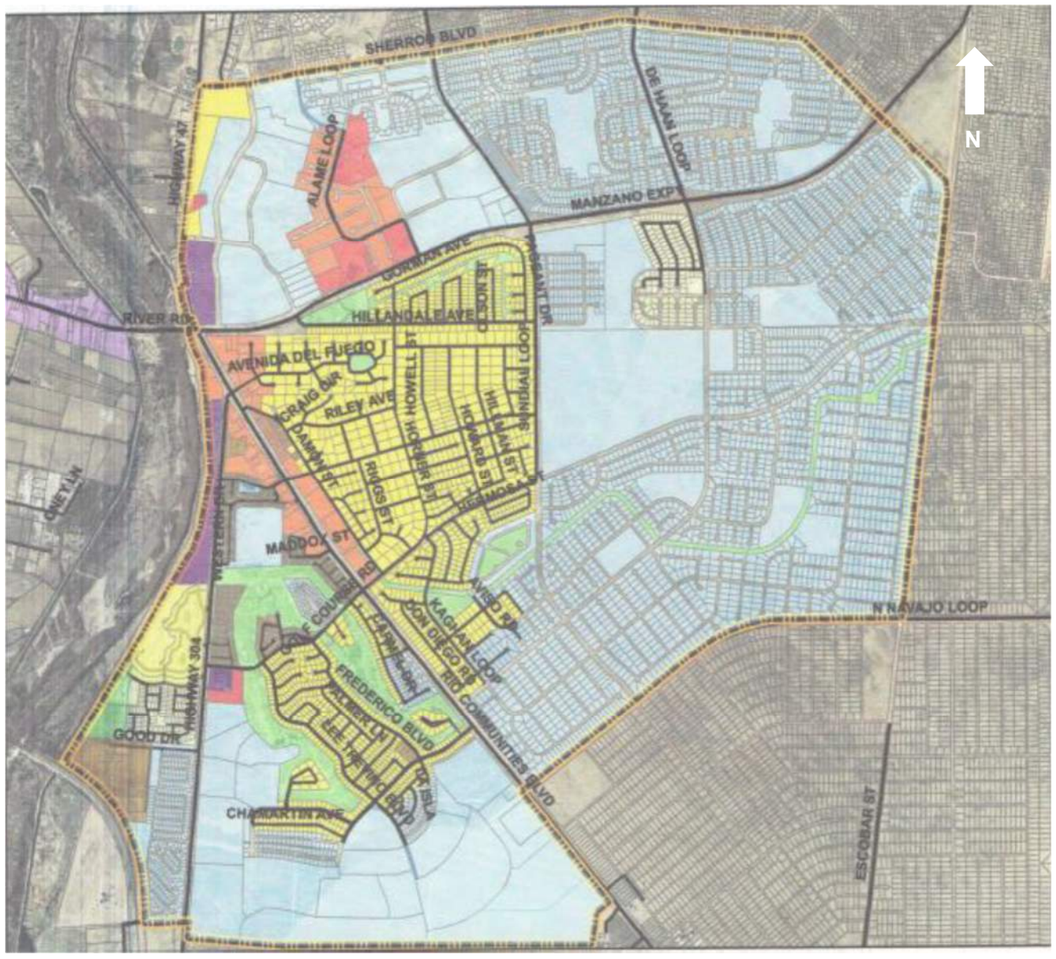


Figure 2: Rio Communities City Map (Source: www.riocommunities.net)

The transportation network in the City consists of two main roadways that provide mobility to the residents: NM 47 (Rio Communities Blvd) and Manzano Expressway. There are also many local roadways throughout the City that provide multimodal connectivity to the residents.

1.2 Project Objectives and Actions

HDR, as the subject matter expert and trusted advisor to the City, was commissioned to perform a comprehensive study and develop a safety streetlight plan for the City. To fulfill the objectives of this project, the team performed the following tasks:

- Inventoried existing roadway condition data – 10 intersections
- Collected vehicular, pedestrian, and bicyclist traffic volumes – 10 intersections
- Identified the need for safety streetlights at intersections and trail crossings
- Prioritized the list of locations into short and long-term improvements
- Developed lighting guidelines for implementation
- Developed project scopes and budgetary costs for the inclusion in the City's Capital Improvement Program (CIP) – 10 intersections
- Developed conceptual lighting layouts for the City's use for planning short-term improvements and planning-level cost estimates for potential grant applications – 10 intersections

1.3 Study Area

The project team initially identified a total of thirty-eight (38) intersections, including both roadway intersections and trail crossings. Table 1 (to the right) shows the initial list of 38 intersections. The project team then interviewed City personnel and reviewed City planning documents and projects planned for near-term improvements to narrow down the list to the top ten (10) intersections for further analysis:

- Manzano Expressway & Hillandale Avenue
- SR47 & De Haan Loop
- Hillandale Avenue & Horner Street
- Goodman Avenue & Damon Street
- Goodman Avenue & Horner Street
- Horner St. & Kaghan Loop
- Goodman Avenue & Hillman Street
- Kaghan Loop & Trail head
- Horner Street & Walking Trail
- Nancy Lopez Boulevard & Lee Trevino Drive

Table 1: Initial List of Intersections for Safety Streetlight Plan Development

No.	First Street	Second Street
1	Manzano Expy.	Hillandale Ave.
2	SR47	De Haan Loop
3	Hillandale Ave.	Horner St.
4	Goodman Ave.	Damon St.
5	Goodmn Ave.	Horner St.
6	Horner St.	Kaghan Loop
7	Goodman Ave.	Hillman St.
8	Kaghan Loop	Trail head
9	Horner St.	Walking Trail
10	Nancy Lopez Blvd.	Lee Trevino Dr.
11	SR47	Nancy Lopez Blvd.
12	Nancy Lopez Blvd.	Frederico Blvd.
13	Horizon Vista Blvd.	Western Dr.
14	SR304	Chisum Trail
15	SR47	Horner St.
16	Hillandale Ave.	Walking Trail
17	SR47	Montano Ct.
18	Horner St.	Damon St.
19	Lee Trevino Dr.	Brown Dr.
20	Lee Trevino Dr.	Jack Nicklaus Dr.
21	Frederico Blvd.	January Dr.
22	Frederico Blvd.	Brown Dr.
23	Manzano Expy.	De Haan Loop
24	San Lucas Ave.	Lee Trevino Dr.
25	Brown Dr.	Palmer Ln.
26	San Lucas Ave.	Nancy Lopez Blvd.
27	Don Diego Rd.	Kaghan Loop
28	Horizon Vista Blvd.	Rio Communities Way
29	Hillandale Ave.	Olson St.
30	Hillandale Ave.	MoragaSt.
31	Kaghan Loop	Potential Park Location
32	Pageant St.	Potential Park Location
33	Logan St.	Trail head
34	Moraga St.	Trail head
35	Nash St.	Trail head
36	Norma St.	Trail head
37	Olson St.	Trail head
38	Macy Ct.	Trail Head

2. EXISTING CONDITION

The transportation network in the City consists of two main roadways that provide mobility to the residents: NM 47 (Rio Communities Blvd) and Manzano Expressway. Per the Mid-Region Council of Governments (MRCOG) Rio Communities 2020 Traffic Counts map (Figure 3), Manzano Expressway has an average daily traffic (ADT) of 2,500 vehicles per day (vpd) within the project area and therefore is designated as a collector street per RP-8-21 definitions. NM 47 (Rio Communities Blvd) has an ADT of 4,100 to 5,700 vpd within the project area and therefore is designated as a major street per RP-8-21 definitions. The remainder of the roads within the project area are assumed to be local streets that provide multimodal connectivity to the community.

Figure 3: Rio Communities 2020 Traffic Count Map

The project team collected morning, mid-day, and afternoon peak hour traffic counts, as well as pedestrian and bicyclist volumes. The project team also collected information on existing roadway conditions, lighting conditions, presence of sidewalks, and proximity to parks or schools. Table 2 shows the detailed existing conditions inventory for the 10 study intersections. Additionally, the team obtained information on right-of-way boundaries and potential nearby power sources using the Valencia County assessors website parcel viewer.

Table 2: Existing Condition Inventory for 10 Study Intersections

Intersection	Vehicle Volume	Pedestrain and Bicycle Volume	Existing Lighting	Sidewalk Presence	Speed Limit	Intersection Control	Sight Visibility	Near Park/ School
	Max in 1 hour	Max in 1 hour	Yes/No	Yes/No	Max			
HORNER ST @ HILLANDALE AVE	176	0	No	No	25	All-way Stop	Vegetation	Park
HORNER ST @ GOODMAN AVE	139	0	No	No	25	All-way Stop	Vegetation	No
RIO COMMUNITIES BLVD @ DE HAAN LOOP	232	0	No	No	45	1-way Stop	None	No
MANZANO EXPRESSWAY @ HILLANDALE AVE	434	0	Yes	No	40	1-way Stop	None	Park
GOODMAN @ DAMON	152	0	No	No	25	2-way Stop	Vegetation	No
NANCY LOPEZ @ LEE TREVINO	59	10	No	Yes	25	2-way Stop	None	No
HORNER ST @ TRAIL	32	0	No	No	25	None	Wall	Park
HORNER ST @ KAGHAN LOOP @ SUNCREST	81	1	No	Yes	25	1-way Stop	None	No
KAGHAN LOOP @ TRAILHEAD	35	0	No	Yes	20	None	Wall	Park
GOODMAN @ HILLMAN	36	0	No	No	25	2-way Stop	Wall	No

Note:

1. Vehicle volume is the maximum number of vehicles in an hour among morning, mid-day, and afternoon peak periods, based on manual counts
2. Pedestrian and bicyclist volume is the maximum number of pedestrian and bicycles in an hour among morning, mid-day, and afternoon peak periods, based on manual counts
3. Speed limit is in miles per hour based on review of readily available imagery

3. INTERSECTION EVALUATION AND PRIORITIZATION

3.1 Evaluation Methods and Criteria

One objective of this project was to evaluate intersections within the City for the prioritization of street lighting improvements. Typically, an analysis of crash data would be completed, and intersections with a higher amount of pedestrian-involved, bicyclist-involved, or night-time crashes would be prioritized. Due to the lack of available crash data in the City, the project team developed three alternative comparison methods referencing the existing conditions and traffic count data:

- Comparisons by independent attributes
- Pair-wise comparisons among intersections
- Measles Chart qualitative comparison

The project team evaluated the top ten intersections that have been identified per discussions with City staff and by a review of City planning documents. These ten intersections are presented in Figure 4.

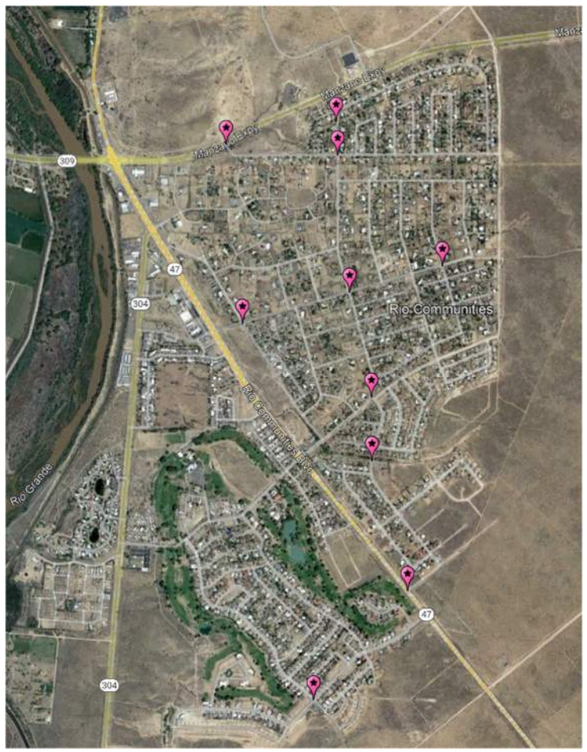


Figure 4: Top Ten Intersections (Each Intersection Is Shown as Star Pins) Selected for Evaluation

3.1.1 Method #1: Comparison by Independent Attributes

The first method used to compare the ten intersections was to review seven independent attributes to determine they relate to the safety at each intersection. Each of these independent attributes were evaluated for each of the ten intersections by assigning a value of zero or one, with a value of one indicating that the intersection is more likely to be prioritized for lighting improvements.

- Peak hour vehicular volume (to supplement lack of average daily traffic and nighttime traffic data)
  - Higher vehicular volumes create more potential points of conflict
  - Intersection was given a value of 1 with a higher volume than the average of all ten intersections
- Peak hour pedestrian & bicyclist volume (to supplement lack of nighttime pedestrian and bicycle volume data)
  - Higher pedestrian and bicyclist volumes represent more use and more potential points of conflict
  - Intersection was given a value of 1 with presence of any pedestrian or bicyclist volumes
- Existing sidewalk
  - If there is existing sidewalk, pedestrians are less likely to walk in the street
  - Intersection was given a value of 1 if there was no existing sidewalk
- Posted speed
  - Higher speeds contribute to a greater chance of fatality or injury in the event of a crash
  - Intersection was given a value of 1 with posted speed of 40 MPH or greater on intersecting streets
- Intersection stop control
  - Intersections with less stop control are more likely to have a conflict
  - Intersection was given a value of 1 if any of the approaches were not stop controlled (exception for the trail crossing intersections)
- Sight visibility issues that may be present
  - Intersections with sight visibility issues are more likely to have a conflict
  - Intersections were given a value of 1 if a sight visibility concern was identified
- Proximity to a park or school
  - Intersections near a park or school may have higher pedestrian activity at night or dusk time
  - Intersections were given a value of 1 if these are within ¼ mile of a park or school

Each intersection's score across all the attributes was added up, and the intersections with the highest scores were ranked the highest. The scoring and rank based on this method of evaluation are presented in Table 3.

Table 3: Comparison by Independent Attributes

Intersection	Scoring								Rank
	Vehicle	Ped/Bike	Sidewalk	Speed	Stop Control	Sight Visibility	Park/School	Total	
HORNER ST @HILLANDALE AVE	1	0	1	0	0	0	1	3	3
HORNER ST @GOODMAN AVE	1	0	1	0	0	0	0	2	7
RIO COMMUNITIES BLVD @DE HAAN LOOP	1	0	1	1	1	0	0	4	2
MANZANO EXPRESSWAY @HILLANDALE AVE	1	0	1	1	1	0	1	5	1
GOODMAN @DAMON	1	0	1	0	1	0	0	3	3
NANCY LOPEZ @LEE TREVINO	0	1	0	0	1	0	0	2	7
HORNER ST @TRAIL	0	0	1	0	0	1	1	3	3
HORNER ST @KAGHAN LOOP @ SUNCREST	0	1	0	0	1	0	0	2	7
KAGHAN LOOP @TRAILHEAD	0	0	0	0	0	1	1	2	7
GOODMAN @HILLMAN	0	0	1	0	1	1	0	3	3

3.1.2 Method #2: Pair-Wise Comparison Among Intersections

This method of comparison requires a matrix to be set up to compare each of the ten intersections one-on-one to determine which intersection should be prioritized for lighting improvements. For each pair, the intersection determined to be more in need of lighting improvements was given a one (1), while the other intersection was given a zero (0). If the intersections' need of lighting improvements were determined to be about the same (tie), each intersection was assigned a value of 0.5.

The determinations are made based on consideration of many factors together, as well as engineering judgement. Each intersection's score was added up, and ranks were assigned with the higher scores receiving higher ranks. The scoring and rank based on this method of evaluation is presented in Table 4.

