City of Santa Fe

Investment Grade Audit (IGA) Report

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Glossary of Standard Investment Grade Audit Acronyms

ACRONYM	DEFINITION
BTU:	British Thermal Units
BTUh:	British Thermal Units per Hour
CBECS:	Commercial Buildings Energy Consumption Survey
CFL:	Compact Fluorescent Lamps
CMU:	Concrete Masonry Unit
DDC:	Direct Digital Controllers
DHW:	Domestic Hot Water
DX:	Direct Expansion
ECI:	Energy Cost Index
EER:	Energy Escalation Rate
EERC:	Energy Escalation Rate Calculator
EIFS:	Exterior Insulated Finish System
ERV:	Energy Recovery Ventilation
EUI:	Energy Utilization Index
FCU:	Fan Coil Unit
FIM:	Facility Improvement Measures
ESPC:	Energy Savings Performance Contract
GESPC:	Guaranteed Energy Savings Performance Contract
HPS:	High Pressure Sodium
HVAC:	Heating, Ventilation and Air Conditioning
IGA:	Investment Grade Audit
kBTU:	1,000 British Thermal Units
KVU:	Kitchen Ventilation Units
kWh:	Kilowatt Hour
LED:	Light Emitting Diodes
MH:	Metal Halide
MUA:	Make-up Air Unit
NG:	Natural Gas
NIST:	National Institute for Standards and Technology
NM-EMNRD:	New Mexico Energy, Minerals, and Natural Resources Department
NM-GSD:	New Mexico General Services Department
NM-OSE:	New Mexico Office of the State Engineer
RH:	Radiant Heaters
RTU:	Rooftop Units
SQF:	Square Feet
TPO:	Thermoplastic Polyolefin
UH:	Unit Heater
VRF:	Variable Refrigerant Flow
W:	Watt

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1.0 Executive Summary

The City of Santa Fe (COSF) engaged Yearout Energy (YE) in August 2019 to perform an Investment Grade Audit (IGA) of several facilities of various types located in Santa Fe, NM. The goal of an IGA is to identify the potential project scope for budget-neutral facility upgrades thanks to reduced utility and O&M costs. The IGA was developed following the program guidelines outlined by the New Mexico Energy, Minerals, and Natural Resources Department (NM-EMNRD) and New Mexico General Services Department (NM-GSD).

The project specific objectives for this IGA include:

- Developing a self-funding, budget-neutral project with a finance period ≤ 20 years
- Reduce energy and water consumption
- Reduce utility and operational costs
- Standardize equipment throughout city facilities
- Accelerate the implementation of renewable energy where feasible to support the Sustainable Santa Fe 25-Year Plan
- Implement LED lighting retrofit/replacement opportunities
- Reduce the COSF's environmental impact

An essential step in the IGA process is to establish the baseline performance for each facility from which proposed improvements will be measured. The following tables depict a summary of the baseline annual cost and energy consumption by utility type for all COSF facilities included in the IGA.

Table 1: Baseline Annual Cost Breakdown by Utility Type

Utility	$/year
Electricity	$3,888,817
Natural Gas	$335,028
Water & Sewer	$317,231
Total	$4,541,076

Table 2: Baseline Annual Energy Consumption Breakdown by Utility Type

Utility	kBTU/year
Electricity	159,107,775
Natural Gas	75,732,660
Total	234,840,435

As a result of the comprehensive IGA process, Yearout Energy and the COSF have co-developed the following recommended Guaranteed Energy Service Performance Contract (GESPC) project:

Table 3: GESPC Project Summary

Turn-Key GESPC Project Price	$15,442,785
Up-front Capital Contribution by COSF	$1,125,000
Approximate Net Financed Amount	$14,280,347
Year 1 Utility Savings	$752,137
Year 1 Operations and Maintenance Savings	$27,643
Estimated Incentives from Utility Provider(s)	$230,392
Project Financing Period	18.0 Years
Weighted Average Service Life of Proposed Measures	31.0 Years
Percent Reduction in Annual Utility Costs*	16.8%
Environmental Impact (Reduction in Annual Emissions)	6,717,430 lbs. CO_2
Environmental Impact (Direct Reduction in Annual Water Consumption)	2,007,380 gallons
Environmental Impact (Indirect Reduction in Annual Water Consumption)	3,264,992 gallons

*The percent reduction in annual utility costs takes into consideration existing or future REC payments made to the COSF

A fundamental benefit of GESPC projects is that they allow for the savings from measures with quicker returns on investment to supplement the funding of critical infrastructure improvements and/or high priority capital intensive measures such as renewable energy.

Throughout the IGA process, Yearout Energy collaborated closely with COSF to identify and co-develop Facility Improvement Measures (FIM) that would allow COSF to leverage future energy and operational savings to fund essential facility capital improvements through a GESPC. The FIMs recommended for implementation include:

- Upgrading approximately 9,000 existing lighting fixtures to LED technology
- Install 2.750MW DC renewable energy systems which are sized for a target offset of 80% of post-retrofit On-Peak consumption at select COSF facilities and a 60% of post-retrofit On-Peak consumption at select Water Utilities and Buckman Direct Diversion (BDD) sites
- Repair the underperforming existing solar PV carports at Genoveva Chavez Community Center to recover lost production and available REC payments
- Upgrade approximately 760 existing domestic water fixtures to reduce water consumption
- Remediate ~200 square feet of existing air leakage in building envelope
- Install 28 new high efficiency transformers
- Identify and correct billing errors to reduce utility costs
- Replace the roof at the Canyon Road Water Treatment Plant in order reduce energy and operational costs and support the installation of rooftop solar PV.

The benefits from those measures are summarized in the following table.

Table 4: Facility Improvement Measures (FIM) Summary

FIM No.	FIM Name	Year 1 Annual Utility Savings	Year 1 Annual O&M Savings	Year 1 Total Annual Savings	Labor, Equip & Material Costs	Estimated Utility Rebate	Net Cost	Average Service Life Years
1.00	LED Lighting	$217,056	$21,761	$238,818	$2,222,158	$192,032	$2,030,126	15.0
2.00	Renewable Energy	$473,609	$0	$473,609	$7,167,913	$0	$7,167,913	37.0
3.00	Water Conservation	$14,404	$1,135	$15,539	$173,807	$21,450	$152,357	20.0
4.00	Building Envelope	$10,477	$1,572	$12,048	$206,170	$0	$206,170	20.0

FIM No.	FIM Name	Year 1 Annual Utility Savings	Year 1 Annual O&M Savings	Year 1 Total Annual Savings	Labor, Equip & Material Costs	Estimated Utility Rebate	Net Cost	Average Service Life Years
5.00	HE Transformers	$9,567	$1,435	$11,002	$199,171	$7,766	$191,405	32.0
6.00	Utility Management	$1,821	$0	$1,821	$0	$1,516	($1,516)	---
7.00	GCCC Solar Carport Repairs	$25,204	$0	$25,204	$155,730	$7,628	$148,102	20.0
8.00	Roof Replacement	$0	$1,740	$1,740	$199,918	$0	$199,918	20.0
Total		$752,137	$27,643	$779,780	$10,324,867	$230,392	$10,094,474	31.0

* Total Annual Savings include Utility Savings and O&M Savings.

Additional FIMs were investigated during the IGA but not recommended for a variety of reasons. A description of these FIMs is provided in Section 4.0 of this report.

The reduction in greenhouse gas (GHG) emissions is of particular interest for the City of Santa Fe. The "Sustainable Santa Fe 25-year Plan" calls for carbon neutrality by 2040 and targets 50% renewable energy consumption by 2025. The installation of solar photovoltaic (PV) energy, energy efficient lighting, high efficiency transformers and building envelope remediation make a significant contribution towards achieving these goals. The annual 6.7-million-pound reduction in CO_2 emissions is equivalent to planting 833 acres of trees or not driving 3.96 million miles each year. It is worth noting that these values are based on the current electricity supply mix and should the targets of the New Mexico Energy Transition Act be achieved, the reductions in GHG emissions by COSF would be even greater.

Following the review and acceptance of this report by COSF, NM-EMNRD and NM-OSE, Yearout Energy will develop a Guaranteed Utility Savings Contract (GUSC) to implement the final agreed-upon project scope. Yearout Energy anticipates the implementation of this project to commence in Q4, 2020, with a 16-month overall construction period.

2.0 Facility Descriptions

The City of Santa Fe (COSF) stretches across 37.4 square miles in Northern New Mexico, as shown in Figure 1, with a total population of roughly 83,875 inhabitants. The COSF owns and maintains many permanent buildings throughout the city, consisting of administrative offices, senior centers, community centers, public safety, fleet, public utility, and other building types.

Figure 1: City of Santa Fe

During the IGA, 38 facilities were audited. For the purpose of clarity in this report, these facilities are at times divided into the City facilities, Public Utility facilities, and Buckman Direct Diversion (BDD) facilities. The BDD is a joint project between the City of Santa Fe and Santa Fe County to build a reliable and sustainable water supply. The locations of these different facilities can be seen in Figure 2, Figure 3, and Figure 4, respectively.