Table 4: Pair-Wise Comparison

Intersection	HORNER ST @ HILLANDALE AVE	HORNER ST @ GOODMAN AVE	RIO COMMUNITIES BLVD @ DE HAAN LOOP	MANZANO EXPRESSWAY @ HILLANDALE AVE	GOODMAN @ DAMON	NANCY LOPEZ @ LEE TREVINO	HORNER ST @ TRAIL	HORNER ST @ KAGHAN LOOP @ SUNCREST	KAGHAN LOOP @ TRAILHEAD	GOODMAN @ HILLMAN	Sum	Rank
HORNER ST @HILLANDALE AVE	-	0.5	0	0	0	1	1	0	0.5	1	4	6
HORNER ST @GOODMAN AVE	0.5	-	0	0	0	1	1	0	1	0	3.5	7
RIO COMMUNITIES BLVD @DE HAAN LOOP	1	1	-	0.5	1	1	1	0.5	1	1	8	1
MANZANO EXPRESSWAY @HILLANDALE AVE	1	1	0.5	-	1	1	1	0.5	1	1	8	1
GOODMAN @DAMON	1	1	0	0	-	1	1	0.5	1	0.5	6	4
NANCY LOPEZ @LEE TREVINO	0	0	0	0	0	-	0.5	0	0.5	0	1	9
HORNER ST @TRAIL	0	0	0	0	0	0.5	-	0	0.5	0	1	9
HORNER ST @KAGHAN LOOP @ SUNCREST	1	1	0.5	0.5	0.5	1	1	-	1	0.5	7	3
KAGHAN LOOP @TRAILHEAD	0.5	0	0	0	0	0.5	0.5	0	-	0	1.5	8
GOODMAN @HILLMAN	0	1	0	0	0.5	1	1	0.5	1	-	5	5

3.1.3 Method #3: Measles Chart – Qualitative Comparison

This system ranks the need for lighting improvements based on a qualitative assessment of each of the following seven attributes for each intersection: peak hour vehicular volume, peak hour pedestrian and bicyclist volumes, presence of existing sidewalk, posted speed, intersection stop control, sight visibility issues, and proximity to a park or school. Each intersection is assigned either a fully filled circle, half-filled circle, or empty circle based on the necessity of lighting improvements per the existing condition of the seven attributes in three different scales:

- ❖ Most urgent need (◍)
- ❖ Moderately urgent need (◐)
- ❖ Less urgent need, given limited availability of funds (○)

This method provides a visual representation of which intersections may have a greater need for lighting improvements based on the chosen attributes. Later, the intersections are prioritized based on visual inspections and presence of more filled circles. The scoring and rank based on this method of evaluation are presented in Table 5.

Table 5: Measles Chart - Qualitative Comparison

Intersection	Scoring								Rank
	Vehicle	Ped/Bike	Lighting	Sidewalk	Speed	Stop Control	Sight Visibility	Park/School	
HORNER ST @HILLANDALE AVE	◐	○	○	◍	○	○	◐	◐	6
HORNER ST @GOODMAN AVE	◐	○	○	◍	○	○	◐	○	8
RIO COMMUNITIES BLVD @DE HAAN LOOP	◍	○	○	◍	◍	◍	○	○	2
MANZANO EXPRESSWAY @HILLANDALE AVE	◍	○	○	◍	◍	◍	○	◐	1
GOODMAN @DAMON	◐	○	○	◍	○	◍	◐	○	3
NANCY LOPEZ @LEE TREVINO	○	◍	○	○	○	◍	○	○	8
HORNER ST @TRAIL	○	○	○	◍	○	◐	◍	◐	3
HORNER ST @KAGHAN LOOP @ SUNCREST	○	◐	○	○	○	◍	○	○	10
KAGHAN LOOP @TRAILHEAD	○	○	○	○	○	◐	◍	◍	6
GOODMAN @HILLMAN	○	○	○	◍	○	◍	◍	○	3

3.2 Evaluation Summary

The three methods of evaluation were then considered together to determine a combined ranking of the intersections. The combined ranking is presented in Table 6.

Table 6: Combined Ranking

Intersection	Ranking			
	By Independent Attributes	Pair-wise Comparison	Measles Chart - Qualitative	Combined
HORNER ST @HILLANDALE AVE	3	6	6	5
HORNER ST @GOODMAN AVE	7	7	8	9
RIO COMMUNITIES BLVD @DE HAAN LOOP	2	1	2	2
MANZANO EXPRESSWAY @HILLANDALE AVE	1	1	1	1
GOODMAN @DAMON	3	4	3	3
NANCY LOPEZ @LEE TREVINO	7	9	8	10
HORNER ST @TRAIL	3	9	3	6
HORNER ST @KAGHAN LOOP @ SUNCREST	7	3	10	7
KAGHAN LOOP @TRAILHEAD	7	8	6	8
GOODMAN @HILLMAN	3	5	3	4

The intersections are ranked in order as listed below.

- **Prioritized Intersection #1:** Manzano Expressway and Hillandale Avenue
- **Prioritized Intersection #2:** Rio Communities Boulevard and De Haan Loop
- **Prioritized Intersection #3:** Goodman Avenue and Damon Street
- **Prioritized Intersection #4:** Goodman Avenue and Hillman Street
- **Prioritized Intersection #5:** Horner Street and Hillandale Avenue
- **Prioritized Intersection #6:** Horner Street and Walking Trail
- **Prioritized Intersection #7:** Horner Street and Kaghan Loop Drive/Suncrest Boulevard
- **Prioritized Intersection #8:** Kaghan Loop Drive and Trailhead
- **Prioritized Intersection #9:** Horner Street and Goodman Avenue
- **Prioritized Intersection #10:** Nancy Lopez Boulevard and Lee Trevino Boulevard

4. LIGHTING GUIDELINES FOR RIO COMMUNITIES

The project team developed recommendations and guidelines for streetlight design for the City. The team conducted a comprehensive literature review on national and local New Mexico specific standard practice guidelines, including the following documents.

- The American Association of State Highway and Transportation Officials (AASHTO) Roadway Lighting Design Guide 2018 – refer to Appendix A for detailed criteria
- ANSI/IES RP-8-21 Recommended Practice for Lighting Roadway and Parking Facilities – refer to Appendix B for detailed criteria
- New Mexico Department of Transportation (NMDOT) standards

The project team also performed a series of photometric analyses as part of this report. The recommendations include the following design parameters:

- Intersection lighting design light levels (minimum, maximum and average values) and uniformity ratios
- Potential pole placements at the intersections
- Luminaire wattage

Other relevant lighting criteria was considered as well, to enhance multimodal nighttime safety. All these criteria were applied for different roadway functional classifications (local, collector, and major streets) and variations in intersection geometry.

4.1 Design Guideline: Pole and Mast Arm

The project team referenced NMDOT standard details for pole height, mounting height, foundations, and mast arm length data required for performing the photometric analysis. The team recommends the same parameters for design, supply, and construction in the City as in the rest of the state:

- NMDOT Standard Detail 707L-07-2/10 (Figure 5)
- Roadway lighting type V poles
- Mounting height – 30 feet
- Luminaire mast arm length - 10 feet

It is noted that longer luminaire mast arms might be needed to provide clear zone on roadways with high speed and high traffic volumes. During the final design process, the engineer should collect traffic data, perform photometric analysis, and develop the final design plans before construction.

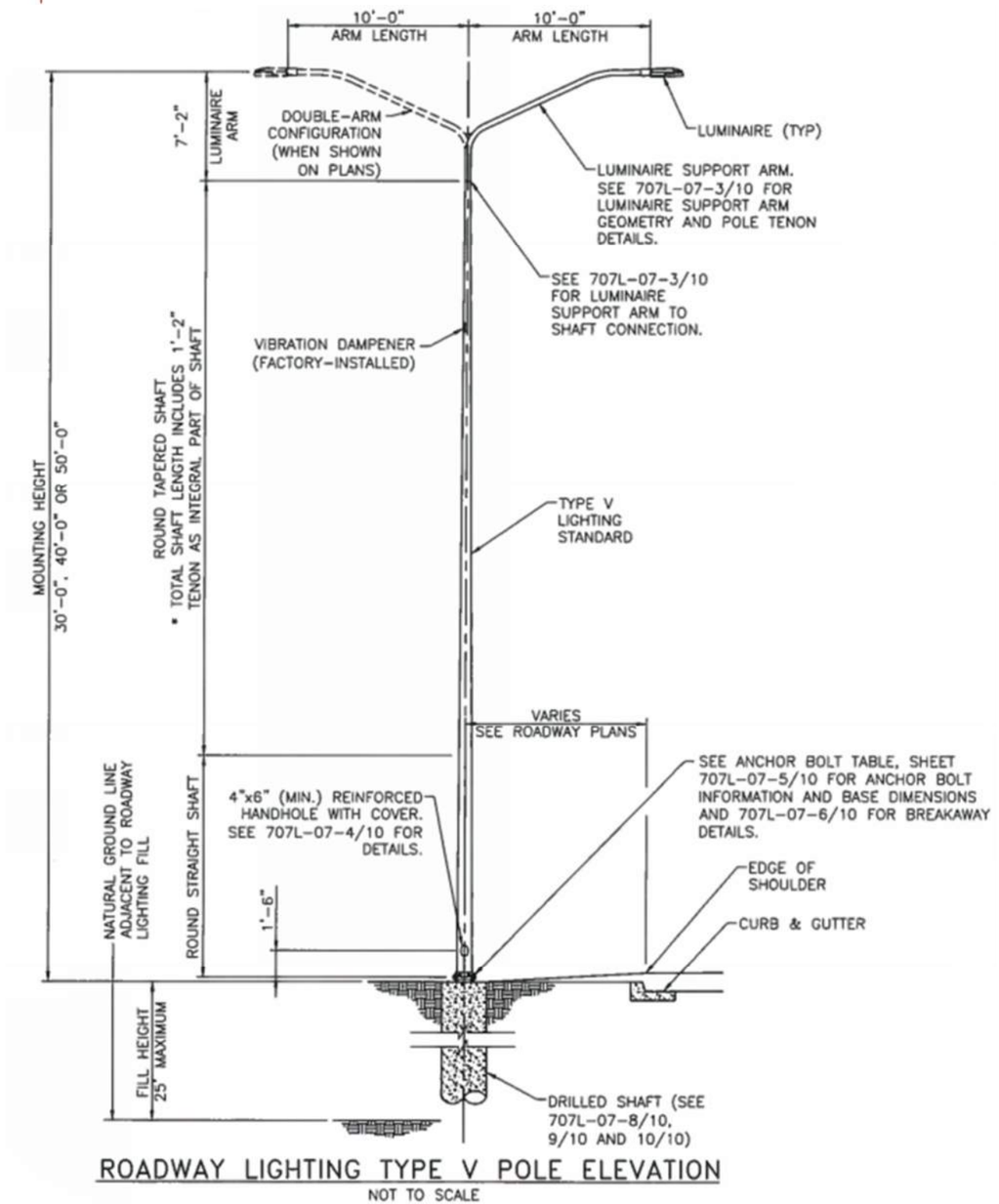


Figure 5: NMDOT Standard Detail 707L-07-2/1

4.2 Design Guideline: Lighting Parameters

Per the project scope, the project team developed a list of five different typical intersection types, based on intersection geometry and functional classification of the intersecting roadways. This list of intersections account for the most common types of intersections throughout the City:

- **Four-legged intersection**: local street vs local street
- **T-intersection**: local street vs local street
- **T-intersection**: local street vs collector street
- **T-intersection**: local street vs major street
- **Intersection of local street vs designated trail crossing**

Based on the identified design standards lighting criteria and existing conditions, the following recommendations for light levels (minimum average illuminance and maximum horizontal uniformity ratio) and light pole placement were developed for each of the five most common different types of intersections throughout the City (Table 7). It is noted that the project team recommends usages of Light Emitting Diodes (LED) lights for both intersection and mid-block roadway lighting. Furthermore, to be in compliance with the New Mexico Night Sky Protection Act:

- All luminaires with fixtures exceeding 500 lumens operating overnight shall be shielded
- Color temperature for all fixtures is not to exceed 3000K
- Light loss factor (which estimates depreciating light levels as equipment ages) is 0.7 for LEDs.

Additionally, the New Mexico Night Sky Protection Act suggests that wattage should be as minimal as possible, and thus the team suggests the wattage be approximately 110 to 130 watts.

Table 7: Intersection Lighting Recommendations

Intersection Type	Minimum Average Illuminance (Fc)*	Maximum Horizontal Uniformity Ratio (Average/Minimum)	Pole Placement
4-legged intersection: local street vs local street	0.7	6.0	See Figure 18
T-intersection: local street vs local street	0.7	6.0	See Figure 18
T-intersection: local street vs collector street	0.9	4.0	See Figure 18
T-intersection: local street vs major street	1.2	3.0	See Figure 18
Intersection of local street vs designated trail crossing	1.9**	-	See Figure 20

*Average illuminance not to exceed 1.5 times the minimum average illuminance

**Criteria for this intersection type is minimum average vertical illuminance

AGi32 lighting analyses were performed using NMDOT standard light poles and mast arms, along with the lighting criteria that were determined for each intersection type. It is noted that General Electric (GE) ERL1 14C530 and GE ERL2 18A530 fixtures were utilized to perform the analyses, which were chosen from the NMDOT Approved Products List (APL) dated February 1, 2022, and different wattage levels chosen as needed. Visual renderings (plan/top and isometric views) were created for each intersection type and are shown in the following figures.

4.2.1 Four-legged Intersection: Local Street & Local Street

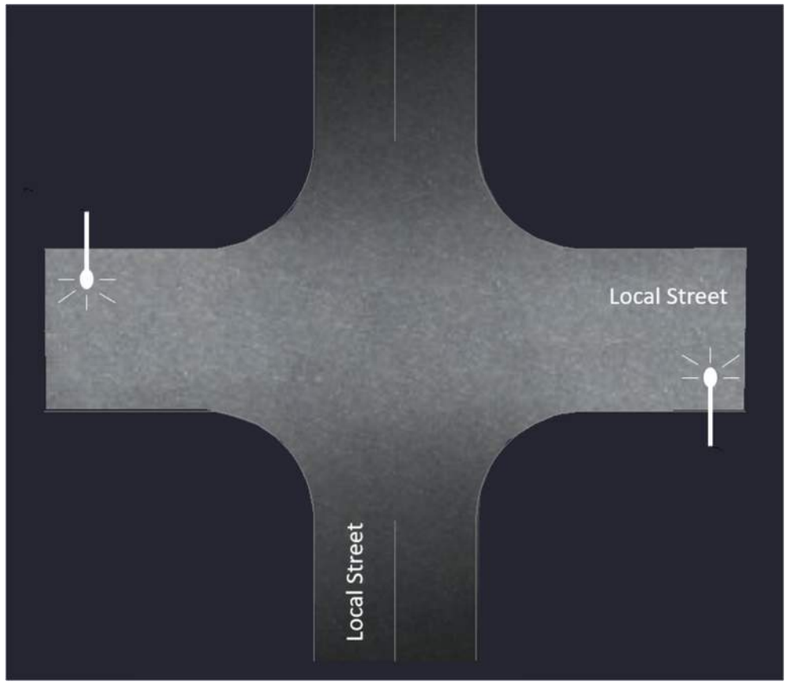


Figure 6: Rendering of 4-Legged Intersection: Local Street vs Local Street – Top View