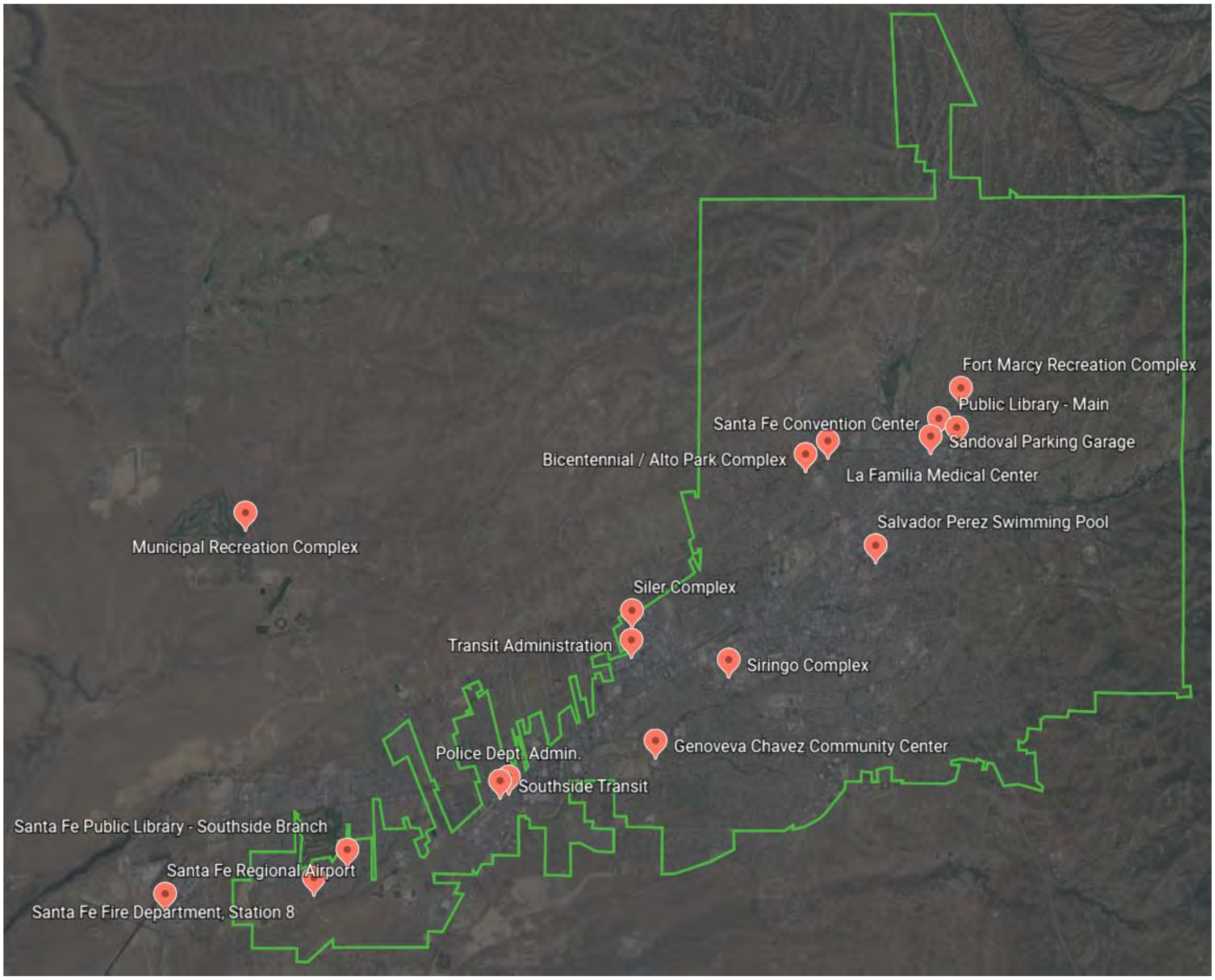


Figure 2: City of Santa Fe IGA Facilities

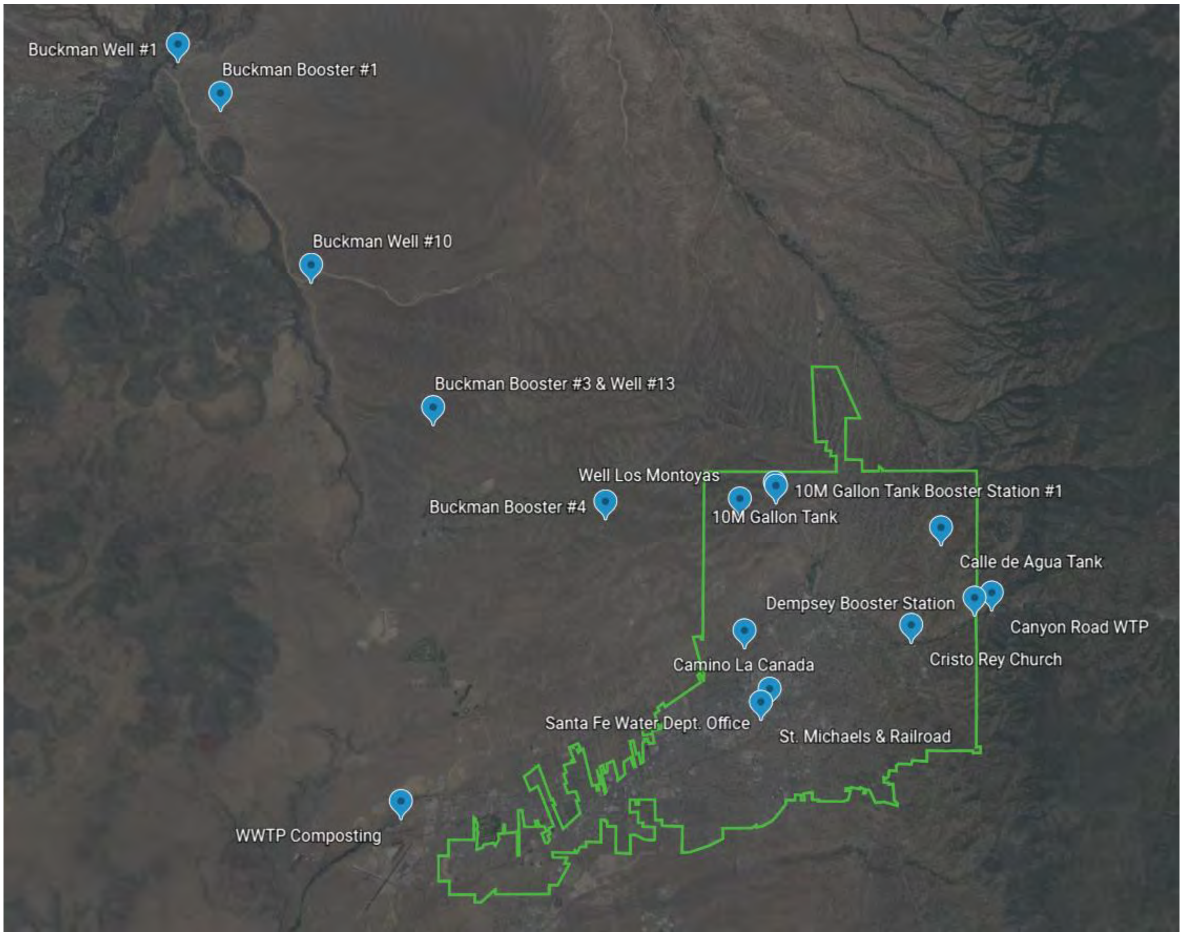


Figure 3: Public Utility IGA Facilities

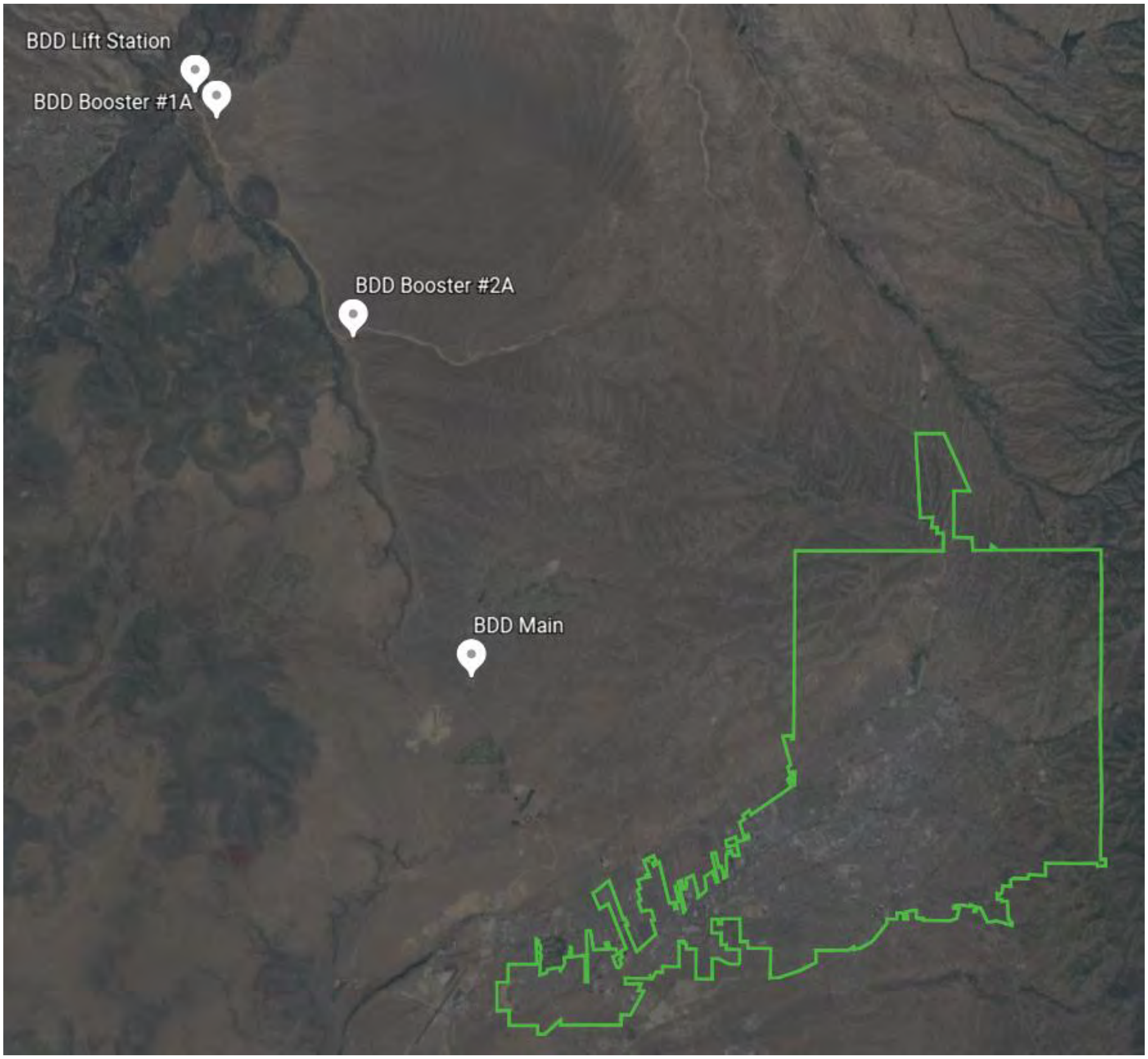


Figure 4: Buckman Diversion District (BDD) IGA Sites

To initiate the project, the COSF provided some of the critical basic information for the IGA facilities in the form of the IGA Facility Workbook which can be found in **Appendix A**. The facilities included in the IGA have total combined gross area of 1,023,900 ft^2 as shown in Table 5,
Table 6, and Table 7. These facilities have been divided by City, Water Utilities and BDD.

Table 5: City of Santa Fe Facility List

Facility No.	Site	Gross Area (ft^2)	Year Built / Renovated
01	Bicentennial / Alto Park Complex	33,500	1976/2005, 2015, 2019
02	Fire Station #2	13,000	N/A
03	Fire Station #8	10,500	2006
04	Fort Marcy Recreation Complex	26,000	1982
05	Genoveva Chavez Community Center	155,300	1999
06	La Familia Medical Center	25,000	1995
07	Municipal Recreation Complex	19,000	1996
08	Police Dept – Admin	30,000	1984
09	Public Library – Main	28,000	1940
10	Public Library – Southside	26,000	2004
11	Salvador Perez Swimming Pool	17,000	1950
12	Sandoval Parking Garage Lot B	130,000	1988
13	Santa Fe Convention Center	72,000	2008
14	Santa Fe Regional Airport	22,500	1956
15	Siler Complex	44,100	1988
16	Siringo Complex	35,500	1950/1995
17	Southside Transit Center	8,900	1999
18	Transit Administration	25,200	1998
Total		721,500	-----

Table 6: Water Division Facility List

Facility No.	Site	Gross Area (ft^2)	Year Built / Renovated
19	Canyon Road Water Treatment Plant	21,300	1974
20	Santa Fe Water Division Office	28,700	1950/2004
21	WWTP	177,400	1961/1982/1998/2008
22	10M Gallon Tank	-----	NA
23	10M Gallon Tank Booster Station #1	-----	NA
24	Buckman Booster Station #1	-----	NA
25	Buckman Booster Station #3 & Well #13	-----	NA
26	Buckman Booster Station #4	-----	NA
27	Buckman Well #1	-----	NA
28	Buckman Well #10	-----	NA
29	Calle De Agua Tank	-----	NA
30	Camino La Canada	-----	NA
31	Cristo Rey Church Pump	-----	NA
32	Dempsey Booster Station	-----	NA
33	St Michaels & SF Railroad	-----	NA
34	Well Los Montoyas	-----	NA
Total		227,400	-----

Table 7: Buckman Direct Diversion (BDD) Facility List

Facility No.	Site	Gross Area (ft^2)	Year Built / Renovated
35	BDD Main	75,000	2010
36	BDD Booster Station #1A	-----	NA
37	BDD Booster Station #2A	-----	NA
38	BDD Lift Station	-----	NA
Total		75,000	-----

IMPORTANT NOTE:

At the COSF's direct request, the project scope was focused towards the implementation of renewable energy and LED lighting upgrades. For completeness of the IGA, Yearout Energy performed an abbreviated field survey of the existing heating, ventilation, and air conditioning (HVAC), domestic hot water (DHW) and other energy-consuming equipment including kitchen and swimming pool equipment to better understand overall building performance at a high-level. Since these systems were not included in the IGA scope of work, the following descriptions of these systems were kept concise. The field data collected included model numbers, serial numbers, and pictures of the general condition. Where available, either through the nameplate or serial number, we have tabulated the equipment manufacturing date. This data, along with additional information, is available in **Appendix C1**.

The majority of energy consumption at the pump houses and booster stations is via the operation of the pumps, therefore the descriptions of sites, including the HVAC systems, lighting, and plug loads have been kept concise and are available in appendices.

The City originally instructed YE to evaluate only the lighting at the Dewatering and Composing Buildings at the Wastewater Treatment Plant (WWTP). During the later stages of the IGA development the City requested YE add the entire WWTP to the lighting scope of work. Because of the large number of transformers and importance of the site to the City's infrastructure and operation, YE included a survey of the electric transformers. Due to the limited scope of work, limited time and travel restrictions of the Coronavirus YE conducted a full lighting and electric transformer survey and did not include surveys of the HVAC systems, plug loads, wastewater treatment equipment.

2.1 Bicentennial / Alto Park Complex

Facility Facts:

Facility Name	Bicentennial / Alto Park Complex
Street Address	1121 Alto St
City, State, Zip	Santa Fe, NM 87501
Gross Area (ft²)	
Pool	4,400
Senior Center	17,000
Head Start	12,100
Total	33,500
Year Built	
Pool	1993
Senior Center	1976
Head Start (Daycare)	-----
Avg. Daily Occupancy	
Swimming Pool (Staff / Visitors)	8 / 130
Head Start (Teachers / Students)	14 / 55
Senior Center (Approximate Full-Time staff / Visitors)	20 / 200

2.1.1 Facility Description

This facility includes a Head Start Daycare Center and Early Prevention, swimming pool, senior center, and ballparks for softball and soccer with concession stand.

The Head Start located on the south side and Early Prevention on the north side of a shared building. According to the city and the utility bills, Early Prevention vacated the building in November 2017. The city plans to reoccupy this area soon. The daycare center includes offices, classrooms, and a small commercial kitchen.

Figure 5: Aerial view of Bicentennial/Alto Park Complex

The swimming pool includes a reception desk, men's and women's locker rooms, a lifeguard office, and a small breakroom. An additional pump room with filters and a boiler room is located on the building perimeter. The swimming pool is outdoors and operates seasonally.

The senior center also houses the administration for senior affairs and includes office space and meeting rooms. Additionally, there is a lobby with TV, dining room, weight room, gaming room, computer room, and commercial kitchens. The first kitchen serves the visiting seniors' breakfast and lunch, while the second kitchen provides prepared food for the Meals on Wheels program. Each kitchen prepares an estimated 300 meals per day.

2.1.2 Hours of Operation

2.1.2.1 Swimming Pool

May-September 1st

Monday	6:00 am – 6:00 pm
Tuesday	6:00 am – 6:00 pm
Wednesday	6:00 am – 6:00 pm
Thursday	6:00 am – 6:00 pm
Friday	6:00 am – 6:00 pm
Saturday	6:00 am – 5:30 pm
Sunday	6:00 am – 5:30 pm

2.1.2.2 Senior Center

	Senior Center	**Kitchen**
Monday	8:00 am – 5:00 pm	5:00 am – 2:00 pm
Tuesday	8:00 am – 5:00 pm	5:00 am – 2:00 pm
Wednesday	8:00 am – 5:00 pm	5:00 am – 2:00 pm
Thursday	8:00 am – 5:00 pm	5:00 am – 2:00 pm
Friday	8:00 am – 5:00 pm	5:00 am – 2:00 pm
Saturday	–	–
Sunday	–	–

2.1.2.3 Head Start

Monday	7:00 am – 3:00 pm
Tuesday	7:00 am – 3:00 pm
Wednesday	7:00 am – 3:00 pm
Thursday	7:00 am – 3:00 pm
Friday	7:00 am – 3:00 pm
Saturday	–
Sunday	–

2.1.3 Building Envelope

2.1.3.1 Swimming Pool

This single-story building has high ceilings and an open corridor down the middle. There are two types of a roof on this building. Firstly, a flat built-up roof above the locker rooms with a modified bitumen rolled sheet exterior that is supported by steel joist with metal deck. The second is a sloped blue metal roof, located in the middle of the building above the lobby and behind the reception desk leading down the main corridor. The walls are 8” masonry concrete unit (CMU) blocks with an interior framed wall with sheetrock interior. The majority of windows throughout the building are double paned with metal frame, including a large window wall that leads out to the pool.

2.1.3.2 Senior Center

This building is single story with a handful of additions, including a dining room, commercial kitchens, food storage, and a computer room that is under construction. The roof on this building is a flat, built-up roof with a modified bitumen rolled sheet exterior and supported by steel joist with metal deck. The original exterior walls are most likely constructed with 2”x6” wood studs at 16” on center, filled with batt insulation. The exterior of the original building has a white brick veneer. The additions have metal stud walls filled with batt insulation and white stucco exterior. The majority of windows throughout the building are double paned. There are a pair of 2’x2’ and 4’x4’ skylights. The main entrance on the east side of the building is through a set of metal double-doors with windows. Auxiliary building entrances located around the building are single doors made of wood or metal.

2.1.3.3 Head Start

This building is a single story with an addition that includes a kitchen on the south side. The flat roof is covered with a sprayed-on urethane foam (SPUF) with a roof coating applied over foam and granules broadcast into the coating. According to the principal, this system was applied around five years ago. This roof structure is likely a metal deck supported by steel joist. Large cracks and punctures are allowing water into the roof system.

Figure 6: Roof at the Head Start

The exterior walls are most likely constructed with 2”x6” wood studs at 16” on center, filled with batt insulation. The exterior of the original building has a white brick veneer and tan stucco on the addition. Most windows throughout the building are double paned with vinyl exterior and wood frame on the exterior and interior. There are a handful of skylights that are 2’x2’ and 2’x4’. The largest area of infiltration/exfiltration is at the doors on all sides of the building. These doors would benefit from new weather-strip and door sweeps that would reduce energy consumption. Several penetrations and openings are located around the perimeter walls and sealing these would reduce air infiltration/exfiltration and energy loss. We also recommend sealing approximately 40 feet of wall cracks.

Figure 7: Gaps in building envelope at Alto Complex

2.1.4 Lighting

2.1.4.1 Swimming Pool

Interior lighting in this area consists of mostly 1’x4’ fixtures with two, 34W T-12 lamps in the common area’s and men's locker room. 2’x2’ fixtures illuminate the women’s restrooms with two-lamp 32W ‘U’ lamps. Additionally, 2’x4’ troffers with two 34W T-12 lamps are located in the office. Most of the space illumination is provided from the existing 34W T-12 lamps that make this building a good candidate for a lighting retrofit. Exit signs consist of 4W LED lamps. Most of the exterior illumination is via a wall pack fixture with one 70W high-pressure sodium lamp. There are no existing lighting controls or occupancy sensors in this building.

2.1.4.2 Senior Center

Most of the interior lighting consists of 1’x4’ and 2’x4’ grid troffers with two or three 32W T-8 lamps in the common areas, offices, dining area, and kitchens. The same 2’x4’ grid troffers illuminate the restrooms with an additional vanity wall mounted 1’x4’ grid troffer with two 32W T-8 lamps. The 6” recessed cans in the lobby have been retrofitted with 12W LED lamps. Most of the space illumination is from the existing 32W T-8 lamps that make this building a good candidate for a lighting retrofit. Most of the exterior illumination is via a wall pack fixture with one 70W high-pressure sodium lamp. Additional exterior lighting includes recessed canopy fixtures with one 100W high-pressure sodium lamp. Two exterior wall pack fixtures have 16W LED lamps. Exit signs consist of 4W LED lamps. There are no existing lighting controls or occupancy sensors in this building.

2.1.4.3 Head Start

The majority of interior lighting consists of 1’x4’ wrap around fixtures with two or three 34W T-12 lamps in the common areas, offices, and classrooms. The restroom illumination is by the same 1’x4’ wrap around fixtures. In the hallway, there is track lighting with one 23W compact fluorescent lamp. Most of the space illumination is from existing 34W T-12's lamps that make this building a good candidate for a lighting retrofit. The exit signs were previously retrofitted with 4W LED lamps. Typical exterior lighting illumination is achieved by wall pack fixtures with one each of a 70W, 100W, or 150W high-pressure sodium lamp. Additional exterior lighting includes recessed canopy fixtures with one 100W high-pressure sodium lamp. There are no existing lighting controls or occupancy sensors in the building.

Refer to **Appendix D1** for a lighting fixture inventory.

2.1.5 HVAC Equipment

The Heating, Ventilation, and Air Conditioning (HVAC) systems are comprised of single-zone packaged rooftop units (RTU) with DX cooling and natural gas heating. The kitchen includes a commercial hood with an exhaust and make-up air unit (MUA).

A list of equipment is tabulated in **Appendix C1**.

2.1.6 Plug Loads

2.1.6.1 Swimming Pool

The plug loads associated with this building vary by space type. Located in the Lifeguards' Office are office plug loads such as computers, monitors, and printers. The kitchen/breakroom equipment includes a refrigerator, microwave, and water cooler.

2.1.6.2 Head Start

The plug loads associated with this building vary by space type and are typical for a daycare center. There are office plug loads such as computers, monitors, and printers are located in a couple of offices and the reception desk. There is a small size commercial kitchen that includes a stove and an oven, which run on natural gas. Additional equipment present are a dishwasher, hot plates, and a refrigerator. The remainder of the rooms are classrooms, a laundry room and some office spaces.

2.1.6.3 Senior Center

The plug loads associated with this building vary by space type. The office has plug loads such as computers, monitors, and printers are present. The kitchen equipment is for a commercial setting, including stoves, an oven, that typically run of natural gas. Additional equipment includes dishwashers, hot plates, and a refrigerator. The multipurpose room has a bingo machine electric display board. There is also a small weight room in the facility.

Refer to **Appendix C3** for detailed plug load inventory and plug load power densities.

2.1.7 Domestic Hot Water

The domestic hot water (DHW) system is a small portion of the energy consumption and units are located in a mechanical closet and include a tank natural gas heater that varies by size. The available data collected during the field survey are tabulated in **Appendix C1**.

2.1.8 Other

2.1.8.1 Swimming Pool

The facility includes a swimming pool water heater, pumps, and filtration system.

2.1.8.2 Senior Center

This facility includes two commercial kitchens. One serves the walk-in residents of the city and the other supports the Meals on Wheels program. These include typical commercial kitchen equipment for food preparation and storage, including a walk-in refrigerator.

2.1.8.3 Head Start

This facility includes a small commercial kitchen.

2.2 Fire Station #2

Facility Facts:

Facility Name	Fire Station #2
Street Address	5750 Alameda Frontage Road
City, State, Zip	Santa Fe, NM
Gross Area (ft²)	13,000
Year Built	Currently in Pre-Construction Phase
Avg. Daily Occupancy	

2.2.1 Facility Description

This facility is not yet built, and the City has put the construction of the building on hold.

2.3 Fire station #8

Facility Facts:

Facility Name	Fire Station #8
Street Address	6796 Jaguar Dr
City, State, Zip	Santa Fe, NM 87507
Gross Area (ft²)	10,500
Year Built	2006
Avg. Daily Occupancy	------

2.3.1 Facility Description

Fire Station #8 is located at 6796 Jaguar Drive and covers the far southwest border of the city. It houses one fire truck and an ambulance in the garage. The facility also includes sleeping quarters, a kitchen, a lounge, an exercise room, and the captain's office.

Figure 8: Aerial View of Fire Station #8

2.3.2 Hours of Operation

Monday	24 hours
Tuesday	24 hours
Wednesday	24 hours
Thursday	24 hours
Friday	24 hours
Saturday	24 hours
Sunday	24 hours

2.3.3 Building Envelope

There are two types of the roof on this building. Firstly, a flat built-up roof above the fire truck garage and training room with a modified bitumen rolled sheet exterior and supported by steel joists with metal deck. The second is a sloped, 24-gauge butler-style standing seam roof supported by purlins spaced at approximately five-foot centers located above the living areas. Typically, the panels are clipped to the purlins and seamed mechanically leaving no exposed fasteners. In some locations, panels are fastened through the panels into the purlins. The exposed fasteners, curbs, roof penetrations, and horizontal seams have been sealed with an unknown coating that appears to be in good condition.