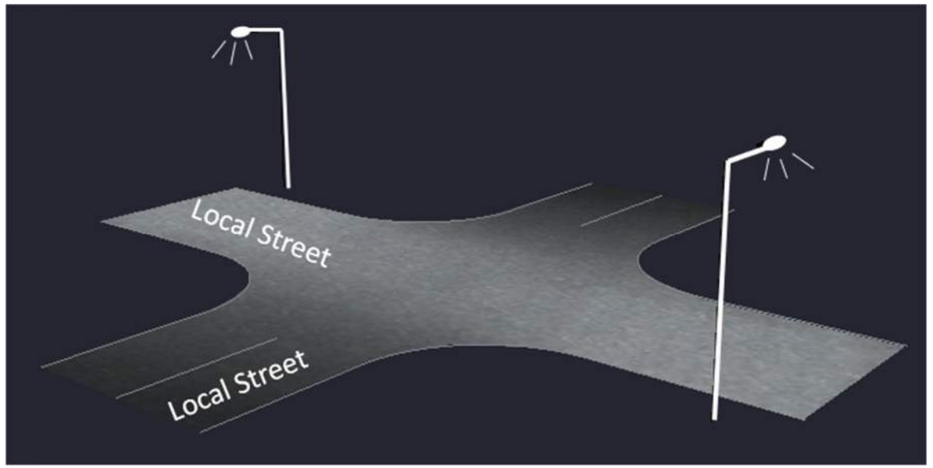


Figure 7: Rendering of 4-Legged Intersection: Local Street vs Local Street – Isometric View

4.2.2 T-intersection: Local Street & Local Street

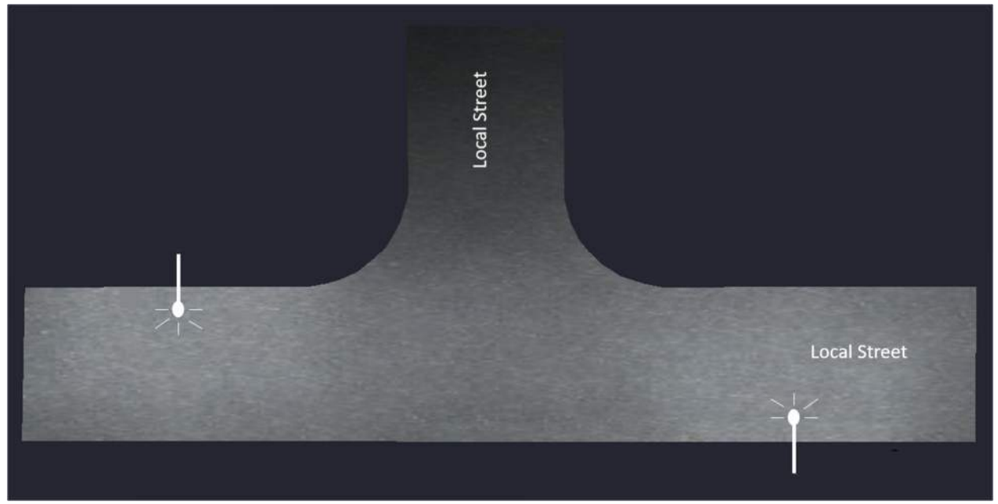


Figure 8: Rendering of T-Intersection: Local Street vs Local Street – Top View

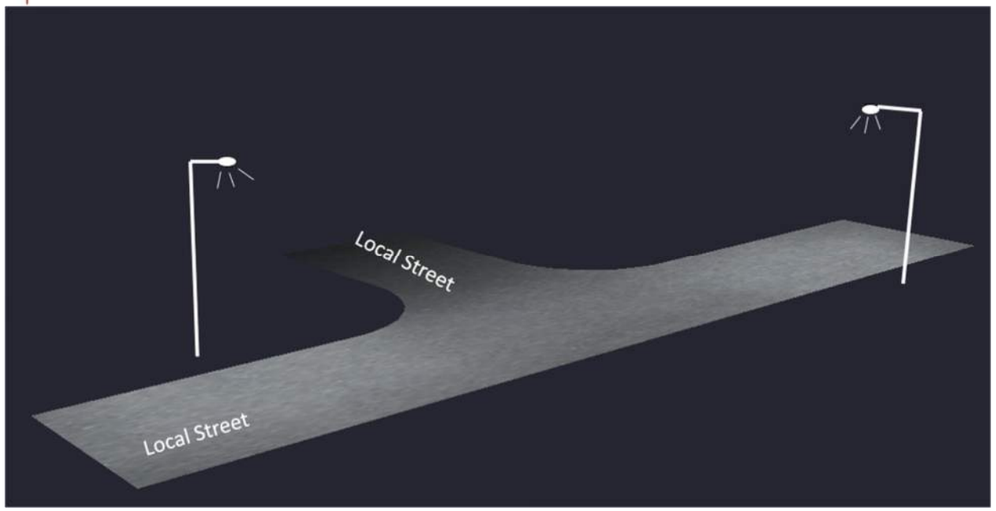


Figure 9: Rendering of T-Intersection: Local Street vs Local Street – Isometric View

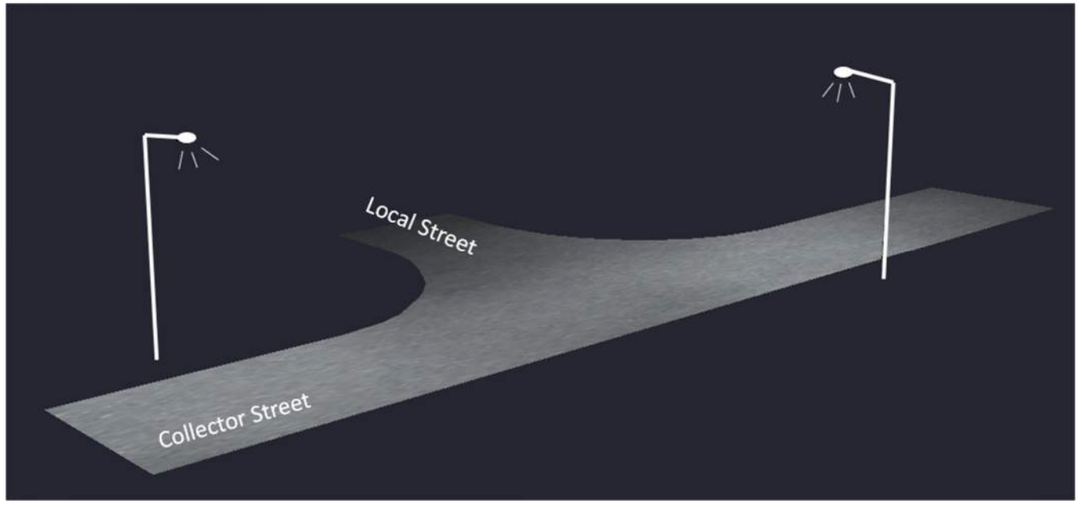


Figure 11: Rendering of T-Intersection: Local Street vs Collector Street – Isometric View

4.2.3 T-intersection: Local Street & Collector Street

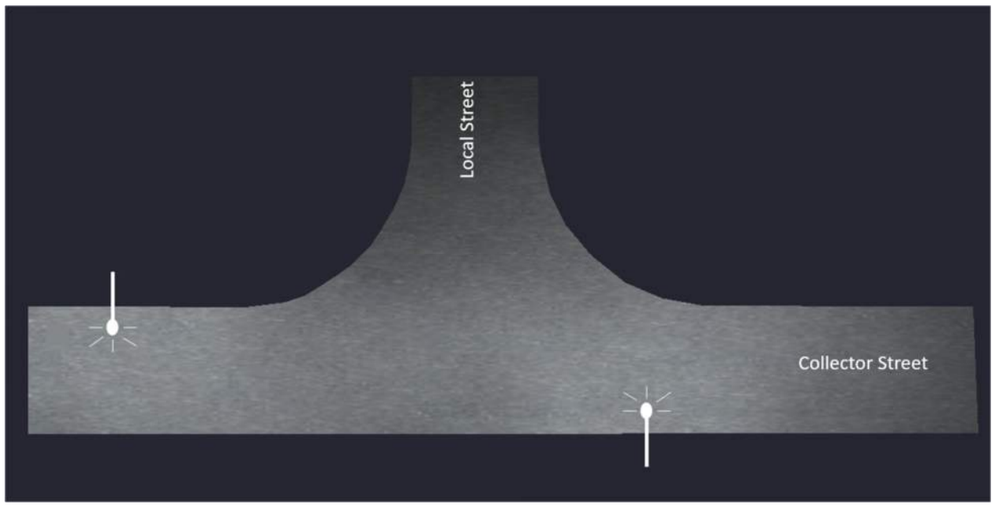


Figure 10: Rendering of T-Intersection: Local Street vs Collector Street – Top View

4.2.4 T-intersection: Local Street & Major Street

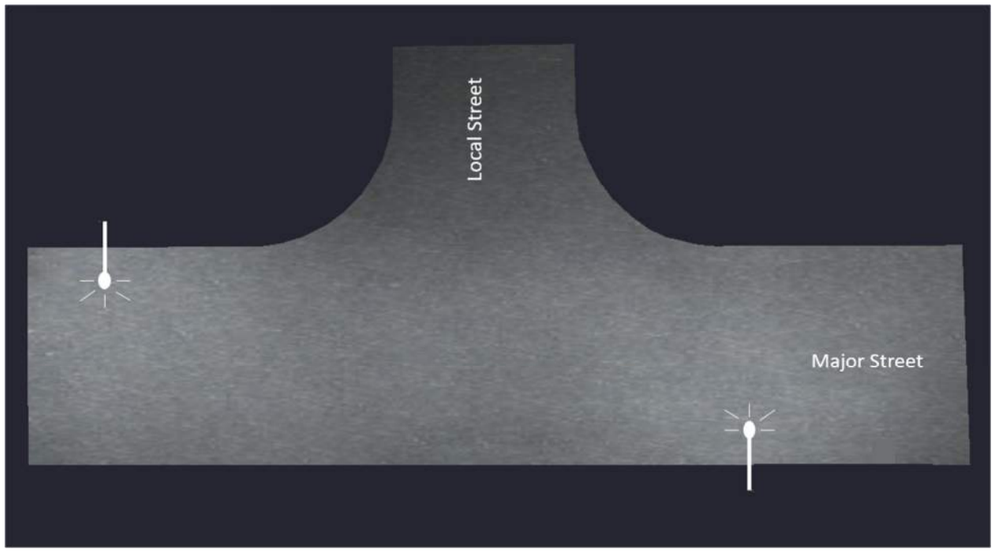


Figure 12: Rendering of T-Intersection: Local Street vs Major Street – Top View

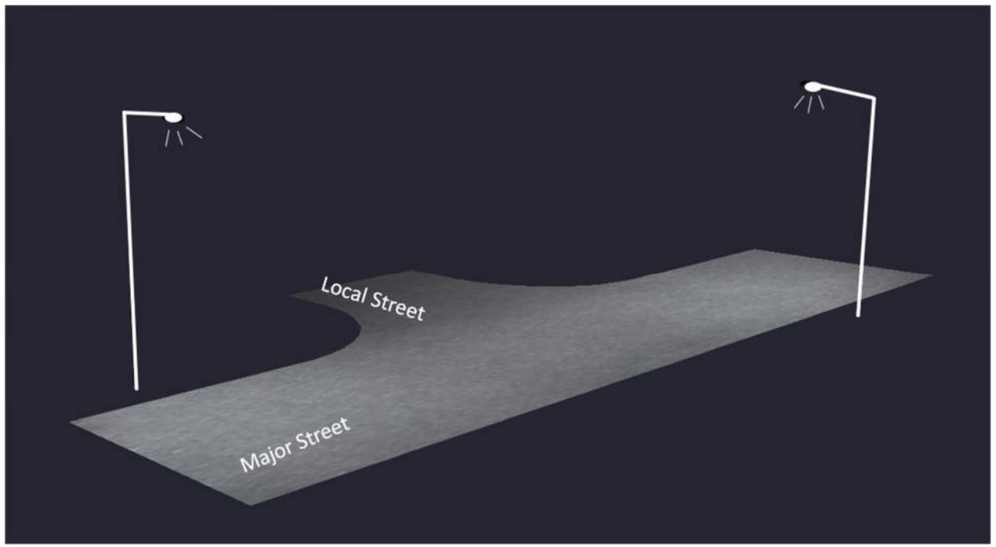


Figure 13: Rendering of T-Intersection: Local Street vs Major Street – Isometric View

4.2.5 Intersection of Local Street & Designated Trail Crossing

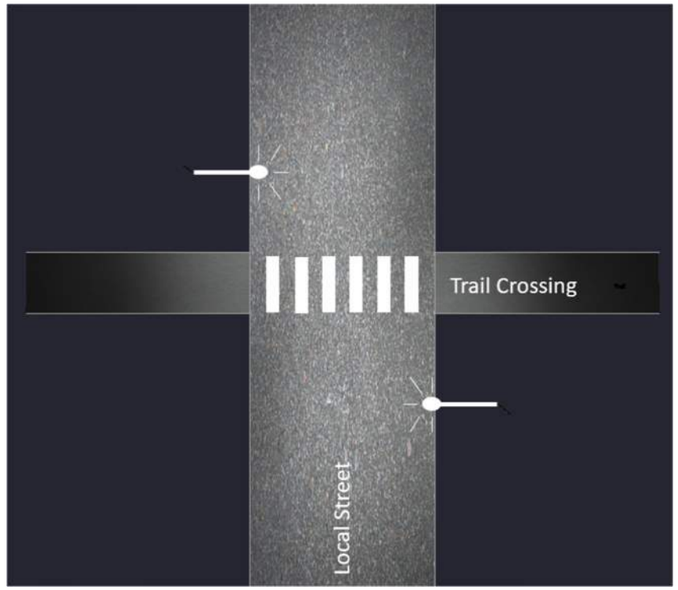


Figure 14: Rendering of Intersection of Local Street vs Designated Trail Crossing – Top View

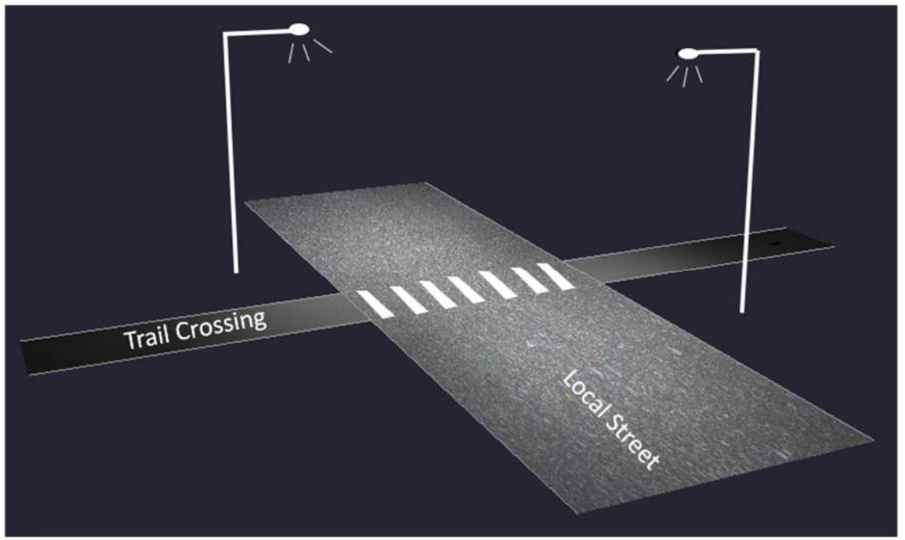


Figure 15: Rendering of Intersection of Local Street vs Designated Trail Crossing – Isometric View

5. FUTURE IMPROVEMENTS FOR CIP LIST

5.1 Short-term Improvements

The project team developed conceptual layouts for the top ten (10) prioritized lighting locations for short-term improvements. These layouts are intended for planning and high-level cost estimating purposes. The City requested the team to account for separate meter pedestal for each intersection. The team identified potential power drop locations, conducted photometric analyses, and identified locations for conduits, pull boxes, and lighting poles for the conceptual plans. The conceptual layouts are on aerial imagery and are not-to-scale. The conceptual layouts are prepared in AutoCAD format and included one (1) plan sheet per location, for a total of ten (10) plan sheets.

The team also developed planning-level cost estimates for the top 10 prioritized projects for inclusion within the City's Capital Improvement Program. The cost estimates sheets include NMDOT bid item numbers for reference. The conceptual quantities (derived from the conceptual design) also include potential right-of-way acquisition needs. The top 10 intersections' planning-level project costs are summarized below. The project summary sheets including project scope, planning-level cost, and conceptual plans are shown on Pages 12 through 31.

- **Prioritized Intersection #1:** Manzano Expressway and Hillandale Avenue - $81,500
  - Refer to Page 12 to 13 for detailed information
- **Prioritized Intersection #2:** Rio Communities Boulevard and De Haan Loop - $75,500
  - Refer to Page 14 to 15 for detailed information
- **Prioritized Intersection #3:** Goodman Avenue and Damon Street - $84,000
  - Refer to Page 16 to 17 for detailed information
- **Prioritized Intersection #4:** Goodman Avenue and Hillman Street - $79,500
  - Refer to Page 18 to 19 for detailed information
- **Prioritized Intersection #5:** Horner Street and Hillandale Avenue - $78,000
  - Refer to Page 20 to 21 for detailed information
- **Prioritized Intersection #6:** Horner Street and Walking Trail - $90,500
  - Refer to Page 22 to 23 for detailed information
- **Prioritized Intersection #7:** Horner Street and Kaghan Loop Drive/Suncrest Boulevard - $124,500
  - Refer to Page 24 to 25 for detailed information
- **Prioritized Intersection #8:** Kaghan Loop Drive and Trailhead - $104,000
  - Refer to Page 26 to 27 for detailed information
- **Prioritized Intersection #9:** Horner Street and Goodman Avenue - $79,000
  - Refer to Page 28 to 29 for detailed information
- **Prioritized Intersection #10:** Nancy Lopez Boulevard and Lee Trevino Boulevard - $141,000
  - Refer to Page 30 to 31 for detailed information

5.2 Long-term Improvements

The project team identified a total of 38 intersections for safety-related street lighting improvements. The top 10 intersections were identified as short-term improvements. The remaining 28 intersections were identified for long-term improvements:

- SR47 & Nancy Lopez Boulevard
- Nancy Lopez Boulevard & Frederico Boulevard
- Horizon Vista Boulevard & Western Drive
- SR304 & Chisum Trail
- SR47 & Horner Street
- Hillandale Avenue & Walking Trail
- SR47 & Montano Court
- Horner Street & Damon Street
- Lee Trevino Drive & Brown Drive
- Lee Trevino Drive & Jack Nicklaus Drive
- Frederico Boulevard & January Drive
- Frederico Boulevard & Brown Drive
- Manzano Expressway & De Haan Loop
- San Lucas Avenue & Lee Trevino Drive
- Brown Drive & Palmer Lane
- San Lucas Avenue & Nancy Lopez Boulevard
- Don Diego Road & Kaghan Loop
- Horizon Vista Boulevard & Rio Communities Way
- Hillandale Avenue & Olson Street
- Hillandale Avenue & Moraga Street
- Kaghan Loop & Potential Park Location
- Pageant Street & Potential Park Location
- Logan Street & Trail head
- Moraga Street & Trail head
- Nash Street & Trail head
- Norma Street & Trail head
- Olson Street & Trail head
- Macy Court & Trail Head

Figure 16 on Page 32 shows the intersections for long-term improvements.

PROJECT SHEET:
Rio Communities Streetlight Project # 1 – Manzano Expressway and Hillandale Avenue

Project ID:

Streetlight Project #1 - Manzano Expressway and Hillandale Avenue

Project Location:

Intersection of Manzano Expressway and Hillandale Avenue

Project Budget:

$89,000.00

Responsible for Maintenance:

City of Rio Communities

Project Description:

Streetlights are being installed to improve the overall safety and functionality of the intersection.

Project Scope:

Project includes design and installation of the following items:

- 2 Luminaire Poles (Type V Standard, 30')
- 2 LED Luminaires
- 2 Light Pole Foundations
- 6 Electrical Pull Box (Standard)
- 1 Meter Pedestal
- 355 LF of Rigid Electrical Conduit
- 1,215 LF of Single Conductor 10 Wiring

Streetlight Project #1 - Manzano Expressway and Hillandale Avenue					
NMDOT ITEM NO.	SHORT DESCRIPTION	UNIT	ESTIMATE UNIT PRICE	ESTIMATE QUANTITY	ESTIMATE AMOUNT
502030	DRILLED SHAFT FOUNDATION 30" DIAMETER	L.F.	$200.00	12.00	$2,400.00
540060	REINFORCING BARS GRADE 60	LB	$2.60	306.00	$795.60
511000	STRUCTURAL CONCRETE, CLASS A	CY	$1,125.00	8.60	$9,675.00
706210	METER PEDESTAL (LIGHTING)	EACH	$8,500.00	1.00	$8,500.00
706350	POWER SERVICE INSTALLATION	EACH	$5,000.00	1.00	$5,000.00
707540	TYPE V STANDARD, 30'	EACH	$4,000.00	2.00	$8,000.00
709020	RIGID ELECTRICAL CONDUIT 2" (DIA.)	L.F.	$12.72	355.00	$4,515.60
710000	ELECTRICAL PULL BOX (STANDARD)	EACH	$640.00	6.00	$3,840.00
711110	SINGLE CONDUCTOR 10	L.F.	$1.50	1,215.00	$1,822.50
716701	LED ROADWAY LUMINAIRE	EACH	$750.00	2.00	$1,500.00
621000	MOBILIZATION	LS	$2,500.00	1.00	$2,500.00
618000	TRAFFIC CONTROL	LS	$1,000.00	1.00	$1,000.00
SUBTOTAL					$49,548.70
CONTINGENCY			25%		$12,387.18
COVID INFLATION			15%		$7,432.31
TOTAL					$69,368.18
SURVEY					$3,000.00
DESIGN					$10,000.00
TOTAL					$82,368.18
NEW MEXICO TAX			7.9375%		$6,537.97
FINAL TOTAL (ROUNDED)					**$89,000.00**

N

LEGEND

- LUMINAIRE POLE
- PULL BOX
- CONDUIT
- LIGHTING METER (MP#)
- POTENTIAL POWER DROP LOCATION (PD#)
- INTERSECTION LOCATION

KEY MAP

GENERAL NOTE:
LUMINAIRE POLES ARE TO BE PLACED APPROXIMATELY 7 FEET FROM EDGE OF PAVEMENT OR APPROXIMATELY 1.5 FEET FROM BACK OF SIDEWALK, IF SIDEWALK EXISTS.

PRELIMINARY PLAN
NOT FOR
CONSTRUCTION

2155 LOUISIANA BLVD NE
SUITE 9500
ALBUQUERQUE, NM 87110
(505) 830-5400

MARK	DATE	DESCRIPTION	BY

EXHIBIT / CONCEPTUAL PLAN

RIO COMMUNITIES
STREETLIGHT SAFETY PLAN

DESIGNED:	MCS	MANZANO EXPY & HILANDALE AVE INTERSECTION LIGHTING LAYOUT RIO COMMUNITIES, NM	DATE: 04/2022
DRAWN:	SD		
CHECKED:	SP		
SCALE:	NTS		

PROJECT SHEET:
Rio Communities Streetlight Project # 2 – SR 47 and De Haan Loop

Project ID:

Streetlight Project #2 - SR 47 and De Haan Loop

Project Location:

Intersection of SR 47 and De Haan Loop

Project Budget:

$83,000.00

Responsible for Maintenance:

City of Rio Communities

Project Description:

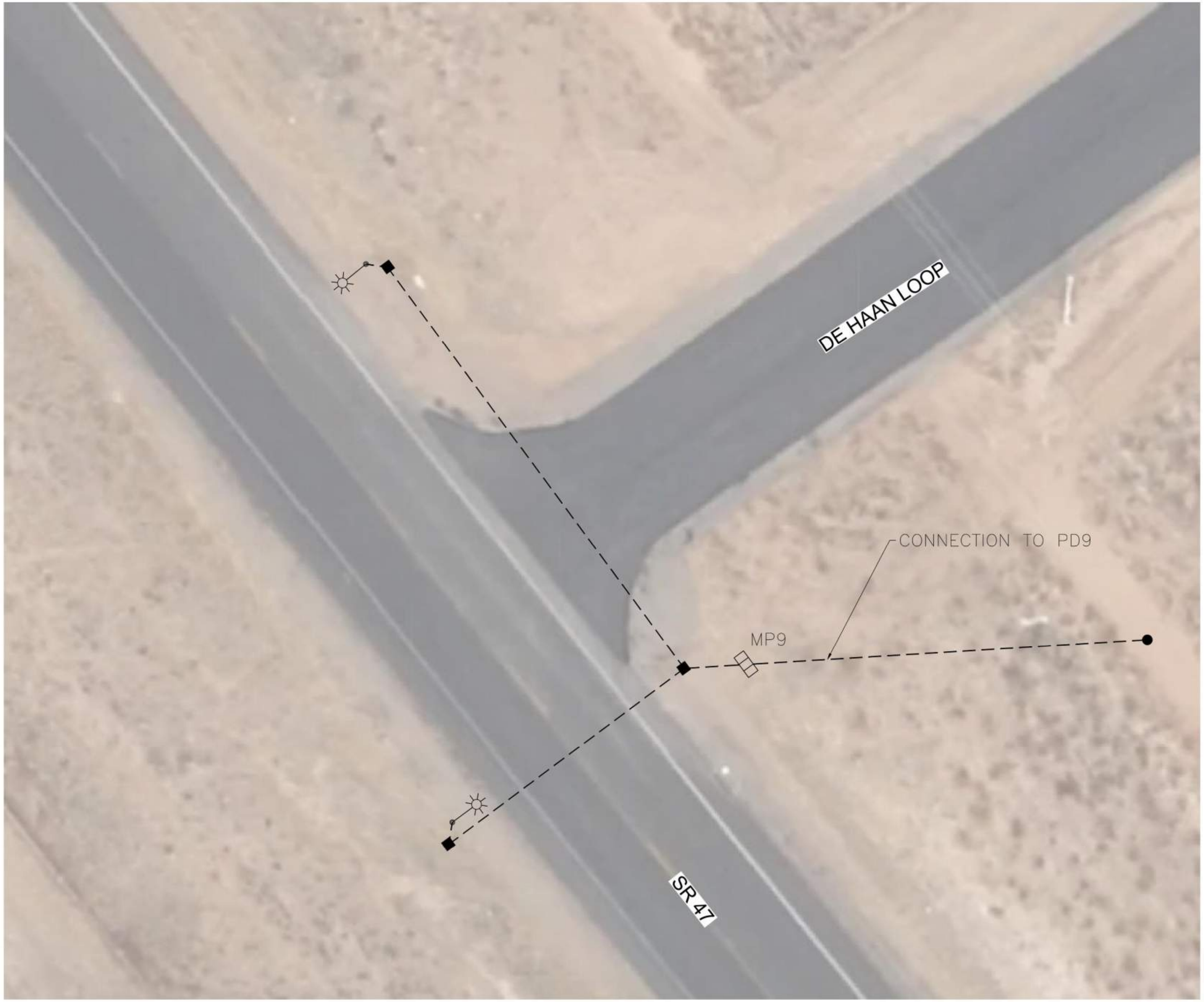
Streetlights are being installed to improve the overall safety and functionality of the intersection.

Project Scope:

Project includes design and installation of the following items:

- 2 Luminaire Poles (Type V Standard, 30')
- 2 LED Luminaires
- 2 Light Pole Foundations
- 3 Electrical Pull Box (Standard)
- 1 Meter Pedestal
- 233 LF of Rigid Electrical Conduit
- 849 LF of Single Conductor 10 Wiring

Streetlight Project #2 - SR 47 and De Haan Loop					
NMDOT ITEM NO.	SHORT DESCRIPTION	UNIT	ESTIMATE UNIT PRICE	ESTIMATE QUANTITY	ESTIMATE AMOUNT
502030	DRILLED SHAFT FOUNDATION 30" DIAMETER	L.F.	$200.00	12	$2,400.00
540060	REINFORCING BARS GRADE 60	LB	$2.60	306	$795.60
511000	STRUCTURAL CONCRETE, CLASS A	CY	$1,125.00	8.6	$9,675.00
706210	METER PEDESTAL (LIGHTING)	EACH	$8,500.00	1	$8,500.00
706350	POWER SERVICE INSTALLATION	EACH	$5,000.00	1	$5,000.00
707540	TYPE V STANDARD, 30'	EACH	$4,000.00	2	$8,000.00
709020	RIGID ELECTRICAL CONDUIT 2" (DIA.)	L.F.	$12.72	233	$2,963.76
710000	ELECTRICAL PULL BOX (STANDARD)	EACH	$640.00	3	$1,920.00
711110	SINGLE CONDUCTOR 10	L.F.	$1.50	849	$1,273.50
716701	LED ROADWAY LUMINAIRE	EACH	$750.00	2	$1,500.00
621000	MOBILIZATION	LS	$2,500.00	1	$2,500.00
618000	TRAFFIC CONTROL	LS	$1,000.00	1	$1,000.00
SUBTOTAL					$45,527.86
CONTINGENCY			25%		$11,381.97
COVID INFLATION			15%		$6,829.18
TOTAL					$63,739.00
SURVEY					$3,000.00
DESIGN					$10,000.00
TOTAL					$76,739.00
NEW MEXICO TAX			7.9375%		$6,091.16
FINAL TOTAL (ROUNDED)					**$83,000.00**



LEGEND

- LUMINAIRE POLE
- PULL BOX
- CONDUIT
- LIGHTING METER (MP#)
- POTENTIAL POWER DROP LOCATION (PD#)
- INTERSECTION LOCATION

KEY MAP

GENERAL NOTE:
LUMINAIRE POLES ARE TO BE PLACED APPROXIMATELY 7 FEET FROM EDGE OF PAVEMENT OR APPROXIMATELY 1.5 FEET FROM BACK OF SIDEWALK, IF SIDEWALK EXISTS.