Figure 9: Fire Station #8 Roof

The exterior walls are most likely metal studs at 16” on center, filled with batt insulation covered by a brown stucco exterior and a sheetrock interior. Most windows throughout the building are double paned with a metal frame. There are several 2’x’2’ and 4’x4’ skylights above the living areas that penetrate the sloped metal roof. Located above the fire truck garage are nine 2’x6’ skylights. The main public entrance is at the north side of the building through a metal-framed door with large window sections. An additional door is located on the east side and accessed from the parking lot. Auxiliary entrances located around the building are single doors made of wood or metal. The largest area of infiltration/exfiltration is at the doors on all sides of the building. These doors would benefit from new weather-strip and door sweeps that would reduce energy consumption.

Figure 10: Gaps in building envelope at Fire Station #8

2.3.4 Lighting

Interior lighting consists mostly of various types of 1’x4’ fixtures with two or three 32W T-8 lamps in the common areas, offices, and dormitory. Restrooms are illuminated by 1’x2’ vanity mounted fixtures, with one 24W T-5 lamp. Also, in this area are 6” recessed cans, with one, triple tube 42W compact

fluorescent lamp. Most of the space illumination is provided from the existing 32W T-8 lamps making this building a good candidate for a lighting retrofit. Exit signs fixtures consist of 4W LED lamps. Wall switches with occupancy sensors are typically found in restrooms, Storage, and housekeeping rooms. Typical exterior lighting is illuminated by a wall pack fixture with one 70W or 100W metal halide lamp. Additional exterior lighting includes bollards with one 100W high-pressure sodium lamp.
Refer to **Appendix D1** for a lighting fixture inventory.

2.3.5 HVAC Equipment

This building is conditioned by rooftop units (RTU) with DX cooling and natural gas heating and natural gas furnace. There is an additional split system that conditions the computer/communication room.

Additional information is available in **Appendix C1**.

2.3.6 Plug Loads

The plug loads associated with this building vary by space type. There is a dorm area with individual rooms. The Chief's Office includes plug loads such as a computer, monitors, and printer. The kitchen equipment includes a gas range and oven along with three refrigerators. The multipurpose/lounge room includes several large TVs and a computer station. There is also a small weight room that includes an elliptical machine and two treadmills.

Refer to **Appendix C3** for detailed plug load inventory and **Appendix D3** plug load power densities.

2.3.7 Domestic Hot Water

The domestic hot water (DHW) system is a small portion of the energy consumption and units are in a mechanical closet and include a tank and natural gas heater. The available data collected during the field survey are tabulated in **Appendix C1.**

2.3.8 Other

An exhaust system above the garage removes exhaust from the truck and ambulance.

2.4 Fort Marcy Recreation Complex

Facility Facts:

Facility Name	Fort Marcy Recreation Complex
Street Address	490 Bishops Lodge Rd
City, State, Zip	Santa Fe, NM 87501
Gross Area (ft^2)	26,000
Year Built	1982
Avg. Daily Occupancy Full-Time Staff / Part-Time Staff / Visitors	5 / 3 / 1,800 per Week

2.4.1 Facility Description

The Fort Marcy Recreation Complex is located at 490 Bishops Lodge Road in Santa Fe, NM 87501. This complex is 26,000 Square Feet (SQF) and incorporates the following main areas:

- Community room
- Gymnasium
- Racquetball courts
- Weight/cardio room
- 25-yard pool
- Adjacent park with multiple fields, playgrounds, putting green

Additional spaces include closed and open cubical office spaces, mechanical and electrical rooms, and locker rooms. This building was under renovations during this IGA that included a major upgrade in the HVAC equipment.

Figure 11: Aerial View of Fort Marcy Recreation Complex

2.4.2 Hours of Operation

Monday	6:00 am – 8:30 pm
Tuesday	6:00 am – 8:30 pm
Wednesday	6:00 am – 8:30 pm
Thursday	6:00 am – 8:30 pm
Friday	6:00 am – 8:30 pm
Saturday	8:00 am – 4:00 pm
Sunday	9:00 am – 3:45 pm

2.4.3 Building Envelope

The roof is supported by a metal deck over steel joists and trusses. It has batt insulation in the ceiling space and a modified bituminous cover. The exterior walls are concrete masonry unit (CMU) blocks with a tan stucco exterior and built out sheetrock interior. Most windows throughout the building are double paned with aluminum frame. The office area underwent a renovation a few years ago. Above the swimming pool area where the roof steps there are sloped window walls. Additionally, located over the gymnasium are twelve skylights.

Figure 12: Existing Roof above Fort Marcy Recreation Center Swimming Pool

The main entrance on the south side of the building is through a set of double sliding doors with a storefront window wall with a metal frame. Additional aluminum double doors are located at the entrance to the offices. Auxiliary entrances located around the building are single doors made of wood or metal. The largest area of infiltration/exfiltration is at the doors on all sides of the building. These doors would benefit from new weather-strip and door sweeps that would reduce energy consumption. Several penetrations and blank openings are located around the perimeter walls and sealing these would reduce air infiltration/exfiltration and energy loss.


Figure 13: Gaps and openings in building envelope at the Fort Marcy Recreation Complex

2.4.4 Lighting

Interior lighting in the open and closed offices consists of 2’x4’ grid troffers with three or four32W T-8 lamps, and 1’x4’ wrap around fixtures with two 32W T-8 lamps. The pool area is retrofitted with 1’x4’ fixtures with four 14W LED lamps. The gymnasium is illuminated mostly by high bay fixtures with six 54W T-5 lamps and additional 2’x4’ grid troffers with LED lamps. The locker room fixtures are vapor tight 1’x4’ with two 32W T-8 lamps. The restrooms include 2’x4’ grid troffers with four 32W T-8 lamps and 6” recessed cans with 12W LED lamps. The majority of the space illumination is provided from the existing T-8 lamps making this building a good candidate for a lighting retrofit. Wall switches with occupancy sensors are found in the family locker room. Exterior lighting is provided by a wall pack fixture with one 70W high-pressure sodium (HPS) lamp, or a shoebox fixture with a 250W HPS lamp. Additional exterior lighting includes bollards, with a single, 100W HPS lamp. 12” square recessed fixtures with 70W HPS lamp.

Refer to **Appendix D1** for a lighting fixture inventory.

2.4.5 HVAC Equipment

A large air handler unit (AHU) with a chiller/boiler hydronic system conditions the gymnasium. Additional rooftop units (RTU) with DX cooling and natural gas heating condition the additional spaces.

2.4.6 Plug Loads

The plug loads associated with this building vary by space type. Typical office plug loads include computers, monitors, and printers. A break room includes a coffee machine, refrigerator, and toaster. There are additional fitness rooms with multiple stationary bicycles, elliptical machines, steppers, and a treadmill.

Refer to **Appendix C3** for detailed plug load inventory and **Appendix D3** plug load power densities.

2.4.7 Domestic Hot Water

The domestic hot water (DHW) system is located in a mechanical closet and includes a tank natural gas heater. The available data collected during the field survey are tabulated in **Appendix C1.**

2.4.8 Other

The facility includes a pool water heating system, pumps, and filtration system.

2.5 Genoveva Chavez Community Center (GCCC)

Facility Facts

Facility Name	Genoveva Chavez Community Center
Street Address	3221 Rodeo Rd
City, State, Zip	Santa Fe, NM 87507
Gross Area (ft^2)	155,300
Year Built	1999
Avg. Daily Occupancy Full-Time Staff / Visitors	34 / 100,000 per Year

2.5.1 Facility Description

Located at 3221 Rodeo Road in Santa Fe, NM 87505 is the Genoveva Chavez Community Center (GCCC). This complex is just over 155,000 square feet (SQF) and incorporates four main activities:

- Ice arena with full-size NHL rink.
- Gymnasium with three basketball courts and an elevated running track.
- Natatorium that includes a competition Olympic-size pool, leisure pool, therapy pool, and spa.
- Fitness center incorporating weight room, aerobics classroom, and two racquetball courts.

Figure 14: Aerial View Genoveva Chavez Community Center

Additional areas include office space, a large community room that can be rented for events, multiple locker rooms, and a concession stand.

The building is two stories high with a large open corridor separating the ice rink on the north and the natatorium on the south. The main entrance, office area, and community room are located at the beginning of this corridor, on the west side of the building. At the end of the corridor are the gymnasium, fitness area, and racquetball courts.



Figure 15: Inside of Genoveva Chavez Community Center

During the IGA, the city was conducting several upgrades to the building HVAC system including the dehumidification system, ice rink chiller, and pool water system.

2.5.2 Hours of Operation

	Staff	**Building**	**Ice Arena**	**Pool**
Monday	5:00 am – 12:00 pm	5:30 am – 9:45 pm	8:00 am — 10:30 pm	5:30 am – 9:00 pm
Tuesday	5:00 am – 12:00 pm	5:30 am – 9:45 pm	6:00 am — 10:30 pm	5:30 am – 9:00 pm
Wednesday	5:00 am – 12:00 pm	5:30 am – 9:45 pm	6:00 am — 10:30 pm	5:30 am – 9:00 pm
Thursday	5:00 am – 12:00 pm	5:30 am – 9:45 pm	6:00 am — 10:30 pm	5:30 am – 9:00 pm
Friday	5:00 am – 12:00 pm	5:30 am – 7:45 pm	6:00 am — 6:30 pm	5:00 am – 7:30 pm
Saturday	–	8:00 am – 7:45 pm	8:30 am — 8:15 pm	10:00 am – 5:50 pm
Sunday	–	9:00 am – 5:45 pm	9:30 am — 4:00 pm	9:00 am – 5:50 pm

2.5.3 Building Envelope

The main sloped, standard seam metal roof has a minimum of 4" polyurethane foam over the structural metal deck a steel truss or joist and with an estimated R-35 value depending on foam thickness. Additionally, the flat roofs have a polyurethane foam system exterior over ½" gypsum board and supported by metal deck over steel joist with an estimated R-35 value depending on foam thickness. Typical exterior walls are constructed of 8" or 12" concrete masonry unit (CMU) blocks with a 3" insulation board covered with stucco exterior and 5/8" gypsum board interior. These walls have an estimated R-19 batt insulation value. The exterior walls for the mechanical rooms, located on the east side of the building are 8" CMU blocks. The majority of windows throughout the building are double paned with tint and aluminum or metal frame. Located on the perimeter of the pool and ice rink are large window walls. Located above the gymnasium are 6'x10' skylights and above the administration area, there are 4'x4' skylights. The main entrance on the east side of the building has multiple double doors with large glass portions. Additional auxiliary entrances located around the building are single doors made of wood or metal. These are areas of infiltration/exfiltration and would benefit from new sweeps and weather stripping.

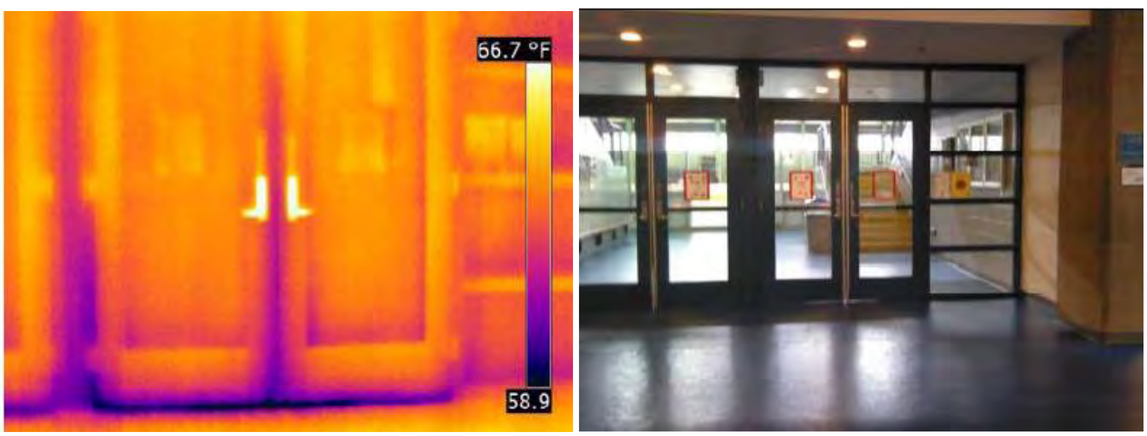


Figure 16: Thermal imaging and photos of building envelope issues

Dry cool air from the hockey rink is mixing with hot humid air from the swimming pool in the corridor. This is causing condensation in several areas. This is most likely due to air gaps between the corrugated roof deck that did not get filled during the original construction.

2.5.4 Lighting

Wall pack fixtures with two 32W lamps, 6" recessed cans with one 32W lamp, and cylindrical downlight fixtures with a 250W metal halide (MH) lamp illuminate the atrium that runs down the middle of the building. Interior lighting in the open and closed offices consists of 2'x4' grid troffers with three 32W T-8 lamps, 1'x4' wrap around fixtures with two 32W T-8 lamps, and 6" recessed cans with a single 32W lamp. The pool area lighting has numerous fixture types that include floodlights with 90W LED lamps, indirect floodlights with either a 400W or 1000W metal halide lamp. 10" cylinder fixtures, 400W metal halide lamp, and numerous 1'x4' high bay fixtures with four 54W T-5 lamps illuminate the hockey rink. High bay 1'x4' fixtures also illuminate the gymnasium along with 6" recessed cans with 32W compact fluorescent lamps (CFL). In the fitness area you will find high bay fixtures with 400W MH lamps, 2'x4' grid troffers with three 32W T-8 lamps, and 6" recessed cans with 32W CFL's. The locker rooms have numerous fixture types that include 1'x4', 1'x2', 1'x1' and 6" cans. A large amount of the space illumination is provided by T-8 and MH lamps which make this building a good candidate for a lighting retrofit. The exterior is illumination varies with surface mounted or recessed fixtures with a 70W, 175W, or 400W metal halide lamp. Additional fixtures include pole-mounted fixtures with 400W MH lamps. There are no existing lighting controls or occupancy sensors in this building.

Refer to **Appendix D1** for a lighting fixture inventory.

2.5.5 HVAC Equipment

Most of the space is served by multiple air handler units (AHU) with evaporative cooling and natural gas heating located on the roof. The pool area has two new large dehumidification units. The office space is conditioned by packaged rooftop units with DX cooling and natural gas heating. There is also a dedicated dehumidification unit for the hockey rink. A couple of split systems provide dedicated air conditioning for the IT/communication rooms. The kitchen includes a commercial hood with an exhaust and make-up air unit (MUA).

Additional information is available in **Appendix C1**.

2.5.6 Plug Loads

The plug loads associated with this building vary by space type. There are office plug loads such as computers, monitors, and printers. A break room includes multiple coffee machines, a refrigerator, and a toaster. There is a concession stand with commercial kitchen equipment. There are several fitness rooms with multiple stationary bicycles, elliptical machines, steppers, and treadmills. There are also two dedicated server rooms with switchboards.

Refer to **Appendix C3** for detailed plug load inventory and **Appendix D3** plug load power densities.

2.5.7 Domestic Hot Water

The domestic hot water (DHW) system includes a large gas heater and two storage tanks. The available data collected during the field survey are tabulated in **Appendix C1.**

2.5.8 Other

2.5.8.1 Swimming Pool

The facility includes several dedicated pool water heating systems, pumps, and filtration.

2.5.8.2 Hockey Rink

A dedicated system for the hockey rink includes a water filtration system, two large chillers, multiple pumps, and a cooling tower. An electric Zamboni conditions the ice surface.

2.5.8.3 Carport Solar PV System

A solar carport system operates on the two electric utility accounts serving this site. This includes a 528kW DC system connected to the larger account and 96kW DC system to the smaller account. The system had a decline in production at the end of 2016 when production went from 48,120 kWh in November to 9,440 kWh the following month. The average monthly production thereafter was 7,000 kWh per month for the following years. A report provided by the installer, Affordable Solar, is available in **Appendix E1**. YE reviewed this report and the system independently. The main causes of the reduction in PV system production are the electric panel breakers tripping and inverter failures. Recently, the system production has been temporarily limited so not to trip the breakers. This has increased the production from the prior breaker tripping, but the system is far below full capacity production, and this is not a desirable long-term solution. The reduced solar production caused an increase in grid provided consumption and the utility company, PNM, changed the rate for account 115447884-1174415-5 in early 2019 from 2A to 3B, a less advantageous rate for solar production.

Figure 17: Aerial view of GCCC

2.6 La Familia Medical Center

Facility Facts:

Facility Name	La Familia Medical Center
Street Address	1035 Alto St
City, State, Zip	Santa Fe, NM 87501
Gross Area (ft^2)	25,000
Year Built	1995
Avg. Daily Occupancy Full-Time Staff / Part-Time Staff / Visitors	50 / 10 / 150

2.6.1 Facility Description

This facility is a non-emergency community medical center and contains medical and health-related accommodations, including examination rooms, nursing stations, medical and billing records and supporting staff offices.

Figure 18: Aerial View of La Familia Medical Center

2.6.2 Hours of Operation

Monday	7:00 am – 6:00 pm
Tuesday	7:00 am – 6:00 pm
Wednesday	7:00 am – 6:00 pm
Thursday	7:00 am – 6:00 pm
Friday	7:00 am – 6:00 pm
Saturday	8:00 am – 3:00 pm
Sunday	–

2.6.3 Building Envelope

Figure 19: Exterior of La Familial Medical Center

The roof is supported by metal deck over steel joists and trusses with batt insulation in the ceiling space and a white TPO cover. The exterior walls are constructed with metal studs on 16” spacing with batt insulation in between a tan stucco exterior and built out sheetrock interior. The majority of windows throughout the building are double paned with aluminum frame. There is a window wall storefront entrance of the main parking lot with double doors. The main entrance on the east side of the building is through a set of metal double-doors. Auxiliary entrances located around the building are single doors made of wood or metal. The largest area of infiltration/exfiltration is at the doors on all sides of the building. These doors would benefit from new weather-strip and door sweeps that would reduce energy consumption. Several penetrations and openings are located around the perimeter walls and sealing these would reduce air infiltration/exfiltration and energy loss. Some windows would benefit from a resealing.