PRELIMINARY PLAN
NOT FOR
CONSTRUCTION

HDR
2155 LOUISIANA BLVD NE
SUITE 9500
ALBUQUERQUE, NM 87110
(505) 830-5400

MARK	DATE	DESCRIPTION	BY

EXHIBIT / CONCEPTUAL PLAN

RIO COMMUNITIES
STREETLIGHT SAFETY PLAN

DESIGNED:	MCS	SR 47 & DE HAAN LOOP INTERSECTION LIGHTING LAYOUT RIO COMMUNITIES, NM	DATE: 04/2022
DRAWN:	SD		
CHECKED:	SP		
SCALE:	NTS		

Date: 22 Mar 2022 - 3:56pm User: SDEY
Drawing Name: 10331609/6.0_CAD_BIM/6.2_WIP/Rio_Communities_Intersection_Exhibits.dwg

PROJECT SHEET:
Rio Communities Streetlight Project # 3 – Goodman Avenue and Damon Street

Project ID:

Streetlight Project #3 - Goodman Avenue and Damon Street

Project Location:

Intersection of Goodman Avenue and Damon Street

Project Budget:

$91,500.00

Responsible for Maintenance:

City of Rio Communities

Project Description:

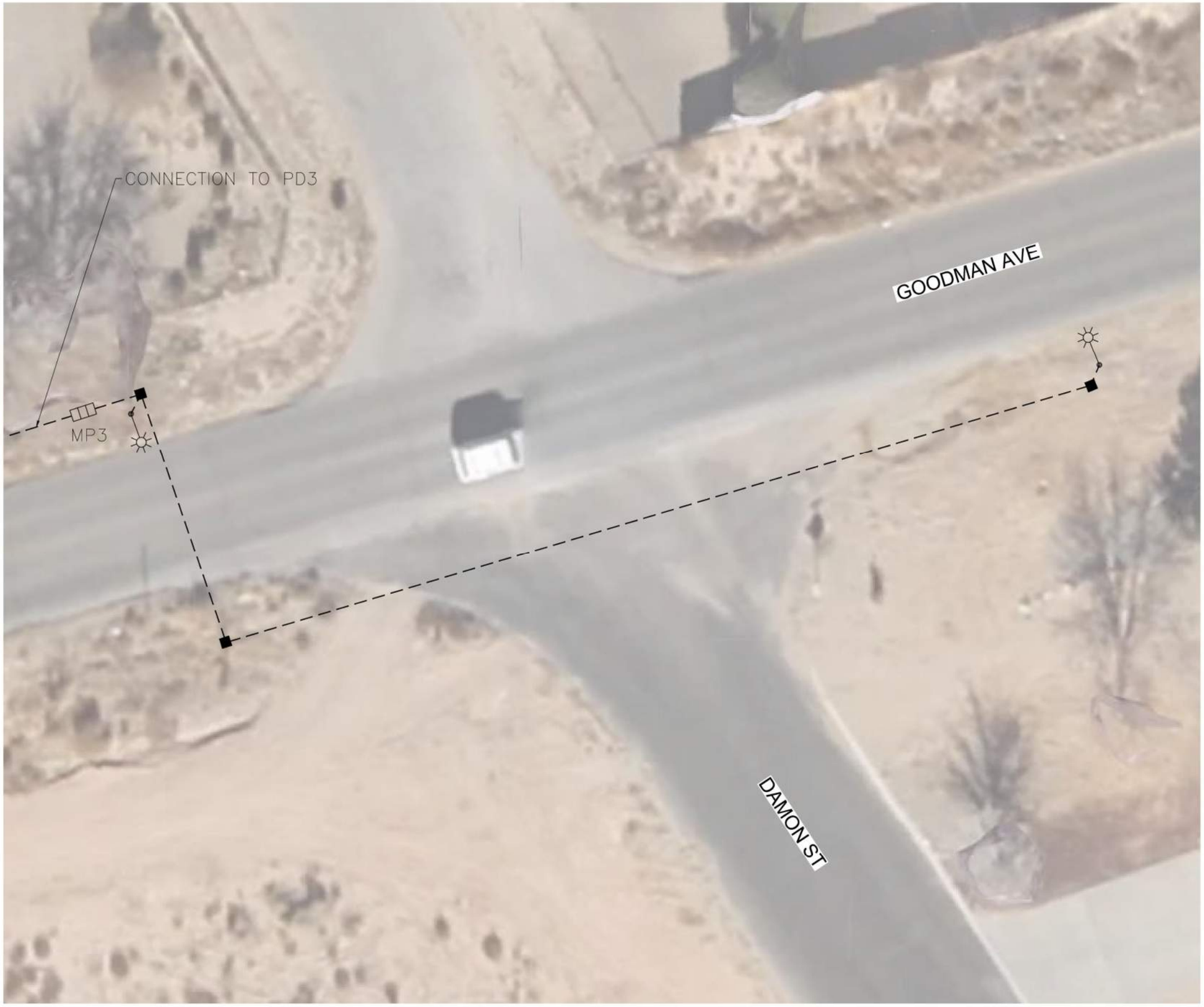
Streetlights are being installed to improve the overall safety and functionality of the intersection.

Project Scope:

Project includes design and installation of the following items:

- 2 Luminaire Poles (Type V Standard, 30')
- 2 LED Luminaires
- 2 Light Pole Foundations
- 3 Electrical Pull Box (Standard)
- 1 Meter Pedestal
- 560 LF of Rigid Electrical Conduit
- 1,830 LF of Single Conductor 10 Wiring

Streetlight Project #3 - Goodman Avenue and Damon Street					
NMDOT ITEM NO.	SHORT DESCRIPTION	UNIT	ESTIMATE UNIT PRICE	ESTIMATE QUANTITY	ESTIMATE AMOUNT
502030	DRILLED SHAFT FOUNDATION 30" DIAMETER	L.F.	$200.00	12	$2,400.00
540060	REINFORCING BARS GRADE 60	LB	$2.60	306	$795.60
511000	STRUCTURAL CONCRETE, CLASS A	CY	$1,125.00	8.6	$9,675.00
706210	METER PEDESTAL (LIGHTING)	EACH	$8,500.00	1	$8,500.00
706350	POWER SERVICE INSTALLATION	EACH	$5,000.00	1	$5,000.00
707540	TYPE V STANDARD, 30'	EACH	$4,000.00	2	$8,000.00
709020	RIGID ELECTRICAL CONDUIT 2" (DIA.)	L.F.	$12.72	560	$7,123.20
710000	ELECTRICAL PULL BOX (STANDARD)	EACH	$640.00	3	$1,920.00
711110	SINGLE CONDUCTOR 10	L.F.	$1.50	1830	$2,745.00
716701	LED ROADWAY LUMINAIRE	EACH	$750.00	2	$1,500.00
621000	MOBILIZATION	LS	$2,500.00	1	$2,500.00
618000	TRAFFIC CONTROL	LS	$1,000.00	1	$1,000.00
SUBTOTAL					$51,158.80
CONTINGENCY			25%		$12,789.70
COVID INFLATION			15%		$7,673.82
TOTAL					$71,622.32
SURVEY					$3,000.00
DESIGN					$10,000.00
TOTAL					$84,622.32
NEW MEXICO TAX			7.9375%		$6,716.90
FINAL TOTAL (ROUNDED)					**$91,500.00**



N

LEGEND

- LUMINAIRE POLE
- PULL BOX
- CONDUIT
- LIGHTING METER (MP#)
- POTENTIAL POWER DROP LOCATION (PD#)
- INTERSECTION LOCATION

KEY MAP

GENERAL NOTE:
LUMINAIRE POLES ARE TO BE PLACED APPROXIMATELY 7 FEET FROM EDGE OF PAVEMENT OR APPROXIMATELY 1.5 FEET FROM BACK OF SIDEWALK, IF SIDEWALK EXISTS.

PRELIMINARY PLAN
NOT FOR CONSTRUCTION

2155 LOUISIANA BLVD NE
SUITE 9500
ALBUQUERQUE, NM 87110
(505) 830-5400

MARK	DATE	DESCRIPTION	BY

EXHIBIT / CONCEPTUAL PLAN
RIO COMMUNITIES
STREETLIGHT SAFETY PLAN

DESIGNED:	MCS	GOODMAN AVE & DAMON ST INTERSECTION LIGHTING LAYOUT RIO COMMUNITIES, NM	DATE: 04/2022
DRAWN:	SD		
CHECKED:	SP		
SCALE:	NTS		

Date: 22 Mar 2022 - 3:55pm User: SDEY
Drawing Name: 10531609/6.0_CAD_BIM/6.2_MP/Rio_Communities_Intersection_Exhibit.dwg

PROJECT SHEET:
Rio Communities Streetlight Project # 4 – Goodman Avenue and Hillman Street

Project ID:

Streetlight Project #4 - Goodman Avenue and Hillman Street

Project Location:

Intersection of Goodman Avenue and Hillman Street

Project Budget:

$87,000.00

Responsible for Maintenance:

City of Rio Communities

Project Description:

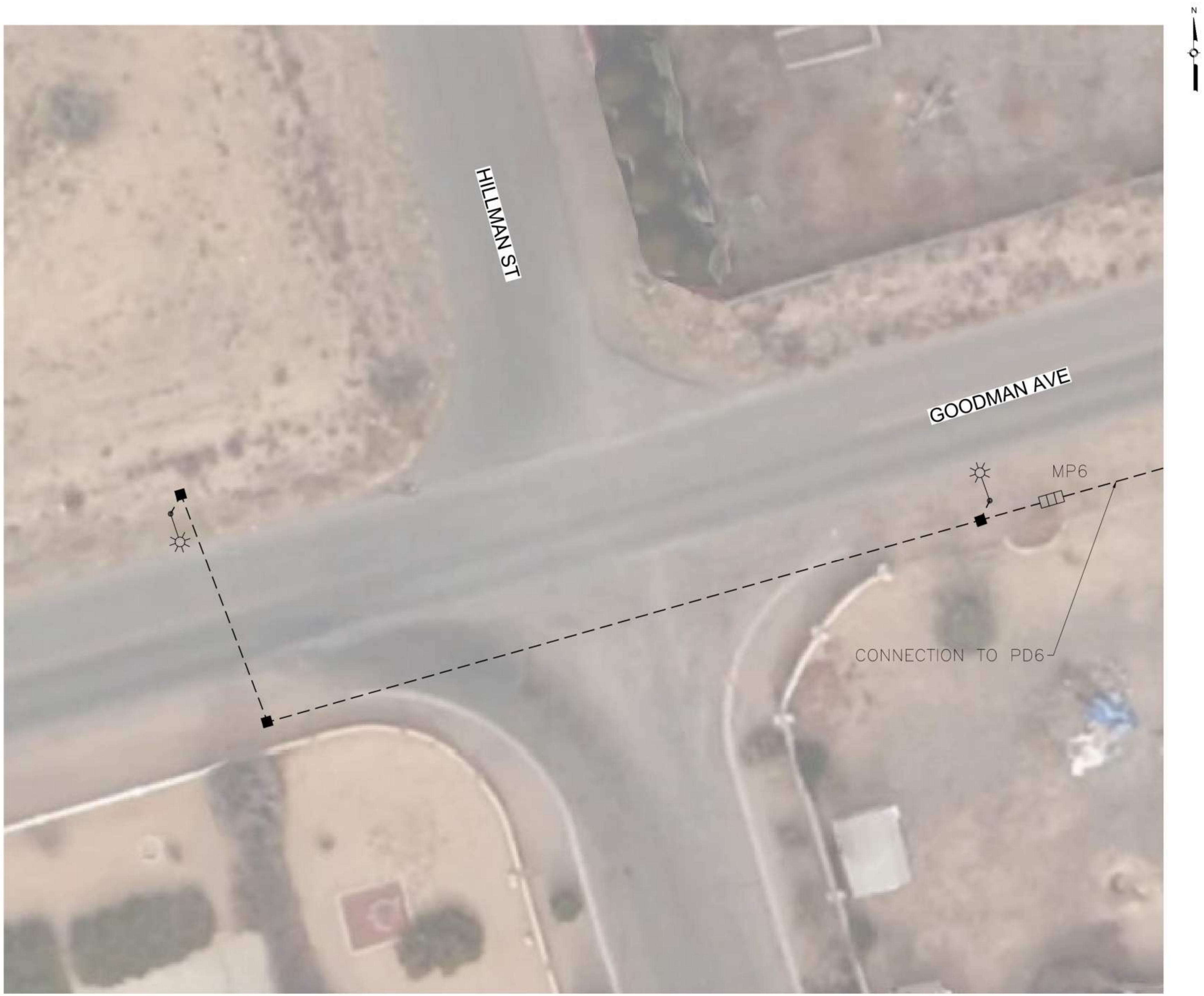
Streetlights are being installed to improve the overall safety and functionality of the intersection.

Project Scope:

Project includes design and installation of the following items:

- 2 Luminaire Poles (Type V Standard, 30')
- 2 LED Luminaires
- 2 Light Pole Foundations
- 3 Electrical Pull Box (Standard)
- 1 Meter Pedestal
- 380 LF of Rigid Electrical Conduit
- 1,290 LF of Single Conductor 10 Wiring

Streetlight Project #4 - Goodman Avenue and Hillman Street					
NMDOT ITEM NO.	SHORT DESCRIPTION	UNIT	ESTIMATE UNIT PRICE	ESTIMATE QUANTITY	ESTIMATE AMOUNT
502030	DRILLED SHAFT FOUNDATION 30" DIAMETER	L.F.	$200.00	12	$2,400.00
540060	REINFORCING BARS GRADE 60	LB	$2.60	306	$795.60
511000	STRUCTURAL CONCRETE, CLASS A	CY	$1,125.00	8.6	$9,675.00
706210	METER PEDESTAL (LIGHTING)	EACH	$8,500.00	1	$8,500.00
706350	POWER SERVICE INSTALLATION	EACH	$5,000.00	1	$5,000.00
707540	TYPE V STANDARD, 30'	EACH	$4,000.00	2	$8,000.00
709020	RIGID ELECTRICAL CONDUIT 2" (DIA.)	L.F.	$12.72	380	$4,833.60
710000	ELECTRICAL PULL BOX (STANDARD)	EACH	$640.00	3	$1,920.00
711110	SINGLE CONDUCTOR 10	L.F.	$1.50	1290	$1,935.00
716701	LED ROADWAY LUMINAIRE	EACH	$750.00	2	$1,500.00
621000	MOBILIZATION	LS	$2,500.00	1	$2,500.00
618000	TRAFFIC CONTROL	LS	$1,000.00	1	$1,000.00
SUBTOTAL					$48,059.20
CONTINGENCY			25%		$12,014.80
COVID INFLATION			15%		$7,208.88
TOTAL					$67,282.88
SURVEY					$3,000.00
DESIGN					$10,000.00
TOTAL					$80,282.88
NEW MEXICO TAX			7.9375%		$6,372.45
FINAL TOTAL (ROUNDED)					**$87,000.00**



LEGEND

- LUMINAIRE POLE
- PULL BOX
- CONDUIT
- LIGHTING METER (MP#)
- POTENTIAL POWER DROP LOCATION (PD#)
- INTERSECTION LOCATION

KEY MAP

GENERAL NOTE:
LUMINAIRE POLES ARE TO BE PLACED APPROXIMATELY 7 FEET FROM EDGE OF PAVEMENT OR APPROXIMATELY 1.5 FEET FROM BACK OF SIDEWALK, IF SIDEWALK EXISTS.

PRELIMINARY PLAN NOT FOR CONSTRUCTION

HDR
2155 LOUISIANA BLVD NE
SUITE 9500
ALBUQUERQUE, NM 87110
(505) 830-5400

MARK	DATE	DESCRIPTION	BY

EXHIBIT / CONCEPTUAL PLAN
RIO COMMUNITIES
STREETLIGHT SAFETY PLAN

DESIGNED:	MCS	GOODMAN AVE & HILLMAN ST INTERSECTION LIGHTING LAYOUT RIO COMMUNITIES, NM	DATE: 04/2022
DRAWN:	SD		
CHECKED:	SP		
SCALE:	NTS		

PROJECT SHEET:
Rio Communities Streetlight Project # 5 – Horner Street and Hillandale Avenue

Project ID:

Streetlight Project #5 - Horner Street and Hillandale Avenue

Project Location:

Intersection of Horner Street and Hillandale Avenue

Project Budget:

$85,500.00

Responsible for Maintenance:

City of Rio Communities

Project Description:

Streetlights are being installed to improve the overall safety and functionality of the intersection.

Project Scope:

Project includes design and installation of the following items:

- 2 Luminaire Poles (Type V Standard, 30')
- 2 LED Luminaires
- 2 Light Pole Foundations
- 3 Electrical Pull Box (Standard)
- 1 Meter Pedestal
- 320 LF of Rigid Electrical Conduit
- 1,110 LF of Single Conductor 10 Wiring

Streetlight Project #5 - Horner Street and Hillandale Avenue					
NMDOT ITEM NO.	SHORT DESCRIPTION	UNIT	ESTIMATE UNIT PRICE	ESTIMATE QUANTITY	ESTIMATE AMOUNT
502030	DRILLED SHAFT FOUNDATION 30" DIAMETER	L.F.	$200.00	12	$2,400.00
540060	REINFORCING BARS GRADE 60	LB	$2.60	306	$795.60
511000	STRUCTURAL CONCRETE, CLASS A	CY	$1,125.00	8.6	$9,675.00
706210	METER PEDESTAL (LIGHTING)	EACH	$8,500.00	1	$8,500.00
706350	POWER SERVICE INSTALLATION	EACH	$5,000.00	1	$5,000.00
707540	TYPE V STANDARD, 30'	EACH	$4,000.00	2	$8,000.00
709020	RIGID ELECTRICAL CONDUIT 2" (DIA.)	L.F.	$12.72	320	$4,070.40
710000	ELECTRICAL PULL BOX (STANDARD)	EACH	$640.00	3	$1,920.00
711110	SINGLE CONDUCTOR 10	L.F.	$1.50	1110	$1,665.00
716701	LED ROADWAY LUMINAIRE	EACH	$750.00	2	$1,500.00
621000	MOBILIZATION	LS	$2,500.00	1	$2,500.00
618000	TRAFFIC CONTROL	LS	$1,000.00	1	$1,000.00
SUBTOTAL					$47,026.00
CONTINGENCY			25%		$11,756.50
COVID INFLATION			15%		$7,053.90
TOTAL					$65,836.40
SURVEY					$3,000.00
DESIGN					$10,000.00
TOTAL					$78,836.40
NEW MEXICO TAX			7.9375%		$6,257.64
FINAL TOTAL (ROUNDED)					**$85,500.00**

N

LEGEND

- LUMINAIRE POLE
- PULL BOX
- CONDUIT
- LIGHTING METER (MP#)
- POTENTIAL POWER DROP LOCATION (PD#)
- INTERSECTION LOCATION

KEY MAP

GENERAL NOTE:
LUMINAIRE POLES ARE TO BE PLACED APPROXIMATELY 7 FEET FROM EDGE OF PAVEMENT OR APPROXIMATELY 1.5 FEET FROM BACK OF SIDEWALK, IF SIDEWALK EXISTS.

PRELIMINARY PLAN
NOT FOR CONSTRUCTION

2155 LOUISIANA BLVD NE
SUITE 9500
ALBUQUERQUE, NM 87110
(505) 830-5400

MARK	DATE	DESCRIPTION	BY

EXHIBIT / CONCEPTUAL PLAN

RIO COMMUNITIES
STREETLIGHT SAFETY PLAN

DESIGNED:	MCS	HILLANDALE AVE & HORNER ST INTERSECTION LIGHTING LAYOUT RIO COMMUNITIES, NM	DATE: 04/2022
DRAWN:	SD		
CHECKED:	SP		
SCALE:	NTS		

Date: 22 Mar 2022 - 3:45pm User: SDEY
Drawing Name: 10331609/4.0_CAD_BIM/8.2_IMP/Rio_Communities_Intersection_Exhibits.dwg

PROJECT SHEET:
Rio Communities Streetlight Project # 6 – Horner Street and Walking Trail

Project ID:

Streetlight Project #6 - Horner Street and Walking Trail

Project Location:

Intersection of Horner Street and Walking Trail

Project Budget:

$98,000.00

Responsible for Maintenance:

City of Rio Communities

Project Description:

Streetlights are being installed to improve the overall safety and functionality of the intersection.

Project Scope:

Project includes design and installation of the following items:

- 2 Luminaire Poles (Type V Standard, 30')
- 2 LED Luminaires
- 2 Light Pole Foundations
- 3 Electrical Pull Box (Standard)
- 1 Meter Pedestal
- 800 LF of Rigid Electrical Conduit
- 2550 LF of Single Conductor 10 Wiring

Streetlight Project #6 - Horner Street and Walking Trail					
NMDOT ITEM NO.	SHORT DESCRIPTION	UNIT	ESTIMATE UNIT PRICE	ESTIMATE QUANTITY	ESTIMATE AMOUNT
502030	DRILLED SHAFT FOUNDATION 30" DIAMETER	L.F.	$200.00	12	$2,400.00
540060	REINFORCING BARS GRADE 60	LB	$2.60	306	$795.60
511000	STRUCTURAL CONCRETE, CLASS A	CY	$1,125.00	8.6	$9,675.00
706210	METER PEDESTAL (LIGHTING)	EACH	$8,500.00	1	$8,500.00
706350	POWER SERVICE INSTALLATION	EACH	$5,000.00	1	$5,000.00
707540	TYPE V STANDARD, 30'	EACH	$4,000.00	2	$8,000.00
709020	RIGID ELECTRICAL CONDUIT 2" (DIA.)	L.F.	$12.72	800	$10,176.00
710000	ELECTRICAL PULL BOX (STANDARD)	EACH	$640.00	3	$1,920.00
711110	SINGLE CONDUCTOR 10	L.F.	$1.50	2550	$3,825.00
716701	LED ROADWAY LUMINAIRE	EACH	$750.00	2	$1,500.00
621000	MOBILIZATION	LS	$2,500.00	1	$2,500.00
618000	TRAFFIC CONTROL	LS	$1,000.00	1	$1,000.00
SUBTOTAL					$55,291.60
CONTINGENCY			25%		$13,822.90
COVID INFLATION			15%		$8,293.74
TOTAL					$77,408.24
SURVEY					$3,000.00
DESIGN					$10,000.00
TOTAL					$90,408.24
NEW MEXICO TAX			7.9375%		$7,176.15
FINAL TOTAL (ROUNDED)					**$98,000.00**

N

LEGEND

- LUMINAIRE POLE
- PULL BOX
- CONDUIT
- LIGHTING METER (MP#)
- POTENTIAL POWER DROP LOCATION (PD#)
- INTERSECTION LOCATION

KEY MAP

GENERAL NOTE:
LUMINAIRE POLES ARE TO BE PLACED APPROXIMATELY 7 FEET FROM EDGE OF PAVEMENT OR APPROXIMATELY 1.5 FEET FROM BACK OF SIDEWALK, IF SIDEWALK EXISTS.

PRELIMINARY PLAN
NOT FOR
CONSTRUCTION

2155 LOUISIANA BLVD NE
SUITE 9500
ALBUQUERQUE, NM 87110
(505) 830-5400

MARK	DATE	DESCRIPTION	BY

EXHIBIT / CONCEPTUAL PLAN
RIO COMMUNITIES
STREETLIGHT SAFETY PLAN

DESIGNED:	MCS	HORNER ST & WALKING TRAIL INTERSECTION LIGHTING LAYOUT RIO COMMUNITIES, NM	DATE: 04/2022
DRAWN:	SD		
CHECKED:	SP		
SCALE:	NTS		

Date: 22 Mar 2022 - 3:54pm User: SDEY
Drawing Name: 10331609/6.0_CAD_BIM/6.2_WIP/Rio_Communities_Intersection_Exhibits.dwg

PROJECT SHEET:
Rio Communities Streetlight Project # 7 – Horner Street and Kaghan Loop Drive

Project ID:

Streetlight Project #7 - Horner Street and Kaghan Loop Drive

Project Location:

Intersection of Horner Street and Kaghan Loop Drive

Project Budget:

$132,000.00

Responsible for Maintenance:

City of Rio Communities

Project Description:

Streetlights are being installed to improve the overall safety and functionality of the intersection.

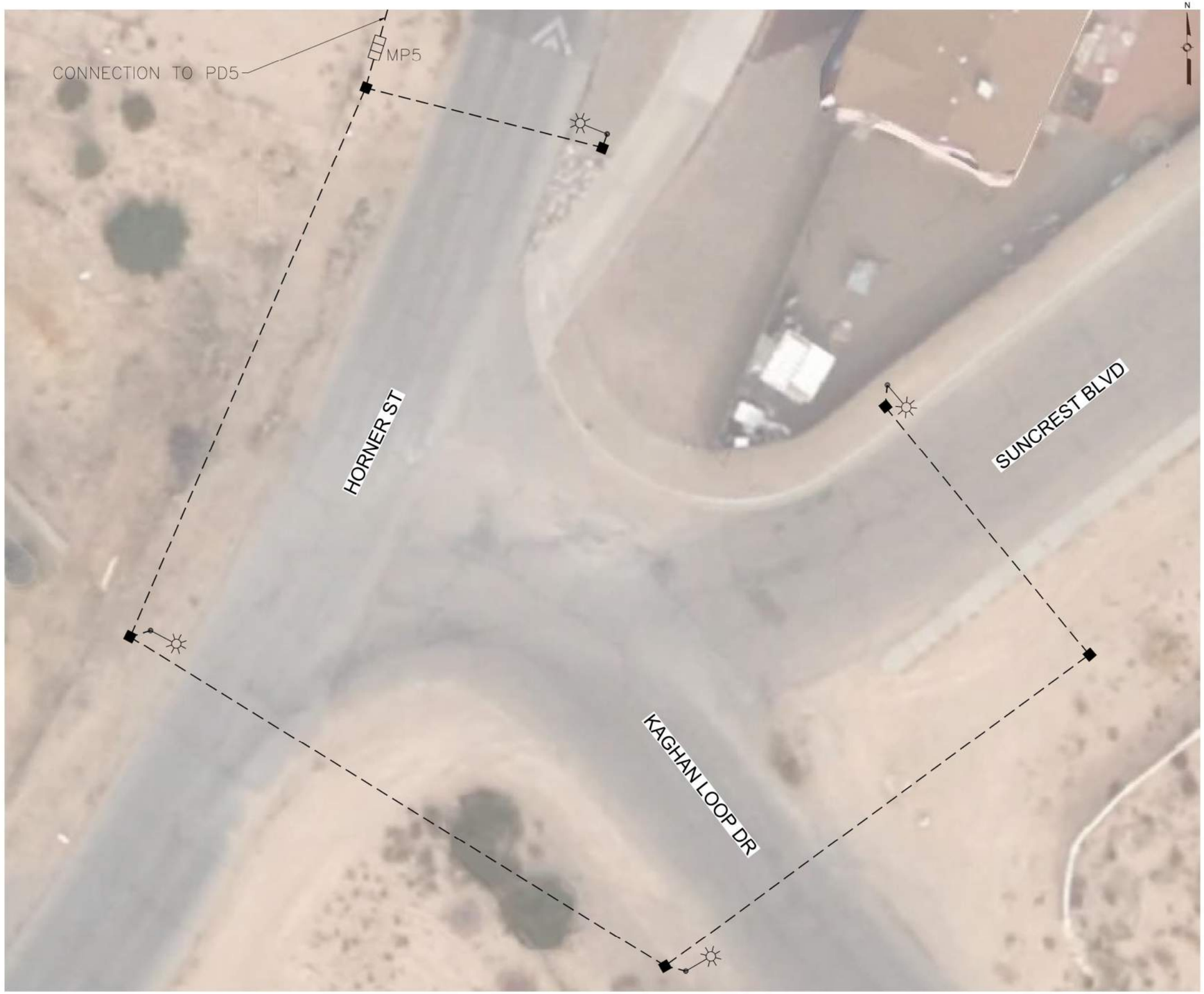
Project Scope:

Project includes design and installation of the following items:

- 4 Luminaire Poles (Type V Standard, 30')
- 4 LED Luminaires
- 4 Light Pole Foundations
- 6 Electrical Pull Box (Standard)
- 1 Meter Pedestal
- 690 LF of Rigid Electrical Conduit
- 2,370 LF of Single Conductor 10 Wiring

Streetlight Project #7 - Horner Street and Kaghan Loop Drive					
NMDOT ITEM NO.	SHORT DESCRIPTION	UNIT	ESTIMATE UNIT PRICE	ESTIMATE QUANTITY	ESTIMATE AMOUNT
502030	DRILLED SHAFT FOUNDATION 30" DIAMETER	L.F.	$200.00	24	$4,800.00
540060	REINFORCING BARS GRADE 60	LB	$2.60	612	$1,591.20
511000	STRUCTURAL CONCRETE, CLASS A	CY	$1,125.00	17.2	$19,350.00
706210	METER PEDESTAL (LIGHTING)	EACH	$8,500.00	1	$8,500.00
706350	POWER SERVICE INSTALLATION	EACH	$5,000.00	1	$5,000.00
707540	TYPE V STANDARD, 30'	EACH	$4,000.00	4	$16,000.00
709020	RIGID ELECTRICAL CONDUIT 2" (DIA.)	L.F.	$12.72	690	$8,776.80
710000	ELECTRICAL PULL BOX (STANDARD)	EACH	$640.00	6	$3,840.00
711110	SINGLE CONDUCTOR 10	L.F.	$1.50	2370	$3,555.00
716701	LED ROADWAY LUMINAIRE	EACH	$750.00	4	$3,000.00
621000	MOBILIZATION	LS	$2,500.00	1	$2,500.00
618000	TRAFFIC CONTROL	LS	$1,000.00	1	$1,000.00
SUBTOTAL					$77,913.00
CONTINGENCY			25%		$19,478.25
COVID INFLATION			15%		$11,686.95
TOTAL					$109,078.20
SURVEY					$3,000.00
DESIGN					$10,000.00
TOTAL					$122,078.20
NEW MEXICO TAX			7.9375%		$9,689.96
FINAL TOTAL (ROUNDED)					**$132,000.00**

*THE NEED FOR RIGHT-OF-WAY ACQUISITION OR EASEMENTS WILL BE DETERMINED DURING DESIGN.



LEGEND

- LUMINAIRE POLE
- PULL BOX
- CONDUIT
- LIGHTING METER (MP#)
- POTENTIAL POWER DROP LOCATION (PD#)
- INTERSECTION LOCATION

KEY MAP

GENERAL NOTE:
LUMINAIRE POLES ARE TO BE PLACED APPROXIMATELY 7 FEET FROM EDGE OF PAVEMENT OR APPROXIMATELY 1.5 FEET FROM BACK OF SIDEWALK, IF SIDEWALK EXISTS.

PRELIMINARY PLAN
NOT FOR
CONSTRUCTION

2155 LOUISIANA BLVD NE
SUITE 9500
ALBUQUERQUE, NM 87110
(505) 830-5400

MARK	DATE	DESCRIPTION	BY

EXHIBIT / CONCEPTUAL PLAN

RIO COMMUNITIES
STREETLIGHT SAFETY PLAN

DESIGNED:	MCS
DRAWN:	SD
CHECKED:	SP
SCALE:	NTS

HORNER ST & KAGHAN LOOP
INTERSECTION LIGHTING LAYOUT
RIO COMMUNITIES, NM

DATE: 04/2022

Date: 22 Mar 2022 - 3:55pm User: SDEY
Drawing Name: 1033105\2\6.0_240_BIM\6.2_WIP\Rio_Communities_Intersection_Exhibits.dwg

PROJECT SHEET:
Rio Communities Streetlight Project # 8 – Kaghan Loop Drive and Trailhead

Project ID:

Streetlight Project #8 - Kaghan Loop Drive and Trailhead

Project Location:

Intersection of Kaghan Loop Drive and Trailhead

Project Budget:

$111,500.00

Responsible for Maintenance:

City of Rio Communities

Project Description:

Streetlights are being installed to improve the overall safety and functionality of the intersection.