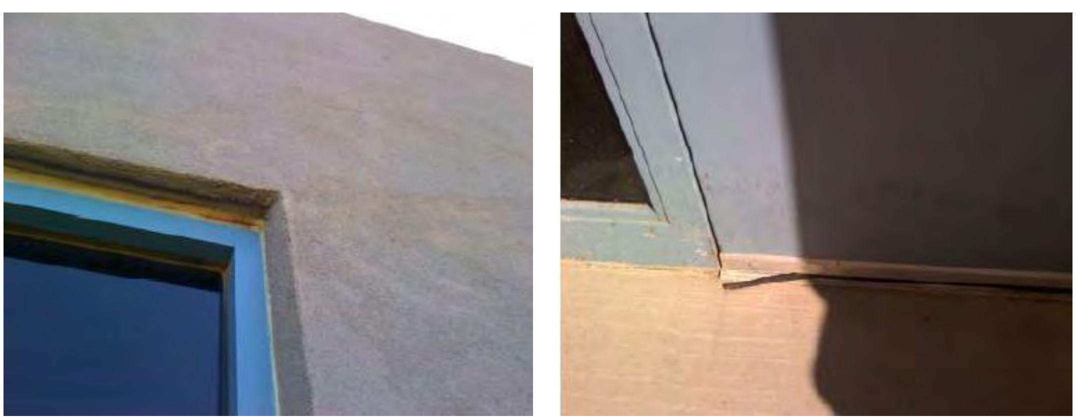


Figure 20: Flaws in building envelope at La Familia Medical Center

2.6.4 Lighting

6” recessed cans with one 70W metal halide (MH) lamp illuminate the entrance vestibule that leads into the lobby, which contains 8” recessed cans and two 26W compact fluorescent lamps (CFL). Offices and exam rooms, and the majority of the building space, are illuminated with 1’x4’ or 2’x4’ grid troffers with two or three 32W T-8 lamps. These T-8 fixtures make this building a good candidate for a lighting retrofit. Exit sign fixtures consist of 4W LED lamps. Typical exterior lighting is illuminated by a wall pack fixture with two or three 26W tube lamps. Additional exterior lighting includes recessed fixtures that are 6” cans with 50W metal halide (MH) lamps or 10” cans with a 100W MH lamp.

Refer to **Appendix D1** for a lighting fixture inventory.

2.6.5 HVAC Equipment

The Heating, Ventilation, and Air Conditioning (HVAC) systems comprise of single-zone packaged rooftop units (RTU) with DX cooling and natural gas heating. Additional split system conditions the computer server/communications rooms.

A list of equipment is tabulated in **Appendix C1**.

2.6.6 Plug Loads

The plug loads associated with this building vary by space type and are typical for medical examination and administration. There are office plug loads such as computers, monitors, and printers. Multiple breakrooms equipment includes coffee machines, microwaves, stoves, various size refrigerators, and water coolers. There are several server rooms with switches.

Refer to **Appendix C3** for detailed plug load inventory and **Appendix D3** plug load power densities.

2.6.7 Domestic Hot Water

The domestic hot water (DHW) system is a small portion of the energy consumption and units are typically located in a mechanical closet and include a tank natural gas heater that varies by size. The available data collected during the field survey are tabulated in **Appendix C1.**

2.6.8 Other

An office and several rooms contain a small portion of the city IT department that includes computer equipment and servers.

2.7 Municipal Recreation Complex

Facility Facts:

Facility Name	Municipal Recreation Complex
Street Address	205 Caja Del Rio
City, State, Zip	Santa Fe, NM 87507
Gross Area (ft²) Administration Clubhouse Maintenance Total	 1,500 11,500 6,000 19,000
Year Built	1996
Avg. Daily Occupancy Maintenance Full-Time/ Seasonal / Administration / Golf Rounds / League participants	6 / 6/ 2 / 35,000 rounds per Year / 3,500 per Year

2.7.1 Facility Description

The Municipal Recreation Complex (MRC) includes the 27-hole Marty Sanchez Links de Santa Fe golf course along with a clubhouse, administration building, and groundkeepers' work sheds. Also included are the nearby softball, soccer, and rugby fields and pumphouses for the golf course and playfields. The clubhouse includes a restaurant, pro shop, and golf cart parking.

2.7.2 Hours of Operation

	Golf Course	Administrative Office	Maintenance Crew
Monday	6:00 am – Dusk	8:00 am – 5:00 pm	6:00 am – 2:00 pm
Tuesday	6:00 am – Dusk	8:00 am – 5:00 pm	6:00 am – 2:00 pm
Wednesday	6:00 am – Dusk	8:00 am – 5:00 pm	6:00 am – 2:00 pm
Thursday	6:00 am – Dusk	8:00 am – 5:00 pm	6:00 am – 2:00 pm
Friday	6:00 am – Dusk	8:00 am – 5:00 pm	6:00 am – 2:00 pm
Saturday	–	–	–
Sunday	–	–	–

2.7.3 Building Envelope

2.7.3.1 Clubhouse

The roof is supported by metal deck over steel joists and trusses and has batt insulation in the ceiling space and a built-up roof with modified bitumen cover. The exterior walls are constructed with metal studs on 16” spacing with batt insulation in between a light tan stucco exterior and a built-out sheetrock interior. The majority of windows throughout the building are double paned with aluminum frame. The entrances of the building are through metal doors with a large glass section.

2.7.3.2 Administration Building

Although access to the roof was not available during the audit, the roof is most likely supported by wood deck over trusses with batt insulation in the ceiling space and a built-up, modified bituminous exterior.

The exterior walls are 2”x6” wood studs at 16” on center, filled with batt insulation, a stucco exterior, and sheetrock interior. The windows throughout the building are double paned. There are a few fiberglass skylights. The main entrance on the south side of the building is through a metal door with a large glass portion.

2.7.3.3 Maintenance Building

This premanufactured metal building has a sloped roof with 24-gauge R-panel over steel purlins on approximately five centers. and large roll-up doors on the southside. Insulation is typical for this type of building and located in the walls and roof.

The largest area of infiltration/exfiltration is at the doors on all sides of the building. These doors would benefit from new weather-strip and door sweeps that would reduce energy consumption. Several penetrations and blank openings are located around the perimeter walls and sealing these would reduce air infiltration/exfiltration and energy loss.

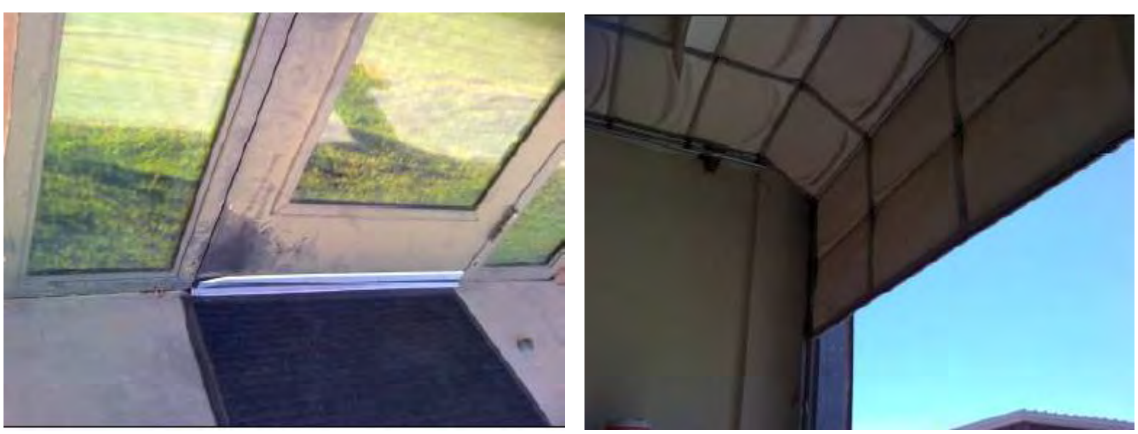


Figure 21: MRC building envelope issues

2.7.4 Lighting

2.7.4.1 Administration Building

The majority of interior lighting consists of 1'x4' or 2'x4' grid troffers with two or four three 34W T-12 lamps in the lobby, offices, and conference room. The restroom's illumination is provided by 1'x4' wrap around fixtures with the same T-12 lamps. The majority of the space illumination is from 34W T-12's lamps which make this building a good candidate for a lighting retrofit. Exterior lighting illumination is by wall sconce fixtures with 60W incandescent lamps.

2.7.4.2 Maintenance Building

1'x8' fixtures with two 59W or 110W T-12 lamps illuminate the open shop area. 2'x4' grid troffers illuminate the office and break area with four 34W T-8 lamps. The T-12's lamps that make this building a good candidate for a lighting retrofit. Exterior lighting illumination is by wall pack fixtures with 150 and 250W metal halides (MH) lamps. There are no existing lighting controls or occupancy sensors in the building.

Refer to **Appendix D1** for a lighting fixture inventory.

2.7.4.3 Clubhouse

Multiple track lights with 18W compact fluorescent lamps (CFL) light most of the pro shop. Either 4" recessed cans illuminate the bar and lounge area with 11W CFL or 8" recessed cans with 32 CFL lamps. 1'x4' vapor tight fixtures illuminate the cart barn with two 32W T-8 lamps. Typical exterior illumination is provided by various types of fixtures that include shoeboxes with 100W LED lamps and 70W metal halide (MH) lamps, along with floodlights with two 150W incandescent lamps and surface canopy 50W MH lamps.

2.7.5 HVAC Equipment

2.7.5.1 Clubhouse

This building conditioned by multiple rooftop units (RTU) with DX cooling and natural gas heating.

2.7.5.2 Administration Building

This building is conditioned by evaporative cooling and heated by a natural gas furnace.

2.7.5.3 Maintenance Building

This building is conditioned by evaporative cooling and natural gas radiant heating.

A list of equipment is tabulated in **Appendix C1**.

2.7.6 Plug Loads

2.7.6.1 Administration Building

The plug loads associated with this building vary by space type. There are office plug loads such as computers, monitors, and printers. The breakroom equipment is a microwave, refrigerator, and water cooler. The conference room has a large TV.

2.7.6.2 Clubhouse

The plug loads associated with this building vary by space type. There is a restaurant with an open sitting area with a bar and an open dining area with multiple TVs all served by a commercial kitchen. There are several small offices with typical plug loads such as computers, monitors, and printers. There is also a pro shop with several cashiers.

Refer to **Appendix C3** for detailed plug load inventory and **Appendix D3** power densities.

2.7.7 Domestic Hot Water

The domestic hot water (DHW) system is a small portion of the energy consumption, and units are typically located in a mechanical closet and include a tank natural gas heater that varies by size. The available data collected during the field survey are tabulated in **Appendix C1.**

2.7.8 Other

Clubhouse

The clubhouse has a commercial kitchen with exhaust hood system and makeup air unit along with walk-in freezer and refrigerator.

"Great 28 Golf Course" Pump House

Water supplied from the wastewater treatment plant is stored in a pond. Adjacent to this pond is a small building the houses four pumps; three of these have 100HP electric motors and the fourth with a 40HP motor. These pumps serve the irrigation system that waters the golf course.

"Hill Pond Soccer" Pump Station

Located above the soccer fields, next to a water storage pond is a pumphouse with two pumps with 60HP electric motors.

2.8 Police Department – Administration

Source: Google Earth

Facility Facts:

Facility Name	Police Department Administration
Street Address	2515 Camino Entrada
City, State, Zip	Santa Fe, NM 87507
Gross Area (ft^2)	30,000
Year Built Original / Remodel / Remodel / Addition	1984 / 2008 / 2011 / 2014
Avg. Daily Occupancy Full-Time Staff / Part-Time Staff / Visitors	230 / 2 / 20-50

2.8.1 Facility Description

This facility operates as the main Police Department for the city and houses the Chief of Police's office on the second floor. Open to the public is a lobby with several reception windows. There are numerous offices, training rooms, and conference rooms throughout the facility along with evidence storage and several temporary holding cells. Constructed in 2014, the two-story addition on the east side includes mostly office space and conference rooms.

Figure 22: Aerial View of Police Department Administration

2.8.2 Hours of Operation

Monday	24 hours
Tuesday	24 hours
Wednesday	24 hours
Thursday	24 hours
Friday	24 hours
Saturday	24 hours
Sunday	24 hours

2.8.3 Building Envelope

The flat roof is supported by metal deck over steel joist and has batt insulation in the ceiling space. The original building was re-roofed in 2009 with a Tremco TPA membrane. In consultations with the manufacturer, the roof is under warranty and Tremco is recommending performing repairs on several locations where seams require re-welding and installing terminal bars are required. The building addition roof has a 60 mil TPO adhered system.

Figure 23: Building envelope issues at the Police Department Administration building roof

The exterior walls are metal studs at 16” on center, filled with batt insulation, a stucco exterior, and sheetrock interior. The majority of windows throughout the building are double paned with steel or aluminum frames. The main entrance on the west side of the building is through a set of metal double doors with large glass sections. Auxiliary entrances located around the building are single doors made of wood or metal. The largest area of infiltration/exfiltration is at the doors on all sides of the building. These doors would benefit from new weather-strip and door sweeps that would reduce energy consumption. Several penetrations and blank openings are located around the perimeter walls and sealing these would reduce air infiltration/exfiltration and energy loss.

Figure 24: Building envelope gaps at the Police Department Administration building

2.8.4 Lighting

Most of the interior space lighting consists of 2'x4' grid troffers with two or three 32W T-8 lamps in the office spaces, conference rooms, main hallways and corridors. The fitness room fixtures are 1'x8' with four 32W T-8 lamps. The locker rooms and restrooms also include 1'x4' wrap around fixtures with two 32W T-8 lamps along with the 2'x4' fixtures previously mentioned. 6" recessed cans illuminate the lobby with 26W compact fluorescent lamps (CFL). T-8 lamps make this building a good candidate for a lighting retrofit. Exit sign fixtures consist of 4W LED lamps. The exterior lighting consists of various fixtures including wall packs with 100W metal halide (MH) lamps, shoe boxes with 400W high-pressure sodium (HPS) lamps, and 8" and 10" recessed cans with 70W MH lamps. Wall switches with occupancy sensors are typically found in offices, conference rooms, and restrooms.

Refer to **Appendix D1** for a lighting fixture inventory.

2.8.5 HVAC Equipment

The Heating, Ventilation and Air Conditioning (HVAC) system for the original building comprises two multi-zone packaged rooftop units (RTU) with DX cooling and one smaller single zone unit with DX cooling and natural gas heating. The two larger units provide supply air to hydronic reheat boxes. The reheat boxes have hot water heating coils that are fed from two boilers located in a large mechanical closet. The newer addition is conditioned via single zone packaged rooftop units. There are several split systems that condition the IT/communication rooms.

A list of equipment is tabulated in **Appendix C1**.

2.8.6 Plug Loads

The plug loads associated with this building vary by space type. There are office plug loads such as computers, monitors, and printers. The multiple breakrooms' equipment includes coffee machines, microwaves, and refrigerators. Conference and training rooms have TVs and audiovisual equipment. There are several server rooms and small laboratories for evidence collection and examination. The second floor has a fitness room with an exercise bike, an elliptical machine, and a pair of treadmills. The following table summarizes the plug load power density using estimated equipment peak wattage.

Refer to **Appendix C3** for detailed plug load inventory and **Appendix D3** plug load power densities.

2.8.7 Domestic Hot Water

The domestic hot water (DHW) system is a small portion of the energy consumption, and units are typically located in a mechanical closet and include a tank natural gas heater that varies by size.

The available data collected during the field survey are tabulated in **Appendix C1.**

2.8.8 Other

None

2.9 Public Library – Main

Facility Facts:

Facility Name	Public Library – Main
Street Address	145 Washington Ave
City, State, Zip	Santa Fe, NM 87501
Gross Area (ft²)	28,000
Year Built	1940
Avg. Daily Occupancy	-----

2.9.1 Facility Description

Located in downtown Santa Fe, just off the main plaza, is the main Library. The upper, 2nd story, level is split between staff office spaces with a break room on the north and children's reading rooms on the south. The ground level houses most of the books with several reading and computer rooms, along with the front desk. Behind the front desk are several open office spaces, including return book sorting areas. In the basement are additional staff open and closed office spaces.

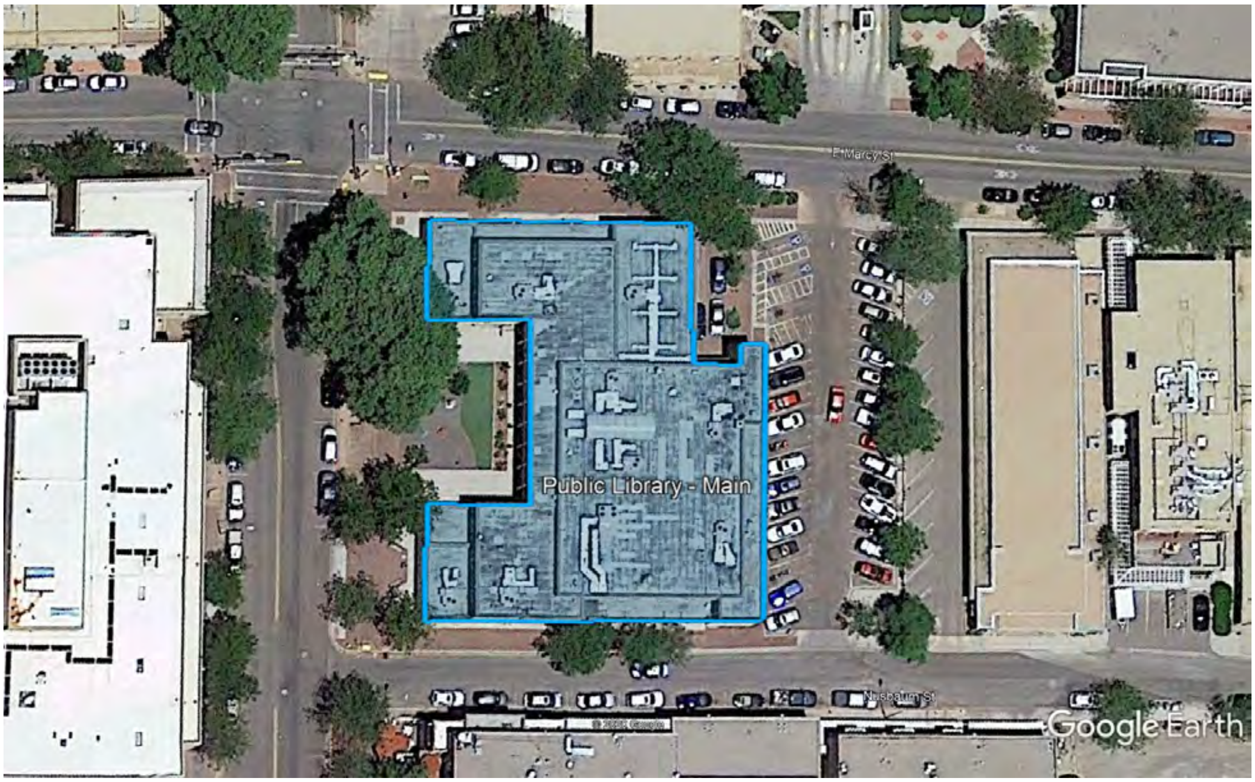


Figure 25: Aerial View Public Library – Main

2.9.2 Hours of Operation

Monday	10:00 am – 8:00 pm
Tuesday	10:00 am – 8:00 pm
Wednesday	10:00 am – 8:00 pm
Thursday	10:00 am – 6:00 pm
Friday	10:00 am – 6:00 pm
Saturday	10:00 am – 6:00 pm
Sunday	1:00 pm – 5:00 pm

2.9.3 Building Envelope

The flat roof is supported by wood trusses or metal joist and batt insulation in the ceiling space and built-up roof with a modified bitumen exterior. The exterior walls are constructed with studs at 16” on center, filled with batt insulation, a stucco exterior, and sheetrock interior. Additional walls are made of adobe. The basement wall is constructed from cast-in-place concrete. The majority of windows throughout the building are single paned with metal frame. The main entrances located on the east and west side of the building are through a set of metal doors with large window sections. The largest area of infiltration/exfiltration is at the doors on all sides of the building. These doors would benefit from new weather-strip and door sweeps that would reduce energy consumption. Several penetrations and blank openings are located around the perimeter walls and sealing these would reduce air infiltration/exfiltration and energy loss. We also recommend sealing approximately 40 feet of wall cracks.

Figure 26: Building envelope issues at the Main Library

2.9.4 Lighting

Most of the interior space lighting consists of 2’x4’ grid troffers with two, three, or four-lamp 32W T-8’s in the office spaces, conference rooms, hallways and corridors. These spaces also include 1’x4’ and 1’x8’ fixtures with 28W T-5 lamps and 6” and 8” recessed cans retrofitted with 12W or 14W LED fixtures. The library space includes 1’x4’ and 1’x8’ fixtures with T-5 lamps and 6” cans with LED’s. Also, in the library space are 4’x4’ fixtures with six T-8 lamps. The T-8 lamps make this building a good candidate for a lighting retrofit. Exit sign fixtures consist of 4W LED lamps. Exterior decorative lighting fixtures have various lamp types which include 150W high-pressure sodium (HPS), 23W compact fluorescents (CFL), and 25W LEDs. There are bollards with 100W metal halide lamps. Wall switches with occupancy sensors are typically found in offices, lobby, storage rooms, and restrooms.

Refer to **Appendix D1** for a lighting fixture inventory.

2.9.5 HVAC Equipment

The Heating, Ventilation, and Air Conditioning (HVAC) systems comprise of single-zone packaged rooftop units (RTU) with DX cooling and natural gas heating. Two additional natural gas boilers supply heating hot water to radiators located through the building.

A list of equipment is tabulated in **Appendix C1**.

2.9.6 Plug Loads

The plug loads associated with this building vary by space type. There are office plug loads such as computers, monitors, and printers. The breakroom equipment includes two microwaves, an electric range, and a refrigerator. Additional equipment includes computer stations and a printing station with multiple printers.

Refer to **Appendix C3** for detailed plug load inventory and **Appendix D3** plug load power densities.

2.9.7 Domestic Hot Water

The domestic hot water (DHW) system is a small portion of the energy consumption and units are typically located in a mechanical closet and include a tank natural gas heater that varies by size. The available data collected during the field survey are tabulated in **Appendix C1.**

2.9.8 Other

None.

2.10 Santa Fe Public Library – Southside

Facility Facts:

Facility Name	Santa Fe Public Library – Southside
Street Address	6599 Jaguar Dr
City, State, Zip	Santa Fe, NM 87507
Gross Area (ft^2)	26,000
Year Built	2004
Avg. Daily Occupancy	-----

2.10.1 Facility Description

Located at 6599 Jaguar Drive this community library is located on the south side of city as the name indicates. The main areas include a reception lobby with a reception desk, several open book halls, a children's book room with a reading area, two open public rooms, and staff offices with a break room. Additional restrooms, electrical, mechanical, and storage rooms are located throughout the building.

Figure 27: Aerial View of Public Library – Southside

2.10.2 Hours of Operation

Monday	10:30 am – 8:00 pm
Tuesday	10:30 am – 8:00 pm
Wednesday	10:30 am – 8:00 pm
Thursday	10:30 am – 8:00 pm
Friday	10:30 am – 6:00 pm
Saturday	10:30 am – 6:00 pm
Sunday	1:00 pm – 5:00 pm

2.10.3 Building Envelope

Figure 28: Southside Library Exterior

There are two types of a roof on this building. Firstly, a flat built-up roof that covers the majority of the roof with a 60-mil adhered EPDM roof system supported by metal deck and steel joist. There are multiple punctures in the membrane and deteriorating patches with unknown material. It is apparent with the amount of patchwork present that the library has experienced leaks. These repairs have most likely voided the original manufacturer warranty. The second is a sloped corrugated metal roof, located above the entrance and portions of the elevated roof in the center of the building.

Figure 29: Southside Library Roofing Condition and Blemishes

The exterior walls are most likely constructed from metal studs at 16” on center, filled with batt insulation, a brown stucco exterior, and sheetrock interior. Most windows throughout the building are double paned with a metal frame. The main public entrance is at the north side of the building through a metal-framed door with large window sections. An additional staff door is located on the southeast side. Auxiliary entrances located around the building are single doors made of metal. The largest area of infiltration/exfiltration is at the doors on all sides of the building. These doors would benefit from new weather-strip and door sweeps that would reduce energy consumption. Sealing several penetrations and blank openings along with lighting fixtures located around the perimeter walls would reduce air infiltration/exfiltration and energy loss.

Figure 30: Southside Library Building Envelope Concerns

2.10.4 Lighting

The interior lighting consists of various fixture types depending on room usage. The main library area lighting includes decorative round chandeliers with six compact florescent lamps as well as radial lens 1’x4’ strip fixtures with one T8 32W lamp. The children's area includes 4” recessed cans with 8W LED lamps and 2’x2’ grid troffers with two T8 17W lamps. Offices are typically illuminated 1’x4’ strip fixtures with two T8 32W lamps. A large amount of T8 fixtures makes this building a good candidate for a lighting retrofit. Exit signs have 4W LED lamps. Wall switches with occupancy sensors are typically found in offices, hallways, restrooms, and storage rooms.

Refer to **Appendix D1** for a lighting fixture inventory.

2.10.5 HVAC Equipment

The Heating, Ventilation, and Air Conditioning (HVAC) systems comprise of multi-zone -zone packaged rooftop units (RTU) with DX cooling and natural gas heating. Additional heating hot water boilers are located in a mechanical and were not accessible during the survey.

Additional information is available in **Appendix C1**.

2.10.6 Plug Loads

The plug loads associated with this building vary by space type. There are office plug loads such as computers, monitors, and printers. The breakroom equipment includes a coffee machine, microwave, an electric range, and a refrigerator. Additional equipment includes computer stations and a printing station with multiple printers. There is a server with switches in a dedicated room.

Refer to **Appendix C3** for detailed plug load inventory and **Appendix D3** plug load power densities.

2.10.7 Domestic Hot Water

The domestic hot water (DHW) system is a small portion of the energy consumption and units are typically located in a mechanical closet and include a tank natural gas heater that varies by size. The available data collected during the field survey are tabulated in **Appendix C1.**

2.10.8 Other

There is a motorized system that opens the high windows located in two large open book areas.

2.11 Salvador Perez Recreation Center

Facility Facts:

Facility Name	Salvador Perez Swimming Pool
Street Address	601 Alta Vista St
City, State, Zip	Santa Fe, NM 87505
Gross Area (ft^2)	17,000
Year Built	1954
Avg. Daily Occupancy Full-time Staff/ Part-Time Staff / Visitors	Currently Closed for Renovations 5 / 3 / 90-100

2.11.1 Facility Description

Serving the public since 1954, the Salvador Perez Recreation Complex is located at 601 Alta Vista in Santa Fe, NM 87505. This complex is 18,000 Square Feet (SQF) and incorporates the following main areas:

- Community classroom
- Weight/cardio room
- 25-yard pool
- Adjacent park with playgrounds, tennis and sand volleyball courts, and soccer and baseball fields.

Additional spaces include office spaces, mechanical and electrical, and locker rooms.

Figure 31: Aerial View of Salvador Perez Swimming Pool

2.11.2 Hours of Operation

Monday	6:00 am – 8:00 pm
Tuesday	6:00 am – 8:00 pm
Wednesday	6:00 am – 8:00 pm
Thursday	6:00 am – 8:00 pm
Friday	6:00 am – 8:00 pm
Saturday	–
Sunday	–

Note: Currently Closed for Renovations

2.11.3 Building Envelope

Both the upper roof above the natatorium and lower roof above the lobby and offices are constructed with metal roof deck supported by steel joist and batt insulation in the ceiling space with a built-up roof with exterior TPO. The exterior walls are concrete masonry unit (CMU) blocks with split face or brown stucco and interior furred out sheetrock walls. The majority of windows throughout the building are double paned with an aluminum frame on the exterior and interior. There is a glass block section below the windows around the lobby. The main entrance on the west side of the building is through a set of double doors with windows. The southside entrance to the pool is via similar double doors with windows and auxiliary entrances located around the building are single doors made of wood or metal. The largest area of infiltration/exfiltration is at the doors on all sides of the building. These doors would benefit from new weather-strip and door sweeps that would reduce energy consumption. Several penetrations and blank openings are located around the perimeter walls and sealing these would reduce air infiltration/exfiltration and energy loss.

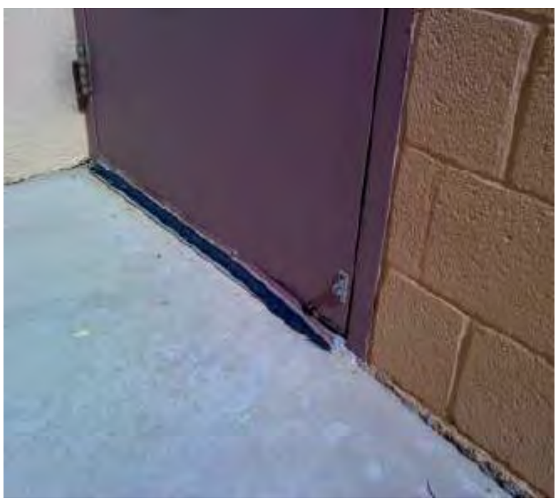


Figure 32: Building envelope issues at Salvador Perez Swimming Pool

2.11.4 Lighting

Interior lighting in the offices and classrooms consists of 2’x4’ grid troffers with three 32W T-8 lamps and 1’x4’ wrap around fixtures with two 32W T-8 lamps. The pool area has been previously retrofitted with 90W LED lamps. The locker room fixtures are vapor tight 1’x4’ with two 32W T-8 lamps. The restrooms include 2’x4’ grid troffers with three 32W T-8 lamps and 1’x4’ wrap around fixtures with two 32W T-8 lamps. The majority of the space illumination provided from the existing T-8 lamps making this building a good candidate for a lighting retrofit. There are no existing lighting controls or occupancy sensors in this building. Wall pack fixtures with one 12W LED lamp, wall packs with 70W high-pressure sodium lamps (HPS), and floodlights with a 250W HPS lamp provide typical exterior illumination for the building. Floodlights illuminate sports fields with 1500W metal halide (MH) lamps. Additional exterior lighting includes floodlights with 250W HPS and wall packs with triple tube 24W compact fluorescent lamps.

Refer to **Appendix D1** for a lighting fixture inventory.

2.11.5 HVAC Equipment

A large dehumidification system provides the Heating, Ventilation, and Air Conditioning (HVAC) systems for the pool area with a natural gas boiler attached that supplies hot water to a heating coil section. The lobby, offices and additional classrooms' air conditioning comprise of single-zone packaged rooftop units (RTU) with DX cooling and natural gas heating.

Additional information is available in **Appendix C1**.

2.11.6 Plug Loads

This building is under construction for renovations and not occupied; therefore, the plug loads are relatively low. There are a couple of small offices with plug loads such as computers, monitors, and printers, but are not in use. There is also a small breakroom with equipment.

Refer to **Appendix C3** for detailed plug load inventory and **Appendix D3** plug load power densities.

2.11.7 Domestic Hot Water

The domestic hot water (DHW) system consists of a large tank natural gas heater located adjacent to the mechanical pool room. The available data collected during the field survey are tabulated in **Appendix C1.**

2.11.8 Other

The facility includes a pool water heating, pumps, and filtration system.

2.12 Sandoval Parking Garage Lot B

Facility Facts:

Facility Name	Sandoval Parking Garage Lot B
Street Address	200 Sandoval
City, State, Zip	Santa Fe, NM 87501
Gross Area (ft²)	130,000
Year Built	1988
Avg. Daily Occupancy (Full-Time Staff/ Visitors)	3 / 800

2.12.1 Facility Description

This facility is the main public parking for the downtown plaza and is a four-story parking facility with several small offices. Additionally, restrooms located in the entrance see heavy traffic since they are among the few public restrooms in the vicinity.

Figure 33: Aerial View of Sandoval Parking Garage

2.12.2 Hours of Operation

Monday	7:00 am – 12:00 pm
Tuesday	7:00 am – 12:00 pm
Wednesday	7:00 am – 12:00 pm
Thursday	7:00 am – 12:00 pm
Friday	7:00 am – 12:00 pm
Saturday	7:00 am – 12:00 pm
Sunday	7:00 am – 12:00 pm

2.12.3 Building Envelope

This building is constructed from reinforced concrete with large open sections between the floor levels and a tan stucco exterior finish. The enclosed areas of this building are few and include a couple of small office spaces for the facility management and maintenance team, restrooms, and an elevator tower.

2.12.4 Lighting

The lighting for the small office areas consists of mostly 2’x4’ grid troffers 2 lamps 32W T-8’s and 1’x4’ strip fixtures with 2 lamps 32W T-8’s. The parking area has previously gone through a LED retrofit with surface mounted fixtures with 20W LED lamps. This retrofit was installed approximately four years ago, but the number of fixture failures has been increasing. There are no existing lighting controls or occupancy sensors in the building.

Refer to **Appendix D1** for a lighting fixture inventory.

2.12.5 HVAC Equipment

The Heating, Ventilation and Air Conditioning (HVAC) system for this building services two small offices and was not available at the time of the survey. It is assumed these units are small package units with DX cooling and electric heating.

Additional information is available in **Appendix C1**.

2.12.6 Plug Loads

There are two small offices with plug loads such as computers, monitors, and printers. Due to the small number of plug loads and large facility areas the plug loads were not summarized in a table.

2.12.7 Domestic Hot Water

The domestic hot water (DHW) system is a small portion of the energy consumption and was not available at the time of the survey.

2.12.8 Other

None

2.13 Santa Fe Convention Center

Facility Facts:

Facility Name	Santa Fe Convention Center
Street Address	201 W. Marcy St
City, State, Zip	Santa Fe, NM 87501
Gross Area (ft²)	72,000
Year Built	2008
Avg. Daily Occupancy (Full-Time Staff, Visitors)	34 / 100,000 per Year

2.13.1 Facility Description

This facility is located at 201 West Marcy Street in Downtown Santa Fe and includes a two-story below-ground parking garage and a two-story above ground convention center. The ground floor includes the main offices and tourist guide room, numerous banquet halls, back hall support areas with three separate commercial kitchens and beverage service stations. The second story contains multiple meeting and conference rooms and a large outdoor open balcony. Additional spaces on the second floor include audio and lighting rooms.