Project Scope:

Project includes design and installation of the following items:

- 2 Luminaire Poles (Type V Standard, 30')
- 2 LED Luminaires
- 2 Light Pole Foundations
- 4 Electrical Pull Box (Standard)
- 1 Meter Pedestal
- 1,290 LF of Rigid Electrical Conduit
- 4,020 LF of Single Conductor 10 Wiring

Streetlight Project #8 - Kaghan Loop Drive and Trailhead					
NMDOT ITEM NO.	SHORT DESCRIPTION	UNIT	ESTIMATE UNIT PRICE	ESTIMATE QUANTITY	ESTIMATE AMOUNT
502030	DRILLED SHAFT FOUNDATION 30" DIAMETER	L.F.	$200.00	12	$2,400.00
540060	REINFORCING BARS GRADE 60	LB	$2.60	306	$795.60
511000	STRUCTURAL CONCRETE, CLASS A	CY	$1,125.00	8.6	$9,675.00
706210	METER PEDESTAL (LIGHTING)	EACH	$8,500.00	1	$8,500.00
706350	POWER SERVICE INSTALLATION	EACH	$5,000.00	1	$5,000.00
707540	TYPE V STANDARD, 30'	EACH	$4,000.00	2	$8,000.00
709020	RIGID ELECTRICAL CONDUIT 2" (DIA.)	L.F.	$12.72	1290	$16,408.80
710000	ELECTRICAL PULL BOX (STANDARD)	EACH	$640.00	4	$2,560.00
711110	SINGLE CONDUCTOR 10	L.F.	$1.50	4020	$6,030.00
716701	LED ROADWAY LUMINAIRE	EACH	$750.00	2	$1,500.00
621000	MOBILIZATION	LS	$2,500.00	1	$2,500.00
618000	TRAFFIC CONTROL	LS	$1,000.00	1	$1,000.00
SUBTOTAL					$64,369.40
CONTINGENCY			25%		$16,092.35
COVID INFLATION			15%		$9,655.41
TOTAL					$90,117.16
SURVEY					$3,000.00
DESIGN					$10,000.00
TOTAL					$103,117.16
NEW MEXICO TAX			7.9375%		$8,184.92
FINAL TOTAL (ROUNDED)					**$111,500.00**

LEGEND

- LUMINAIRE POLE
- PULL BOX
- CONDUIT
- LIGHTING METER (MP#)
- POTENTIAL POWER DROP LOCATION (PD#)
- INTERSECTION LOCATION

KEY MAP

GENERAL NOTE:
LUMINAIRE POLES ARE TO BE PLACED APPROXIMATELY 7 FEET FROM EDGE OF PAVEMENT OR APPROXIMATELY 1.5 FEET FROM BACK OF SIDEWALK, IF SIDEWALK EXISTS.

PRELIMINARY PLAN NOT FOR CONSTRUCTION

HDR
2155 LOUISIANA BLVD NE
SUITE 9500
ALBUQUERQUE, NM 87110
(505) 830-5400

MARK	DATE	DESCRIPTION	BY

EXHIBIT / CONCEPTUAL PLAN

RIO COMMUNITIES
STREETLIGHT SAFETY PLAN

DESIGNED:	MCS	KAGHAN LOOP & TRAIL HEAD INTERSECTION LIGHTING LAYOUT RIO COMMUNITIES, NM	DATE: 04/2022
DRAWN:	SD		
CHECKED:	SP		
SCALE:	NTS		

PROJECT SHEET:
Rio Communities Streetlight Project # 9 – Horner Street and Goodman Avenue

Project ID:

Streetlight Project #9 - Horner Street and Goodman Avenue

Project Location:

Intersection of Horner Street and Goodman Avenue

Project Budget:

$87,000.00

Responsible for Maintenance:

City of Rio Communities

Project Description:

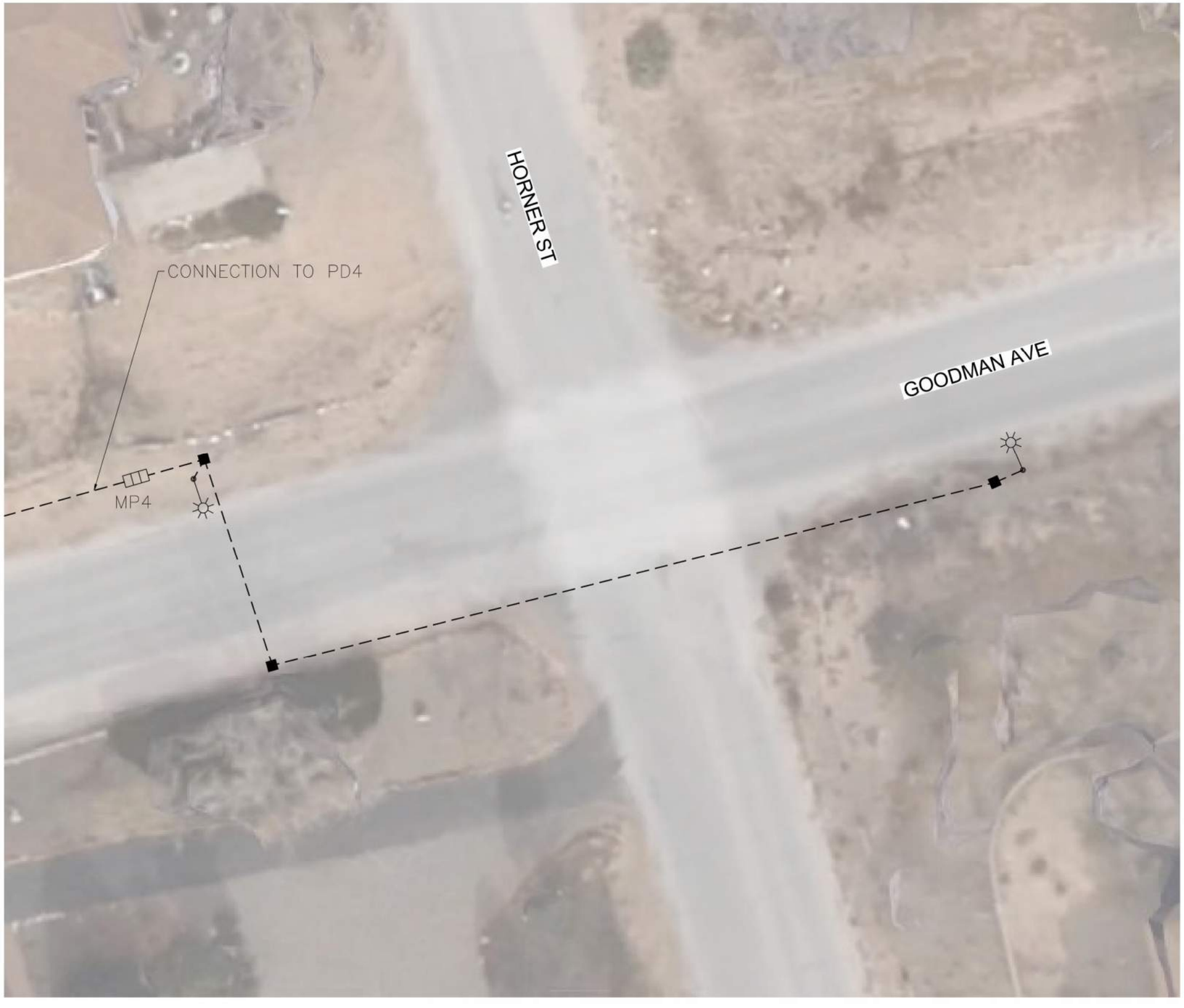
Streetlights are being installed to improve the overall safety and functionality of the intersection.

Project Scope:

Project includes design and installation of the following items:

- 2 Luminaire Poles (Type V Standard, 30')
- 2 LED Luminaires
- 2 Light Pole Foundations
- 3 Electrical Pull Box (Standard)
- 1 Meter Pedestal
- 375 LF of Rigid Electrical Conduit
- 1,275 LF of Single Conductor 10 Wiring

Streetlight Project #9 - Horner Street and Goodman Avenue					
NMDOT ITEM NO.	SHORT DESCRIPTION	UNIT	ESTIMATE UNIT PRICE	ESTIMATE QUANTITY	ESTIMATE AMOUNT
502030	DRILLED SHAFT FOUNDATION 30" DIAMETER	L.F.	$200.00	12	$2,400.00
540060	REINFORCING BARS GRADE 60	LB	$2.60	306	$795.60
511000	STRUCTURAL CONCRETE, CLASS A	CY	$1,125.00	8.6	$9,675.00
706210	METER PEDESTAL (LIGHTING)	EACH	$8,500.00	1	$8,500.00
706350	POWER SERVICE INSTALLATION	EACH	$5,000.00	1	$5,000.00
707540	TYPE V STANDARD, 30'	EACH	$4,000.00	2	$8,000.00
709020	RIGID ELECTRICAL CONDUIT 2" (DIA.)	L.F.	$12.72	375	$4,770.00
710000	ELECTRICAL PULL BOX (STANDARD)	EACH	$640.00	3	$1,920.00
711110	SINGLE CONDUCTOR 10	L.F.	$1.50	1275	$1,912.50
716701	LED ROADWAY LUMINAIRE	EACH	$750.00	2	$1,500.00
621000	MOBILIZATION	LS	$2,500.00	1	$2,500.00
618000	TRAFFIC CONTROL	LS	$1,000.00	1	$1,000.00
SUBTOTAL					$47,973.10
CONTINGENCY			25%		$11,993.28
COVID INFLATION			15%		$7,195.97
TOTAL					$67,162.34
SURVEY					$3,000.00
DESIGN					$10,000.00
TOTAL					$80,162.34
NEW MEXICO TAX			7.9375%		$6,362.89
FINAL TOTAL (ROUNDED)					**$87,000.00**



N

LEGEND

- LUMINAIRE POLE
- PULL BOX
- CONDUIT
- LIGHTING METER (MP#)
- POTENTIAL POWER DROP LOCATION (PD#)
- INTERSECTION LOCATION

KEY MAP

GENERAL NOTE:
LUMINAIRE POLES ARE TO BE PLACED APPROXIMATELY 7 FEET FROM EDGE OF PAVEMENT OR APPROXIMATELY 1.5 FEET FROM BACK OF SIDEWALK, IF SIDEWALK EXISTS.

PRELIMINARY PLAN
NOT FOR CONSTRUCTION

2155 LOUISIANA BLVD NE
SUITE 9500
ALBUQUERQUE, NM 87110
(505) 830-5400

MARK	DATE	DESCRIPTION	BY

EXHIBIT / CONCEPTUAL PLAN
RIO COMMUNITIES
STREETLIGHT SAFETY PLAN

DESIGNED:	MCS
DRAWN:	SD
CHECKED:	SP
SCALE:	NTS

GOODMAN AVE & HORNER ST
INTERSECTION LIGHTING LAYOUT
RIO COMMUNITIES, NM

DATE: 04/2022

Date: 22 Mar 2022 - 3:56pm User: SDEY
Drawing Name: 10331659/6.0_CAD_BIM/6.2_WIP/Rio_Communities_Intersection_Exhibits.dwg

PROJECT SHEET:
Rio Communities Streetlight Project # 10 – Nancy Lopez Boulevard and Lee Trevino Boulevard

Project ID:

Streetlight Project #10 - Nancy Lopez Boulevard and Lee Trevino Boulevard

Project Location:

Intersection of Nancy Lopez Boulevard and Lee Trevino Boulevard

Project Budget:

$148,500.00

Responsible for Maintenance:

City of Rio Communities

Project Description:

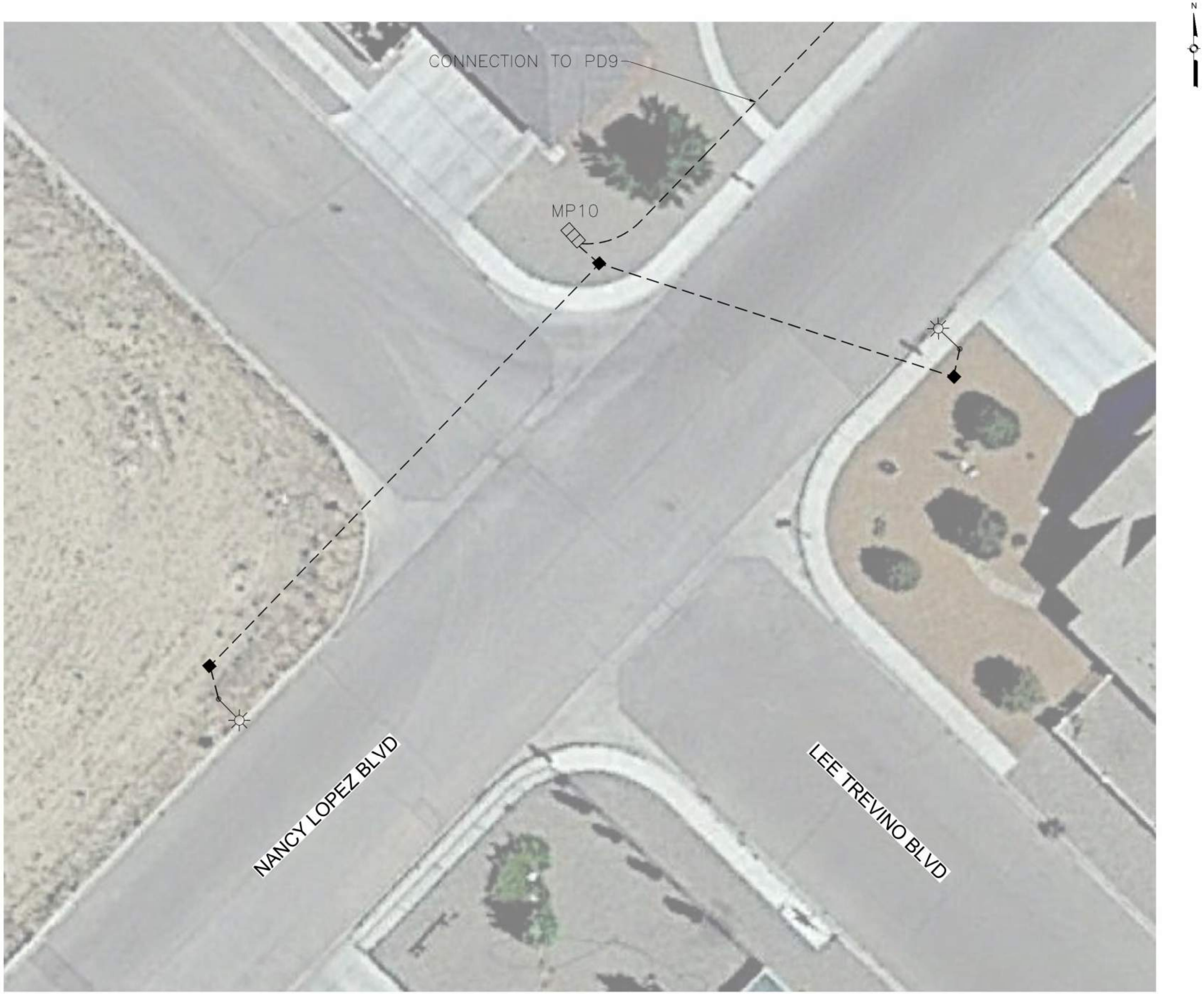
Streetlights are being installed to improve the overall safety and functionality of the intersection.