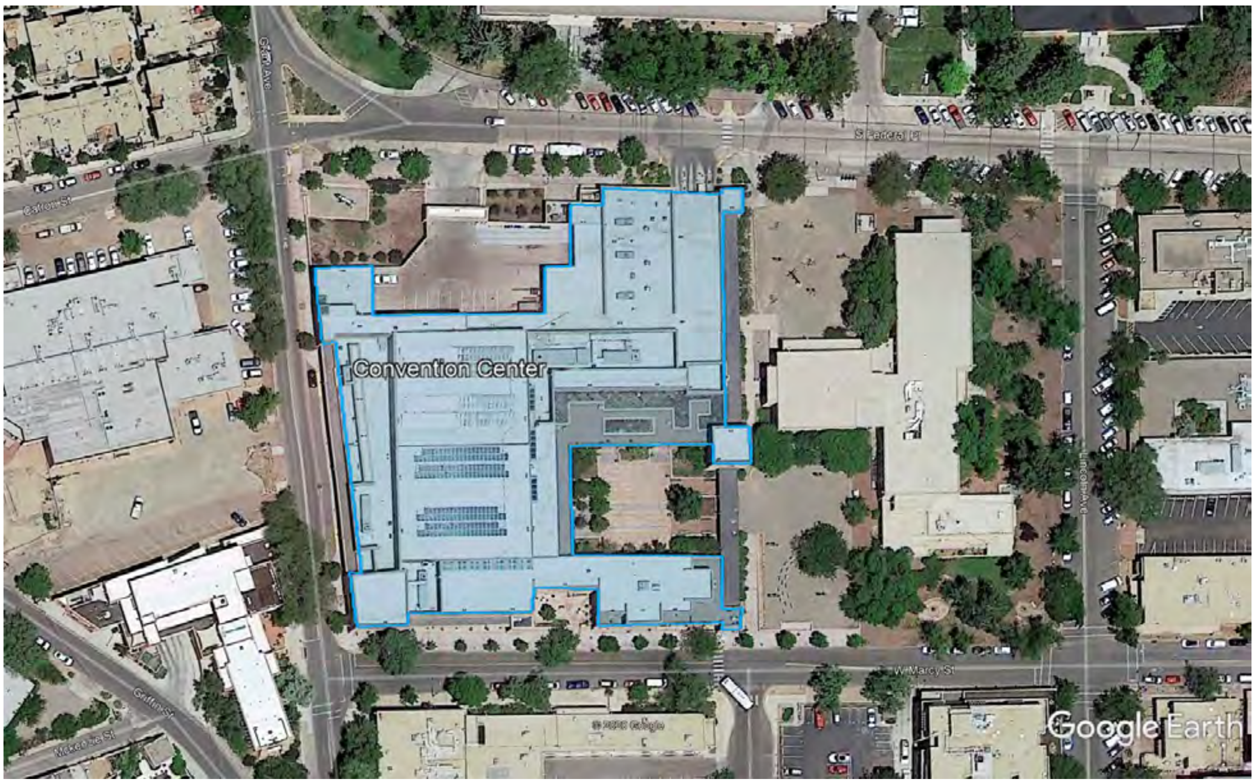


Figure 34: Aerial View of Santa Fe Convention Center

2.13.2 Hours of Operation

	Offices	Conference / Banquet
Monday	8:00 am – 5:00 pm	Varies depending on events
Tuesday	8:00 am – 5:00 pm	Varies depending on events
Wednesday	8:00 am – 5:00 pm	Varies depending on events
Thursday	8:00 am – 5:00 pm	Varies depending on events
Friday	8:00 am – 5:00 pm	Varies depending on events
Saturday	8:00 am – 5:00 pm	Varies depending on events
Sunday	8:00 am – 5:00 pm	Varies depending on events

2.13.3 Building Envelope

The roofs are flat and structurally supported by metal deck over steel joist with batt insulation in the ceiling space and built-up roof with TPO exterior. The exterior walls are most likely 6” steel studs at 16” on center, filled with batt insulation, a dark tan stucco exterior, and sheetrock or gypsum board interior. The majority of windows throughout the building are double paned with various color frames. Located around the building are several large public entrances through multiple doors with large window sections. Auxiliary entrances located around the building have single doors made of wood or metal. Located on the loading dock in the back of the building are large Metal roll-up doors. The largest area of infiltration/exfiltration is at the doors on all sides of the building. These doors would benefit from new weather-strip and door sweeps that would reduce energy consumption. Several penetrations and blank openings are located around the perimeter walls and sealing these would reduce air infiltration/exfiltration and energy loss.

Figure 35: Building Envelope Gaps at SFCC

2.13.4 Lighting

The Convention center has gone through several LED lighting upgrades, in selected areas, undertaken by the management team. This building incorporates many spaces with different types of lighting, the typical space lighting is as follows:

Visitors Center:	Recessed 6” cans with triple tube 26W compact fluorescent lamps (CFL) lamps
	Decorative chandeliers with two 26W CFL lamps
Common Areas:	Recessed 6” cans with 8.5W LED lamps
Conference Rooms:	Recessed 6” cans with triple tube 26W CFL lamps
	10” & 12” cans with either 250W metal halide (MH) lamps or halogen lamps
	Decorative fixtures with 36W lamps
Hallways:	Recessed 6” cans with triple tube 26W CFL
	Decorative chandeliers with two 26W CFL lamps

	Decorative chandeliers with five 13W CFL lamps
	1'x8' strip fixtures with four 32W T-8's
	Flood lights with PAR 38 12W LED
Lobby	Decorative pendant with 8W and 12W LED
	Flood Lights with 150W metal halide lamps
Offices	2'x2' grid troffers with two 32W T-8 U shaped lamps
	2'x4' grid troffers with two 32W T-8 lamps
Restrooms	Recessed 6" cans with triple tube 26W CFL lamps
	1'x4' wrap-around with two 32W T-8 lamps
Parking garage	Surface-mounted industrial fixture with one 100W metal halide (MH)
Exterior	Wall sconce with triple tube 26W compact fluorescent lamps (CFL) lamps
	Recessed 12" square 26W CFL
	Outdoor flood light with one 32W halogen lamp
	Decorative chandeliers with one 26W halogen lamp

Wall switches with occupancy sensors are typically found in offices and restrooms.

Refer to **Appendix D1** for a lighting fixture inventory.

2.13.5 HVAC Equipment

The main Heating, Ventilation and Air Conditioning (HVAC) system comprised of several large multi-zone packaged rooftop units (RTU) with DX cooling. These units provide supply air to hydronic reheat boxes. The re-heat boxes have hot water heating coils that are fed from two boilers located in the mechanical room. Additional electric wall heaters and hanging unit heaters (UH) are located throughout the building. There are several split systems that condition IT/communication rooms.

Additional information is available in **Appendix C1**.

2.13.6 Plug Loads

The plug loads associated with this building vary by space type and are typical for offices, conference rooms and halls, banquet rooms, and commercial kitchens. There are office plug loads such as computers, monitors, and printers. The kitchen equipment is also for a commercial setting, including coffee machines, gas stoves & ovens, dishwashers, hot plates, commercial refrigerators, and water coolers. Additionally, spread throughout the facility are a handful of vending machines. The conference rooms include TVs, projectors, and audiovisual equipment. There are a couple of server rooms with switchboards.

Refer to **Appendix C3** for detailed plug load inventory and **Appendix D3** plug load power densities.

2.13.7 Domestic Hot Water

Domestic hot water (DHW) is provided by two large commercial size natural gas heaters.

2.13.8 Other

Kitchens

Three sperate commercial kitchens with typical commercial equipment are located in the back of the building. This includes kitchen exhaust hood systems and make-up air units, multiple walk-in freezers and refrigerators along with several large ice machines and multiple hot and cold drinking stations. An audio-video control room with equipment is located on the second floor of the backhouse.

Solar PV System

The city entered a power purchase agreement (PPA) with Dissigno Holdings that installed a roof-mounted solar PV system. According to staff, there are occasional inverters that fail and go of the line that reduces the system production. Additional information regarding rate and production is available in the Baseline Utility Analysis section of this report.

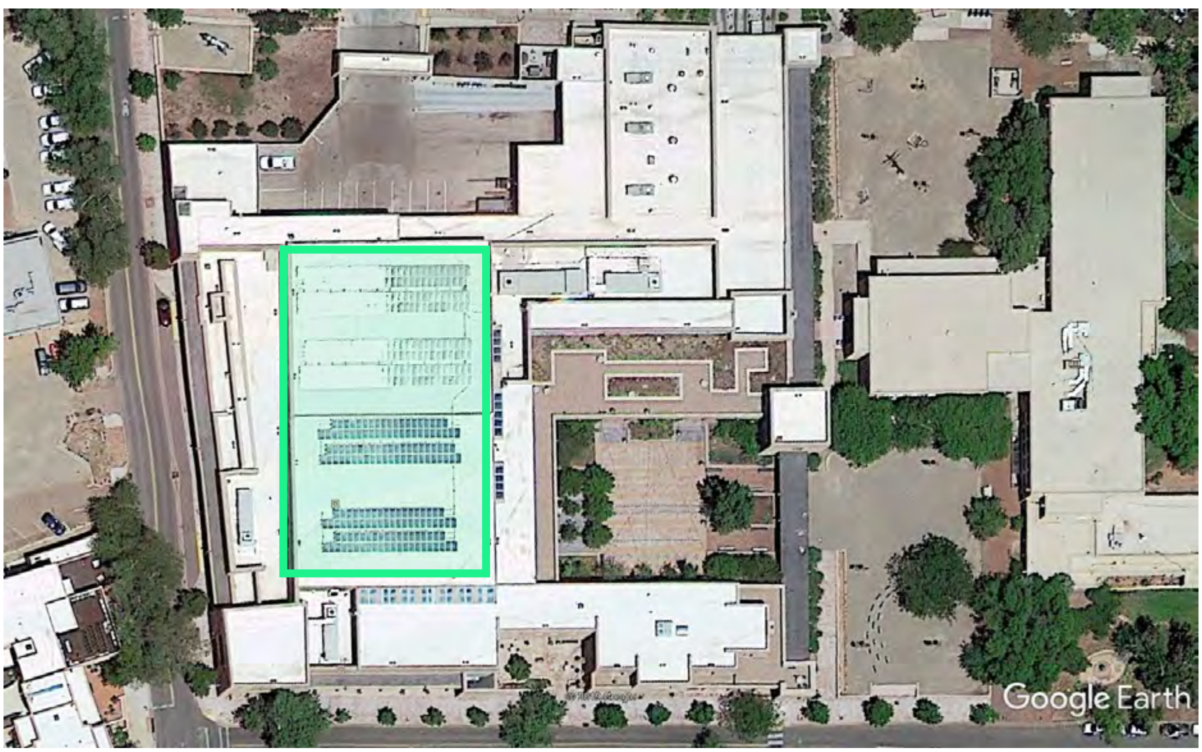


Figure 36: Solar PV System installed at SFCC

2.14 Santa Fe Regional Airport

Facility Facts:

Facility Name	Santa Fe Regional Airport
Street Address	3003 Aviation Dr
City, State, Zip	Santa Fe, NM 87507
Gross Area (ft²)	
Terminal	7,100
Maintenance Shop	6,000
Fire Station #10	9,400
Total	22,500
Year Built	
Terminal	1956
Maintenance Shop	1990
Fire Station #10	2008
Avg. Daily Occupancy	-----

2.14.1 Facility Description

Located at the end of 3003 Aviation Drive is the Main Terminal for the Regional Airport. This building is two stories high and includes a control tower. On the first floor is the main desk and staff offices for two commercial airline companies and three rental car companies. Also located on the ground floor is a restaurant with a commercial kitchen, TSA screening area, luggage pick-up, and departing flight waiting area. The second floor and tower house the Federal Transit Administration (FTA). The Airport Administration is located in a temporary mobile office adjacent to the terminal building.
On the south side of the airport is a maintenance shop used by the city staff.

Figure 37: Santa Fe Regional Airport Aerial View of IGA Buildings

2.14.2 Hours of Operation

	Terminal	**Fire Station**
Monday	Varies	24 hours
Tuesday	Varies	24 hours
Wednesday	Varies	24 hours
Thursday	Varies	24 hours
Friday	Varies	24 hours
Saturday	Varies	24 hours
Sunday	Varies	24 hours

2.14.3 Building Envelope

2.14.3.1 Terminal

The flat roof is supported by wood trusses or metal joist with batt insulation in the ceiling space and built-up roof with a modified bitumen exterior. The exterior walls are most likely 2”x6” wood studs at 16” on center, filled with batt insulation, a stucco exterior, and sheetrock interior or adobe. The windows of this building are a mixture of single-pane and double paned with wood frame. The main entrance on the southeast side of the building is through a set of wooden double-doors with a large glass panel. An additional double door is located on the south side. Additional doors including auxiliary entrances, are located around the building and include single doors made of wood or metal.

2.14.3.2 Maintenance Shop

Figure 38: Santa Fe Regional Airport Maintenance Shop

The shop is a premanufactured metal building with a sloped 24-gauge R-panel metal roof supported by steel purlins on approximately five-foot centers. Walls are metal and both the roof and walls are have rolled insulation. Six metal roll-up doors are facing the south.

2.14.3.3 Fire Station #10

Figure 39: Santa Fe Regional Airport Fire Station

The roof is supported by steel joist and metal deck above the garage and built-up roof over metal deck above the living area. The exterior walls are most likely 6" metal studs at 16" on center, filled with batt insulation, a stucco exterior, and sheetrock interior. The windows and entrance doors with windows of this building are double paned with metal frame. There three large metal garage roll-up doors on both the north and south of the building where the fire trucks and ambulance are located. The largest area of infiltration/exfiltration is at the doors on all sides of the building. These doors would benefit from new weather-strip and door sweeps that would reduce energy consumption. Several penetrations and blank openings are located around the perimeter walls and sealing these would reduce air infiltration/exfiltration and energy loss.

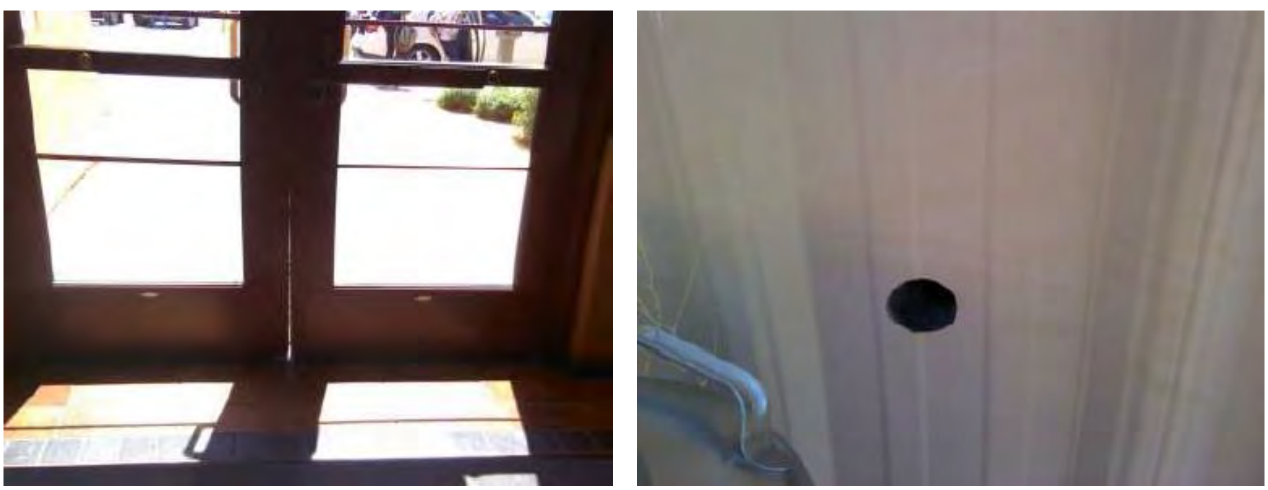


Figure 40: Building Envelope Gaps at the Santa Fe Regional Airport

2.14.4 Lighting

2.14.4.1 Terminal

The lobby lighting includes decorative chandeliers with three or twelve 12W LED lamps, linear floodlights with 40W LED lamps and 1'x4' strip fixtures with two 32W T-8 lamps. Ticket and rental car counter along with break room lighting are provided via 2'x4' grid troffers with two or three 32W T-8 lamps and 1'x4' fixtures with three 32W T-8s. Recessed 6" cans illuminate restrooms with 23W compact fluorescent lamps (CFL). Several exterior wall pack fixtures have been retrofitted with various wattage LED lamps. Additional outdoor flood lights include fixtures with 150W and 400W high-pressure sodium (HPS) lamps.

2.14.4.2 Maintenance Shop

1'x8' strip fixtures illuminate this open space with four 32W T-8's.

2.14.4.3 Fire Station #10

2'x4' grid troffers with two or three-lamp, 32W T-8's are located in the corridors, dorm rooms, fitness room, lounge, observation rooms, kitchen, and dining room. Restrooms lighting includes 1'x4' vanity wall-mounted fixtures with two 32W T-8 lamps. The garage is illuminated with rectangular high bay fixtures with six 54W T-5 lamps. Typical exterior light fixtures are wall packs with triple tube 32W compact florescent lamps and wall packs with 100W metal halide lamps. Wall switches with occupancy sensors are typically found in offices and restrooms. A large number of T-8 lamps and high wattage exterior lamps make these facilities good candidates for a lighting retrofit.

Refer to **Appendix D1** for a lighting fixture inventory.

2.14.5 HVAC Equipment

2.14.5.1 Terminal

The cooling system for this building is provided by residential size evaporative coolers located on the roof. Heating is provided by a hydronic system that includes a heating hot water boiler and radiators.

2.14.5.2 Maintenance Shop

Heating is via natural gas radiant tube heaters. There is no cooling.

2.14.5.3 Fire Station #10

The Heating, Ventilation, and Air Conditioning (HVAC) systems comprise of single-zone packaged rooftop units (RTU) with DX cooling and natural gas heating. Additional natural-gas radiant tube heaters are located in the truck parking garage.

Additional information is available in **Appendix C1**.

2.14.6 Plug Loads

The plug loads associated with this building vary by space type and are typical for offices and airport lobbies. There are office plug loads such as computers, monitors, and printers. Breakroom equipment includes coffee machines, microwaves, refrigerators, and water coolers. There are multiple TVs in the terminal area. A server is stored in a small room. There are a couple of server rooms with switchboards.

Refer to **Appendix C3** for detailed plug load inventory and **Appendix D3** plug load power densities.

2.14.7 Domestic Hot Water

The domestic hot water (DHW) system is a small portion of the energy consumption and units are typically located in a mechanical closet and include a tank natural gas heater that varies by size. The available data collected during the field survey are tabulated in **Appendix C1.**

2.14.8 Other

A large X-ray machine for luggage is located in the Airport Terminal.

2.15 Siler Complex

Facility Facts:

Facility Name	Siler Complex
Street Address	1142 Siler Rd
City, State, Zip	Santa Fe, NM 87507
Gross Area (ft²) Building 'A' Building 'B' Building 'C' Total	 23,000 4,500 16,600 44,100
Year Built	1988
Avg. Daily Occupancy	

2.15.1 Facility Description

This is the city's main Operation and Maintenance Complex (OMC). Building A houses the offices and shops for the Solid Waste and Streets Department. This includes the original open truck shop and a newly renovated wing with the offices for Solid Waste. Additional sign painting and electronic signal shops are also found in this building. Building B, the smaller of the three, encompasses the Parks OMC, which is mostly shops and a recently added temporary office trailer. Building C includes both the Parks and Recreation offices on the street front and Fleet Maintenance garage in the back.

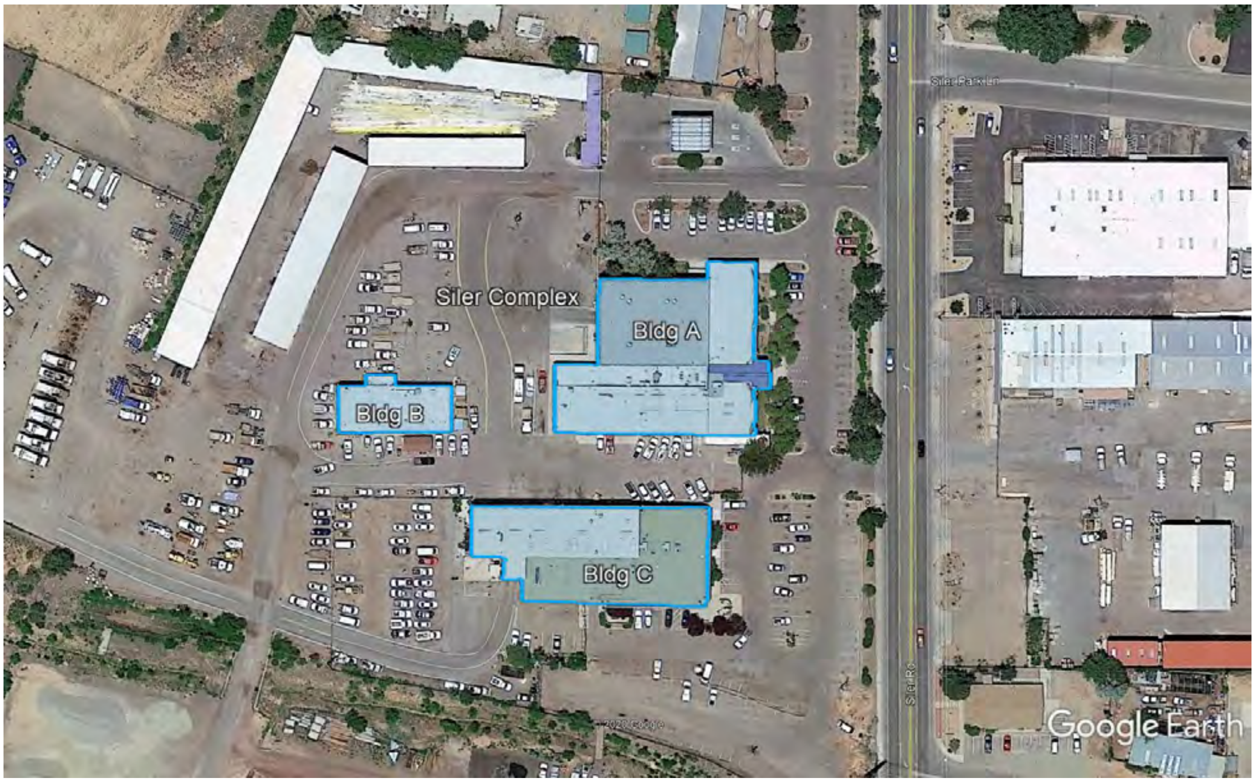


Figure 41: Siler Complex Aerial View of IGA Buildings

2.15.2 Hours of Operation

Monday	8:00 am – 5:00 pm
Tuesday	8:00 am – 5:00 pm
Wednesday	8:00 am – 5:00 pm
Thursday	8:00 am – 5:00 pm
Friday	8:00 am – 5:00 pm
Saturday	8:00 am – 5:00 pm
Sunday	8:00 am – 5:00 pm

These hours can vary depending on department and personnel, but generally follow those indicated above.

2.15.3 Building Envelope

Figure 42: Siler Complex Building Exterior

2.15.3.1 Building A

This building appears to have gone through a number of additions over the years. The original higher roof is flat and is composed of a metal deck over steel joist, batt insulation in the ceiling space, and covered with continuous rolled sheets of modified bituminous. The newer, lower section has the same roof structure and installation, but with a TPO cover. The exterior walls are either concrete masonry unit (CMU) blocks or steel stud walls with a light-colored exterior stucco and both wall types have the same furred out sheetrock interior with batt insulation. The majority of windows throughout the building are double paned. The main entrance located at the center of the building faces the northeast and is accessed through a single door with aluminum frame and large glass panels. Additional auxiliary entrances located around the building are single doors made of wood or metal. There are a number of large metal roll-up doors located at the various shops.

2.15.3.2 Building B

The roof is flat and structurally supported by metal deck over steel joist, batt insulation in the ceiling space, and covered with newer TPO cover. The exterior walls are built from concrete masonry unit (CMU) blocks covered with a light-color exterior stucco and furred out sheetrock interior with batt insulation. The majority of windows throughout the building are double paned. There are main entrance and additional auxiliary doors located around the building are single doors made of wood or metal. There are a number of large metal roll-up doors located at the shops.

2.15.3.3 Building C

Both the front office area with a lower roof and back garage with a higher roof are constructed from a premanufactured metal building and have a sloped metal roof that has been covered with newer brown foam.

Figure 43: Siler Complex Building C Building Exterior

The exterior office walls have a tan stucco exterior while the taller garage walls are constructed from a light tan metal and furred out sheetrock interior with batt insulation. The majority of windows throughout the building are double paned. Entrance and additional auxiliary doors located around the building are single doors made of wood or metal. There are a number of large metal roll-up doors located at the garage bays. The largest area of infiltration/exfiltration is at the perimeter doors. These doors would benefit from new weather-strip and door sweeps that would reduce energy consumption. Several penetrations and blank openings are located around the perimeter walls and sealing these would reduce air infiltration/exfiltration and energy loss. Several windows on Building A have ineffective sealant and would also benefit from resealing.

Figure 44: Gaps in Building Envelope at Siler Complex Building C

2.15.4 Lighting

2.15.4.1 Building A

The majority of the interior lighting consists of 1'x4' and 2'x4' grid troffers with two or three 32W T-8 lamps in the common areas, offices, and hallways. 1'x4' grid troffers and wall-mounted fixtures illuminate the restrooms and locker rooms with two 32W T-8s. Additional shop lighting includes 1'x8' fixtures with two 96W T-12 lamps. The maintenance shop is illuminated by high mount fixtures with 400W metal halide (MH) lamps. Wall switches with occupancy sensors are typically found in offices and restrooms. Typical exterior lighting consists of the surface canopy and wall pack fixtures with 100W high-pressure sodium (HPS) lamps. Additional lighting is provided from shoeboxes with 250W HPS lamps.

2.15.4.1 Building B

The majority of the lighting comes from the 1'x8' fixtures with two 96W T-12 lamps located in the shops. The maintenance shop is illuminated by high mount fixtures with 400W metal halide (MH) lamps. 1'x4' surface-mounted fixtures illuminate the restrooms with two 32W T-8s. Additional 2'x4' grid troffers with two or three 32W T-8 lamps illuminate the maintenance shops. There are no lighting controls in this building. Typical exterior lighting consists of the surface canopy and wall pack fixtures with 100W high-pressure sodium (HPS) lamps. Additional lighting is provided from knuckle fixtures with 300W incandescent lamps.

2.15.4.1 Building C

The majority of the interior lighting consists of 1'x4' and 2'x4' grid troffers with two or three 34W T-12 lamps in the common areas, offices, and hallways. 1'x4' grid troffers and wall-mounted fixtures illuminate the restrooms with two 32W T-8s. Additional shop lighting includes 1'x8' fixtures with two 96W T-12 lamps. The lobby fixtures consist of 1'x4' egg crate fixtures with two 32W T-8 lamps and 2'x2' surface mounted troffers with two 34W T-12 U shaped lamps. There are no existing lighting controls or occupancy sensors in this building. Typical exterior lighting consists of wall pack fixtures with 100W or 250W high-pressure sodium (HPS) lamps. 32W T-8 lamps provide the majority of the space illumination, this along with exterior fixtures high wattage lamps make these building good candidates for a lighting retrofit.

Refer to **Appendix D1** for a lighting fixture inventory.

2.15.5 HVAC Equipment

2.15.5.1 Building A

The Main Heating, Ventilation, and Air Conditioning (HVAC) systems comprise of single-zone packaged rooftop units (RTU) with DX cooling and natural gas heating. Additional evaporative cooling units and natural gas Radiant tube heaters and unit heaters are located in the shop areas.

2.15.5.2 Building B

The Main Heating, Ventilation, and Air Conditioning (HVAC) systems comprise of evaporative cooling units and natural gas radiant tube heaters and unit heaters are located in the shop areas.

2.15.5.3 Building C

The Main Heating, Ventilation, and Air Conditioning (HVAC) systems are similar to Building A and comprise of single-zone packaged rooftop units (RTU) with DX cooling and natural gas heating. Additional evaporative cooling units and natural gas radiant tube heaters and unit heaters are located in the shop areas. There are additional mini-split systems located throughout the building that condition IT/Communication rooms.

Additional information is available in **Appendix C1**.

2.15.6 Plug Loads

2.15.6.1 Building A

The plug loads associated with this building vary by space type and are typical for office spaces with conference rooms, breakrooms, and workshops. There are office plug loads such as computers, monitors, and printers. Breakroom equipment includes coffee machines, microwaves, refrigerators, and water coolers.

2.15.6.2 Building B

The plug loads associated with this building vary by space and are typical for workshops.

2.15.6.3 Building C

The plug loads associated with this building vary by space type and are typical for office spaces with conference rooms, breakrooms, and an automotive garage. There are office plug loads such as computers, monitors, and printers. Breakroom equipment includes coffee machines, microwaves, refrigerators, and water coolers.

Refer to **Appendix C3** for detailed plug load inventory and **Appendix D3** plug load power densities.

2.15.7 Domestic Hot Water

The domestic hot water (DHW) system is a small portion of the energy consumption and units are typically located in a mechanical closet and include a tank natural gas heater that varies by size. The available data collected during the field survey are tabulated in **Appendix C1.**

2.15.8 Other

There is a vehicle service garage and additional painting and electric sign shops that include specialty equipment for their work.

2.16 Siringo Complex

Source: Google Earth

Facility Facts:

Facility Name	Siringo Complex
Street Address	6751 Siringo Rd
City, State, Zip	Santa Fe, NM 87507
Gross Area (ft²)	
Building 'C'	9,500
Building 'D'	3,700
Building 'E'	5,500
Building 'F/H/G'	6,000
Building 'I'	3,000
Building 'J'	2,300
Warehouse	5,500
Total	35,500
Year Built (Bldg. C &J / all others)	1950 / 1995
Avg. Daily Occupancy	-----

2.16.1 Facility Description

This facility houses several buildings that include many of the management and record-keeping for the city and is as follows:

- Building C- Records and IT.
- Building D- Facility Maintenance offices and workshop
- Building E- Facilities Administration
- Building F- IT
- Building G- Training Hall
- Building H- IT
- Building I -Police Records
- Building J- IT
- Facilities Warehouse

The majority of the building's space is closed or open cubical offices. Additional spaces include maintenance workshops, warehouse storage, and computer servers.

Figure 45: Siringo Complex Aerial View of IGA Buildings

2.16.2 Hours of Operation

Monday	8:00 am – 5:00 pm
Tuesday	8:00 am – 5:00 pm
Wednesday	8:00 am – 5:00 pm
Thursday	8:00 am – 5:00 pm
Friday	8:00 am – 5:00 pm
Saturday	8:00 am – 5:00 pm
Sunday	8:00 am – 5:00 pm

2.16.3 Building Envelope

2.16.3.1 Building C and J

These buildings were originally constructed in 1950 and served as Army or National Guard barracks. The sloped roof is supported by wood trusses and has batt insulation in the ceiling space and a tar tile exterior cover. The exterior walls are wood studs at 16” on center, filled with batt insulation, a stucco exterior, and sheetrock interior. There are a number of wall sections of the building that have a white brick veneer exterior. The majority of windows throughout the buildings are double paned with vinyl or wood frame. Building J has a large window wall on the east side. The entrances of the buildings are through wooden or metal doors.

2.16.3.2 Buildings D, E, F, G, H, & I

The majority of the buildings have a pitched corrugated roof, while Building E has a barreled roof with the same corrugated metal, and Building G has a flat roof with TPO cover. The exterior walls are most likely metal studs at 16” on center, filled with batt insulation, and white stucco exterior. The majority of windows throughout the buildings are double paned with vinyl or metal frames. The entrances of the buildings are through metal doors with glass windows sections.

2.16.3.3 Warehouse

This building is a premanufactured metal building with a sloped metal roof and sheet metal exterior walls with rolled batt insulation. The largest amount of infiltration/exfiltration on these buildings was at the exterior doors. These doors would benefit from new door sweeps and weather stripping and some would require new sealant around the frame.

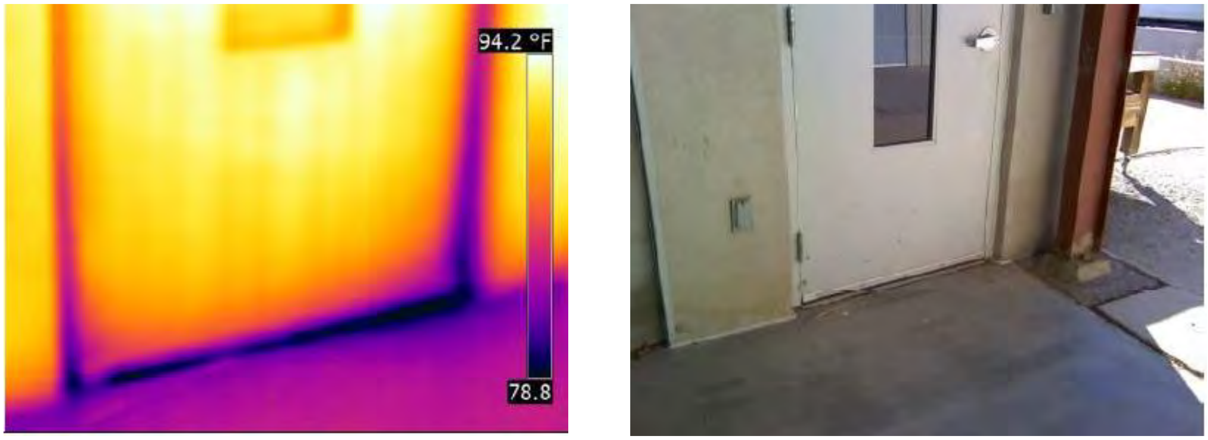


Figure 46: Thermal Imaging of Gaps in Building Envelope at Siringo Complex Warehouse

Sealing penetrations and blank openings is recommended to reduce air and moisture infiltration leading to reduce energy loss.

Figure 47: Additional Gaps in Building Envelope at Siringo Complex Warehouse

2.16.4 Lighting

2.16.4.1 Building C and J

The majority of the interior lighting consists of 1'x4' and 2'x4' grid troffers with two, three, or four 34W T-12 lamps in the common areas, offices, and conference room. 1'x4' wraparounds illuminate the restrooms with two 34W T-12s. Additional shop and storage room lighting includes 1'x8' fixtures with two 96W T-12 lamps. There are no existing lighting controls or occupancy sensors in this building. Typical exterior lighting consists of wall pack fixtures with 70W metal halide (MH) lamps and knuckle floodlights with two 70W MH lamps. Additionally, there are floodlights with 250W MH lamps and surface mounted fixtures with 40W LED lamps.

2.16.4.1 Buildings D, E, F, G, H, & I

The majority of the interior lighting consists of 1'x4' and 2'x4' grid troffers with two, three, or four 32W T-8 lamps in the common areas, offices, and conference room. Additional office lighting includes 2'x2' grid troffers with two T-8 U tubes. 1'x4' wrap arounds illuminate the restrooms with two 34W T-12s. Additional storage room lighting includes 1'x8' fixtures with two 96W T-12 lamps. There are no existing lighting controls or occupancy sensors in this building. Typical exterior lighting consists of wall pack fixtures with variable lamps that include 150W, 175W, and 250W metal halide (MH) lamps along with 70W and 150W MH Lamps. Additional illumination is formed decorative post top fixtures with 150W high-pressure sodium (HPS) lamps. There are also several wall sconce with 60W incandescent lamps. 32W T-8 lamps provide the majority of the space illumination, this along with exterior fixtures high wattage lamps, make these buildings good candidates for a lighting retrofit.

Refer to **Appendix D1** for a lighting fixture inventory.

2.16.5 HVAC Equipment

The Heating, Ventilation, and Air Conditioning (HVAC) systems comprise of single-zone packaged rooftop units (RTU) with DX cooling and natural gas heating. Several additional evaporative coolers are located on roofs along with split systems for the conditioning of IT/Communication rooms

Additional information is available in **Appendix C1**.

2.16.6 Plug Loads

The plug loads associated with this complex vary by space type. There are office plug loads such as computers, monitors, and printers. The breakroom equipment includes coffee machines, microwaves, and refrigerators. Additional spaces include server rooms and workshops.

Refer to **Appendix C3** for detailed plug load inventory and **Appendix D3** plug load power densities.