Project Scope:

Project includes design and installation of the following items:

- 2 Luminaire Poles (Type V Standard, 30')
- 2 LED Luminaires
- 2 Light Pole Foundations
- 3 Electrical Pull Box (Standard)
- 1 Meter Pedestal
- 2,700 LF of Rigid Electrical Conduit
- 8,250 LF of Single Conductor 10 Wiring

Streetlight Project #10 - Nancy Lopez Boulevard and Lee Trevino Drive					
NMDOT ITEM NO.	SHORT DESCRIPTION	UNIT	ESTIMATE UNIT PRICE	ESTIMATE QUANTITY	ESTIMATE AMOUNT
502030	DRILLED SHAFT FOUNDATION 30" DIAMETER	L.F.	$200.00	12	$2,400.00
540060	REINFORCING BARS GRADE 60	LB	$2.60	306	$795.60
511000	STRUCTURAL CONCRETE, CLASS A	CY	$1,125.00	8.6	$9,675.00
706210	METER PEDESTAL (LIGHTING)	EACH	$8,500.00	1	$8,500.00
706350	POWER SERVICE INSTALLATION	EACH	$5,000.00	1	$5,000.00
707540	TYPE V STANDARD, 30'	EACH	$4,000.00	2	$8,000.00
709020	RIGID ELECTRICAL CONDUIT 2" (DIA.)	L.F.	$12.72	2700	$34,344.00
710000	ELECTRICAL PULL BOX (STANDARD)	EACH	$640.00	3	$1,920.00
711110	SINGLE CONDUCTOR 10	L.F.	$1.50	8250	$12,375.00
716701	LED ROADWAY LUMINAIRE	EACH	$750.00	2	$1,500.00
621000	MOBILIZATION	LS	$2,500.00	1	$2,500.00
618000	TRAFFIC CONTROL	LS	$1,000.00	1	$1,000.00
SUBTOTAL					$88,009.60
CONTINGENCY			25%		$22,002.40
COVID INFLATION			15%		$13,201.44
TOTAL					$123,213.44
SURVEY					$4,000.00
DESIGN					$10,000.00
TOTAL					$137,213.44
NEW MEXICO TAX			7.9375%		$10,891.32
FINAL TOTAL (ROUNDED)					**$148,500.00**



LEGEND

- LUMINAIRE POLE
- PULL BOX
- CONDUIT
- LIGHTING METER (MP#)
- POTENTIAL POWER DROP LOCATION (PD#)
- INTERSECTION LOCATION

KEY MAP

GENERAL NOTE:
LUMINAIRE POLES ARE TO BE PLACED APPROXIMATELY 7 FEET FROM EDGE OF PAVEMENT OR APPROXIMATELY 1.5 FEET FROM BACK OF SIDEWALK, IF SIDEWALK EXISTS.

PRELIMINARY PLAN NOT FOR CONSTRUCTION

HDR
2155 LOUISIANA BLVD NE
SUITE 9500
ALBUQUERQUE, NM 87110
(505) 830-5400

MARK	DATE	DESCRIPTION	BY

EXHIBIT / CONCEPTUAL PLAN

RIO COMMUNITIES
STREETLIGHT SAFETY PLAN

DESIGNED:	MCS	NANCY LOPEZ BLVD & LEE TREVINO DR INTERSECTION LIGHTING LAYOUT RIO COMMUNITIES, NM	DATE: 04/2022
DRAWN:	SD		
CHECKED:	SP		
SCALE:	NTS		

Figure 16: Identified Intersections for Long-Term Improvements

6. APPENDICES

Appendix A - Design Criteria: AASHTO Roadway Lighting Design Guide 2018

DESIGN LIGHT LEVELS: Recommended design light levels using both the luminance and illuminance method are noted in Table 8 (Table 3-5a & 3-5b of the AASHTO roadway lighting design guide 2018). AASHTO roadway lighting design guide 2018 recommends using either the illuminance or luminance method for roadways. When designing for intersections, the illuminance method should be used. Light levels for intersections of two continuously lit streets are typically designed to a value equal to the sum of the individual lighting level values. Per AASHTO design guide, the light levels for intersection classifications are as follows:

Table 8: AASHTO Lighting Criteria (Table 3-5a & 3-5b of the AASHTO Roadway Lighting Design Guide 2018)

Roadway and Walkway Classification[a]	Area Classifications	Illuminance Method					
		Average Maintained Illuminance (E_{avg})				Minimum Illuminance E_{min}	Illuminance Uniformity Ratio E_{avg}/E_{min}
		R1	R2	R3	R4		
	General Land Use	(footcandles) (min)	(footcandles) (min)	(footcandles) (min)	(footcandles) (min)	(footcandles)	Avg/min (max)[b]
Principal Arterials:							
Interstate and other freeways	All	0.6	0.6	0.6	0.6	0.2	4:1
Other Principal Arterials (partial or no control of access)	Commercial	1.1	1.6	1.6	1.4	As uniformity ratio allows	4:1
	Intermediate	0.8	1.2	1.2	1.0		4:1
	Residential	0.6	0.8	0.8	0.8		4:1
Minor Arterials	Commercial	0.9	1.4	1.4	1.0		4:1
	Intermediate	0.8	1.0	1.0	0.9		4:1
	Residential	0.5	0.7	0.7	0.7		4:1
Collectors	Commercial	0.8	1.1	1.1	0.9		4:1
	Intermediate	0.6	0.8	0.8	0.8		4:1
	Residential	0.4	0.6	0.6	0.5		4:1
Local	Commercial	0.6	0.8	0.8	0.8		6:1
	Intermediate	0.5	0.7	0.7	0.6		6:1
	Residential	0.3	0.4	0.4	0.4		6:1
Alleys	Commercial	0.4	0.6	0.6	0.5		6:1
	Intermediate	0.3	0.4	0.4	0.4		6:1
	Residential	0.2	0.3	0.3	0.3		6:1
Sidewalks	Commercial	0.9	1.3	1.3	1.2		3:1
	Intermediate	0.6	0.8	0.8	0.8		4:1
	Residential	0.3	0.4	0.4	0.4		6:1
Pedestrian Ways and Bicycle Ways[e]	All	1.4	2.0	2.0	1.8		3:1

[a] See AASHTO's *A Policy on Geometric Design of Highways and Streets* [7] for roadway and walkway classifications.
[b] Higher uniformity ratios are acceptable for elevated ramps near high-mast poles.
[c] $L_{initial}$ refers to the maximum point along the pavement, not the maximum in lamp life. The Maintenance Factor applies to both the L_t term and the L_{ma} term.
[d] Use 0.6 for R1 surface.
[e] Assumes a separate facility. For Pedestrian Ways and Bicycle Ways adjacent to roadway, use roadway design values. Use R3 requirements for walkway or bikeway surface materials other than the pavement types shown. Other design guidelines such as IES or CIE may be used for pedestrian ways and bikeways when deemed appropriate.

Area classification noted in AASHTO as Commercial, Intermediate, and Residential correspond to High, Medium and Low pedestrian conflict as defined by IES in RP-8-21.

POLE PLACEMENT AT INTERSECTION: per AASHTO, light poles should be placed such that key decision points, conflict points and crosswalks should be illuminated. When illuminating the crosswalks, poles should be positioned in advance of the crosswalk to provide positive contrast, which combined with the vehicle headlight, helps increase contrast and improve the visibility of the pedestrian in the crosswalk. Luminaire poles should be placed such that they are outside of the clear zone (the area adjacent to the edge of the roadway that should be kept clear of obstructions). During design, the engineer will determine how to best accommodate clear zone requirements for each specific location. If clear zone requirements dictate that the light pole needs to be placed further away from the edge of the roadway, a longer mast arm may be used. For locations where poles cannot be placed outside of the clear zone, either breakaway poles or barrier protection should be considered. These criteria are illustrated in Figure 17.

A

B

Figure 17: AASHTO Recommended Light Pole Placement (Figure 3-3 of the AASHTO Roadway Lighting Design Guide 2018).

Appendix B - Design Criteria: ANSI/IES RP-8-21

DESIGN LIGHT LEVELS: Per RP-8-21, Chapter 12, Intersection Lighting Design Is Classified Into Three Different Types Which Include: Full Intersection Lighting, Partial Intersection Lighting And Delineation (Beacon) Lighting.

- Full intersection lighting is defined as lighting covering the functional area of an intersection in a uniform manner over the traveled portion of the roadway.
- Partial intersection lighting is defined as the lighting of key decision areas, potential conflict points, and/or hazards in and on the approach to an intersection. Partial intersection lighting may also guide a driver from one key point to the next, and (if sufficient luminaires are used) place the road user on a safe heading after leaving an illuminated area.
- Delineation (beacon) lighting is defined as lighting that marks an intersection location for approaching traffic, lights vehicles on a cross street, or lights a median crossing.

The values for full intersection lighting are based on the principle that the amount of light should be proportional to the classification of the intersecting roadways and equal to the sum of the values used for each separate roadway. The values included in **Table 9** (Table 12-1 of the RP-8-21) are the recommended average-maintained illuminance levels for fully lighted intersections of continuously lighted roadways, based on street classification and pedestrian volumes. The recommendations assume an R2 or R3 pavement type, which is typically hot mix asphalt pavement.

The decision to use full intersection lighting criteria instead of partial intersection lighting was made because this design will be forward compatible for when City illuminates the cross streets in the future.

Table 9: RP-8 Lighting Criteria (Table 12-1 of the RP-8-21)

Functional Classification	Pedestrian Activity Level Classification			E_{avg}/E_{min}
	High	Medium	Low	
Major/Major	34/3.2	26/2.4	18/1.7	3.0
Major/Collector	29/2.7	22/2.0	15/1.4	3.0
Major/Local	26/2.4	20/1.9	13/1.2	3.0
Collector/Collector	24/2.2	18/1.7	12/1.1	4.0
Collector/Local	21/2.0	16/1.5	10/0.9	4.0
Local/Local	18/1.7	14/1.3	8/0.7	6.0

The intersection classifications are determined based on average daily traffic (ADT) per the ranges defined below.

- Major (M) street: Over 3,500 vehicles ADT
- Collector (C) street: 1,500 to 3,500 vehicles ADT
- Local (L) street: 100 to 1,500 vehicles ADT

Pedestrian activity levels are defined by the number of pedestrians during the highest nightly average one-hour volume period. The ranges for each designation are defined below.

- High pedestrian activity areas: > 100 pedestrians per hour
- Medium pedestrian activity areas: 11 - 99 pedestrians per hour
- Low pedestrian activity areas: < 10 pedestrians per hour

For a mid-block crossing (such as a trail path crossing) for areas with low pedestrian conflict, a vertical illuminance of 20 lux (approximately 1.9 Fc) will improve pedestrian visibility.

POLE PLACEMENT: Where full roadway lighting that ties into the intersection is present, the spacing of the poles on the approach road should be designed to coordinate with the pole locations for the intersection. Light poles should be positioned in advance of the crosswalks to improve visibility in the crosswalk by providing improved vertical illuminance and positive contrast. Typical pole placements for common intersection geometries can be seen in **Figure 18** and **Figure 19** (Figures 12-5 and 12-6 of the RP-8). Pole placement for a mid-block crossing (such as a trail path crossing) can be seen in **Figure 20** (Figure 12-21 of the RP-8). These typical pole placements are used as a starting point, and then the pole placements are adjusted to fit the geometry of each intersection, and to meet additional lighting level criteria, such as illuminance and uniformity. Therefore, the actual light pole locations are to be determined by a lighting analysis.

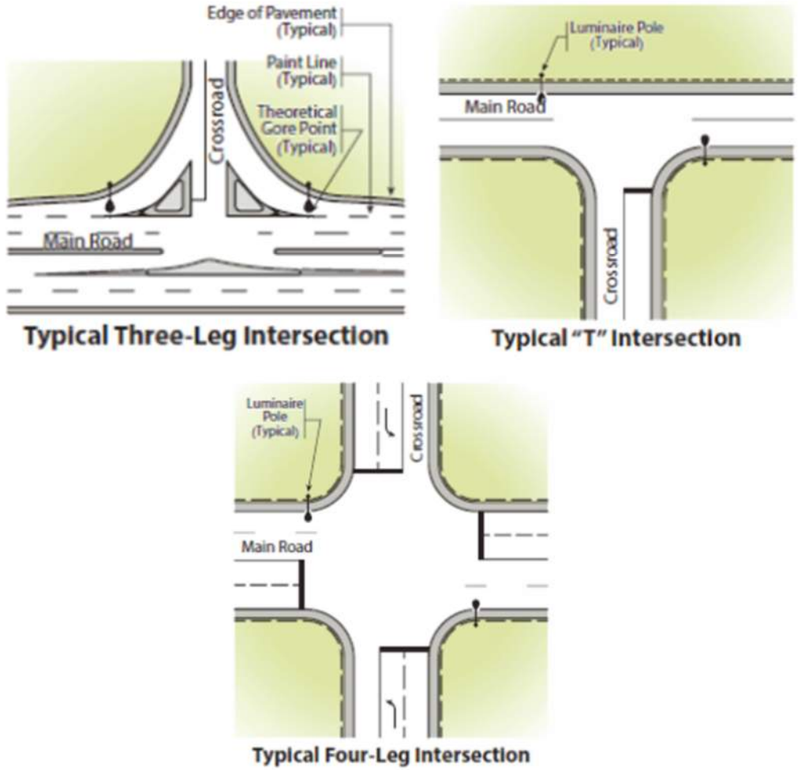


Figure 18: Typical Pole Placement for Partial Intersection Lighting (Per ANSI/IES RP-8-21)

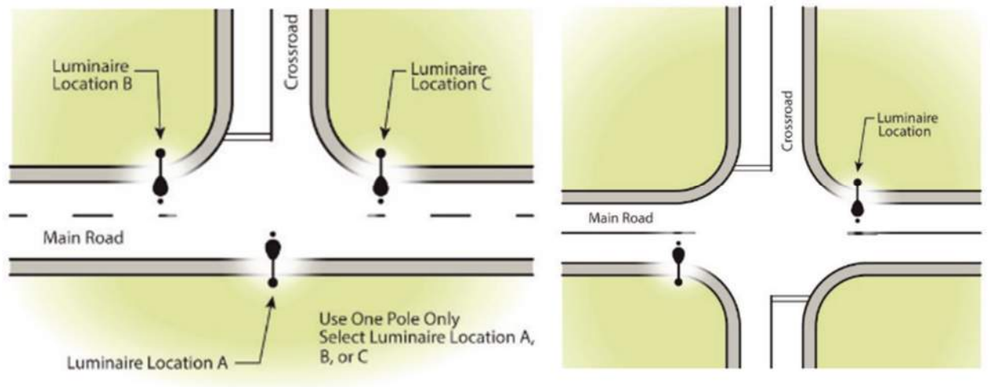


Figure 19: Typical Pole Locations for Delineation Lighting

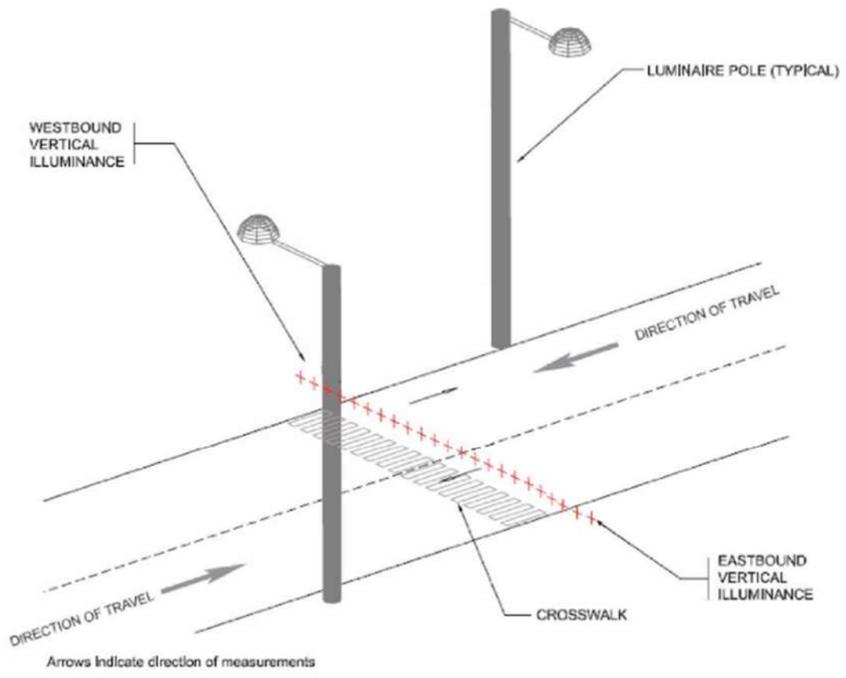


Figure 20: Design Example for a Midblock Crosswalk

END OF THE RIO COMMUNITIES STREETLIGHT SAFETY PLAN REPORT