2.16.7 Domestic Hot Water

The domestic hot water (DHW) system is a small portion of the energy consumption and units are typically located in a mechanical closet and include a tank natural gas heater that varies by size. The available data collected during the field survey are tabulated in **Appendix C1.**

2.16.8 Other

None

2.17 Southside Transit

Facility Facts:

Facility Name	Southside Transit
Street Address	
City, State, Zip	Santa Fe, NM
Gross Area (ft²)	8,900
Year Built	1999
Avg. Daily Occupancy	Vacant

2.17.1 Facility Description

This facility was not in use for a long period of time and is currently undergoing renovations. Therefore, it was not accessible during the survey.

Figure 48: Southside Transit Aerial View

2.18 Transit Administration

Facility Facts:

Facility Name	Transit Administration
Street Address	2931 Rufina St
City, State, Zip	Santa Fe, NM 87507
Gross Area (ft²) Administration & Operations Bus Wash Shop/Garage Total	 12,300 4,600 8,300 25,200
Year Built	1998
Avg. Daily Occupancy Administration (Full-Time / Visitors) Operations (Full-time) Shop (Full-Time)	 9 / 10-40 9 9

2.18.1 Facility Description

This facility is the main administration and operations for the city bus and transit system and includes the main administration building, garage, and bus wash. Located in the front section of the main buildings are the administration offices with customer service center and lobby, training room, activity room, and locker rooms. Located at the backside of the building are additional offices and a day room with a kitchen. Additional supporting spaces include a storage room, janitor room, and restrooms.

Figure 49: Transit Administration Aerial View of IGA Buildings

2.18.2 Hours of Operation

	Administration	Operations and Shop
Monday	8:00 am – 5:00 pm	4:30am – 11:30pm
Tuesday	8:00 am – 5:00 pm	4:30am – 11:30pm
Wednesday	8:00 am – 5:00 pm	4:30am – 11:30pm
Thursday	8:00 am – 5:00 pm	4:30am – 11:30pm
Friday	8:00 am – 5:00 pm	4:30am – 11:30pm
Saturday	8:00 am – 5:00 pm	7:00 am – 9:30pm
Sunday	8:00 am – 5:00 pm	7:00 am – 7:15pm

2.18.3 Building Envelope

2.18.3.1 Administration Building

This building has both a sloped and a flat roof. The sloped, light green metal roof is supported by steel joist and has batt insulation in the ceiling space. The flat roof is also supported by metal deck over steel joist with batt insulation in ceiling space, and TPO exterior. The exterior walls are 6” metal studs at 16” on center, filled with batt insulation, a light tan stucco exterior, and sheetrock interior. The majority of windows throughout the building are double paned with vinyl or metal frame. The main public entrance is at the south side of the building and through a set of metal double-doors doors with window storefront. An additional employee single-door entrance is located on the west side. Auxiliary entrances located around the building are single doors made of wood or metal.

2.18.3.2 Shop/Garage

This is a premanufactured metal building with sloped metal roof and metal walls typical of this type of building. There is a small number of the windows at the two offices and a metal entrance door with a window section. There are also a number of large metal roll-up doors on both sides of the building.

2.18.3.3 Bus Wash

This building has a flat roof, concrete masonry unit (CMU) block walls, and is open on two sides for buses.

The largest area of infiltration/exfiltration is at the perimeter doors. These doors would benefit from new weather-strip and door sweeps that would reduce energy consumption. Several penetrations and blank openings are located around the perimeter walls and sealing these would reduce air infiltration/exfiltration and energy loss.

Figure 50: Gaps in Building Envelope at Transit Administration

2.18.4 Lighting

The majority of the interior lighting consists of 1’x4’ and 2’x4’ grid troffers with two, three, or four 32W T-8 lamps which illuminates the common areas, hallways, offices, and conference room. 1’x4’ wraparounds illuminate the restrooms with two 34W T-12s. Transit shop lighting includes 1'x8' fixtures with four 32W T-8 lamps. Wall switches with occupancy sensors are typically found in offices and restrooms. Typical exterior lighting consists of wall pack and shoebox fixtures with variable lamps, including 70W and 400W metal halide (MH) lamps. Additional illumination is from wall packs with 40W LED lamps. The majority of the space illumination is provided by 32W T-8 lamps, this along with exterior fixtures high wattage lamps makes this building a good candidate for a lighting retrofit.

Refer to **Appendix D1** for a lighting fixture inventory.

2.18.5 HVAC Equipment

Typical Heating, Ventilation, and Air Conditioning (HVAC) systems comprise of single-zone packaged rooftop units (RTU) with DX cooling and natural gas heating. There are additional natural gas radiant tube heaters and unit heats in the shop and bus wash.

Additional information is available in **Appendix C1**.

2.18.6 Plug Loads

The only plug loads considered for this complex included were for the administration building and vary by space type and are typical for office spaces, conference rooms, and breakrooms. There are office plug loads such as computers, monitors, and printers. Breakroom equipment includes coffee machines, microwaves, refrigerators, and water coolers.

Refer to **Appendix C3** for detailed plug load inventory and **Appendix D3** plug load power densities.

2.18.7 Domestic Hot Water

The domestic hot water (DHW) system is a small portion of the energy consumption and units are typically located in a mechanical closet and include a tank natural gas heater that varies by size. The available data collected during the field survey are tabulated in **Appendix C1.**

2.18.8 Other

Commercial Garage Equipment

There is commercial garage equipment for services heavy vehicles along with electric lifts. Additionally, there is commercial equipment is located in a bus washing building.

Solar PV System

The city entered a power purchase agreement (PPA) with RSBF Santa Fe, LCC that installed a 163kW capacity ground-mounted and carport solar PV system. Additional information regarding rate and production is available in the Baseline Utility Analysis section of this report.

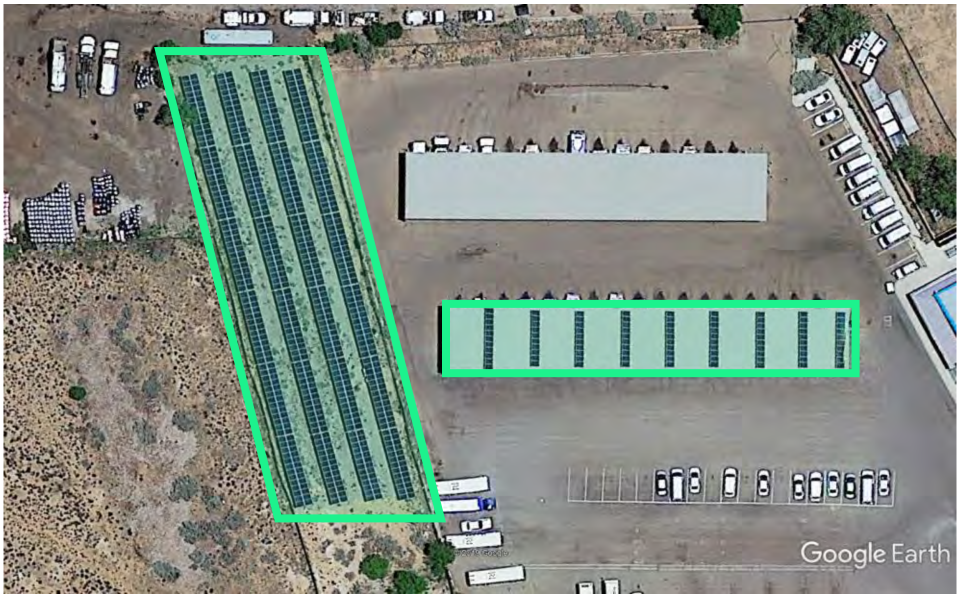


Figure 51: Existing Solar PV System at the Transit Administration

2.19 Canyon Road Water Treatment Plant (WTP)

Facility Facts:

Facility Name	Canyon Road Water Treatment Plant
Street Address	1780 Upper Canyon Road
City, State, Zip	Santa Fe, NM 87505
Gross Area (ft²)	
Plant-1	10,700
Plant-2	6,300
Plant-3	700
Plant-4	2,300
Maintenance Shop	1,300
Total	21,300
Year Built	1974
Avg. Daily Occupancy	26

2.19.1 Facility Description

This facility includes the Administration Building, Service Building, Water Treatment Plant, and Pump House. The Administration Building upper level includes offices, a break room, a monitoring room, and several other small water testing rooms. The lower level contains pumps and aerators. The Service Building consists of an open shop area and a small office. The Water Treatment Plant has several open rooms including, a pump room, centrifuge room, filter room, and garage for the waste truck. The Pump House is a two-story building with pumps on the below ground level and service area at ground level.

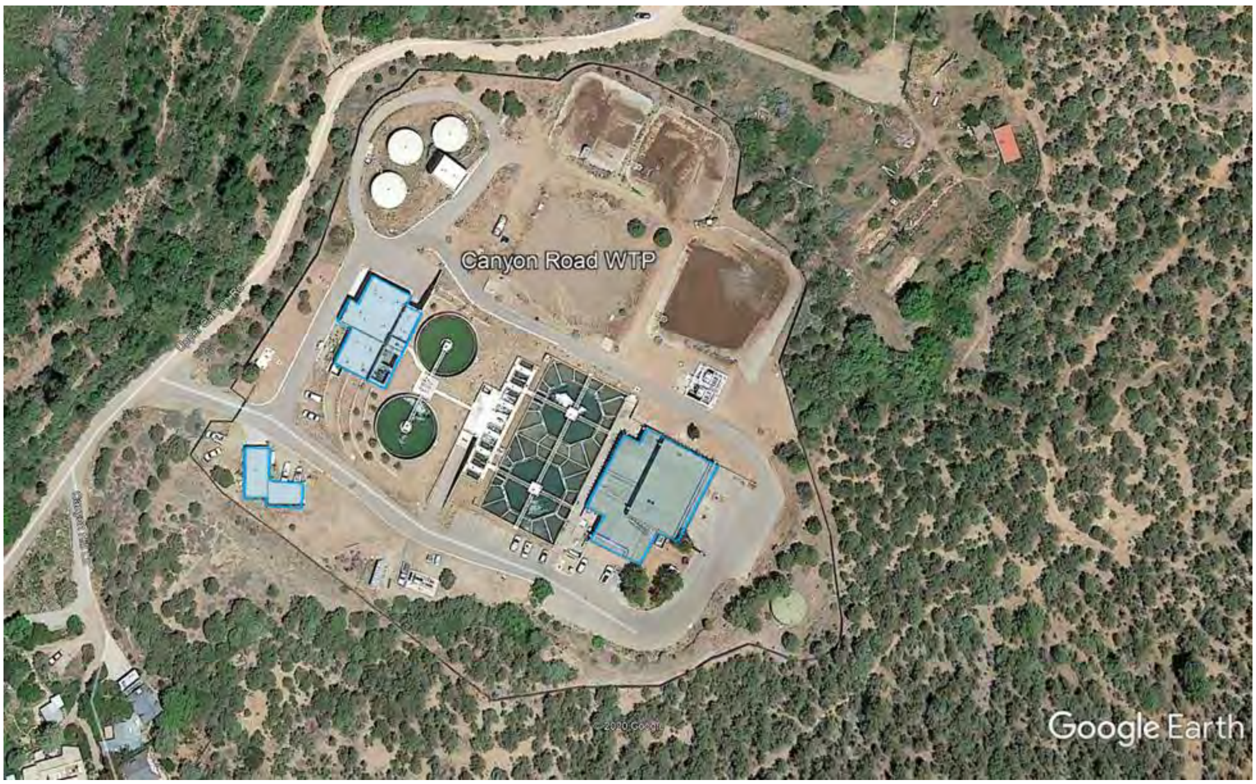


Figure 52: Canyon Road WTP Aerial View of IGA Buildings

2.19.2 Hours of Operation

Monday	24 hours
Tuesday	24 hours
Wednesday	24 hours
Thursday	24 hours
Friday	24 hours
Saturday	24 hours
Sunday	24 hours

2.19.3 Building Envelope

The main building at the Canyon Road Water Treatment Plant (WTP) age is unknown but the roof appears to be 15-25 years of age. The facility has a built-up roof system over a concrete deck. Visual inspection and core samples revealed that the existing built up roof system is different for the upper and lower roofs, but is typically constructed from Polyiso, perlite 3-ply BUR, #90 cap sheet and mopped asphalt.

Figure 53: Roof Condition at Canyon Road Water Treatment Plant

The exterior above-grade walls are constructed from concrete masonry unit (CMU) blocks, batt insulation, and stucco exterior, and sheetrock interior. Below grade, the walls are reinforced concrete. The majority of windows throughout the building are double paned. The main entrance on the south side of the Administration Building is through a set of double doors with upper half windows. Additional auxiliary entrances located around the building are single doors made of metal. There are a couple of roll-up metal garage doors on a number of the buildings. The largest area of infiltration/exfiltration is at the doors on all sides of the building. These doors would benefit from new weather-strip and door sweeps that would reduce energy consumption. Several penetrations and blank openings are located around the perimeter walls and sealing these would reduce air infiltration/exfiltration and energy loss.


Figure 54: Gaps in Building Envelope at Canyon Road Water Treatment Plant

2.19.4 Lighting

This facility has recently gone through an LED lighting upgrade that consisted of the majority of both the interior and exterior lighting.

Refer to **Appendix D1** for a lighting fixture inventory.

2.19.5 HVAC Equipment

The Heating, Ventilation, and Air Conditioning (HVAC) systems comprise as indicated in the following sections.

2.19.5.1 Main Building

Air handler units (AHU) condition this building with a chiller/boiler hydronic system. Additional unit heaters (UH) are located throughout the building.

2.19.5.2 Additional Buildings

The Service Building is heated by both UH's and radiant tube heaters that use natural gas. The Pump House is conditioned radiant tube heaters. The Water Treatment Plant includes both UH's and a furnace.

Additional information is available in **Appendix C1**.

2.19.6 Plug Loads

The Administration Building and the Maintenance Building are the two buildings in this facility that have associated plug loads. The rest of the buildings are industrial with equipment associated with water treatment and pump houses.

2.19.6.1 Administration Building

The plug loads associated with this building vary by space type. The handful of offices include plug loads such as computers, monitors, and printers. The breakroom has typical equipment, including a coffee machine, two microwaves, an electric range, and refrigerators. Located in this building are two vending machines. The control room includes several computer stations with multiple monitors and large flat-screen TVs. There are also several small water testing laboratories.

2.19.6.2 Maintenance Shop

The maintenance shop is relatively small and includes an open work area and two offices. The office has plug loads such as computers, monitors, and printers. This building has various workshop equipment, including welding machines (not all plugged in), a drill press and so forth.

Refer to **Appendix C3** for detailed plug load inventory and **Appendix D3** plug load power densities.

2.19.7 Domestic Hot Water

The domestic hot water (DHW) system is a small portion of the energy consumption and units are typically located in a mechanical closet and include a tank natural gas heater that varies by size. The available data collected during the field survey are tabulated in **Appendix C1.**

2.19.8 Other

There is a large amount of energy-consuming equipment related to the moving and treatment of water. The available data collected during the field survey are tabulated in **Appendix C2.**

2.20 Santa Fe Water Division Office

Facility Facts:

Facility Name (Customer Service, T&D, Water Conservation)	Santa Fe Water Division Office
Street Address	801 W San Mateo Rd
City, State, Zip	Santa Fe, NM 87505
Gross Area (ft^2)	
Main Building	22,000
Transmission & Distribution (T&D) Office	1,950
Water Conservation Office	1,550
Maintenance	3,200
Total	28,700
Year Built	
Customer Service	1950
Transition & Distribution Bldg. and Water Conservation Bldg.	2004
Avg. Daily Occupancy	
Customer Service (Full-Time Staff / Visitors)	54 / 150-200
Transition & Distribution Bldg.	33 / 0
Water Conservation	6 / 5

2.20.1 Facility Description

This facility serves as the city's main utility department with the primary focus on the management of the water treatment, distribution, and billing systems. The facility's Main Building includes a two-story building that houses the water and sewer customer service department on the ground floor and management, including engineering on the second floor. Additional buildings include the Transmission and Distribution (T&D) office and Water Conservation Office (WCO). There are two metal workshops that are used primarily for storage.

Figure 55: Santa Fe Water Division Office Aerial View of IGA Buildings

2.20.2 Hours of Operation

	Main Building	T&D	WCO
Monday	7:00 am – 5:00 pm	7:00 am – 4:00 pm	7:00 am – 5:00 pm
Tuesday	7:00 am – 5:00 pm	7:00 am – 4:00 pm	7:00 am – 5:00 pm
Wednesday	7:00 am – 5:00 pm	7:00 am – 4:00 pm	7:00 am – 5:00 pm
Thursday	7:00 am – 5:00 pm	7:00 am – 4:00 pm	7:00 am – 5:00 pm
Friday	7:00 am – 5:00 pm	7:00 am – 4:00 pm	7:00 am – 5:00 pm
Saturday	–	–	–
Sunday	–	–	–

2.20.3 Building Envelope

2.20.3.1 Main Building

The flat roof is supported by pre-cast concrete T's with rolled batt insulation in the cavities and tar and gravel exterior. Similar to the roof structure, the exterior walls are also pre-cast concrete T's. The majority of windows throughout the building are double paned and there is a large two-story window wall on the southern side of the building at the customer lobby. The main entrance at the south side of the building is through a set of double doors with metal frames and glass sections. Auxiliary entrances located around the building are single doors made of metal.

2.20.3.2 Transmission and Distribution (T&D)

The flat roof is most likely supported by wood trusses and has batt insulation in the ceiling space and a modified bituminous cover. The exterior walls are most likely 2"x6" wood studs at 16" on center, filled with batt insulation, a stucco exterior, and sheetrock interior. The majority of windows throughout the building are double paned. The main entrance at the north side of the building is through a single solid door made of wood or metal.

2.20.3.3 Water Conservation Office (WCO)

Similar to the T&D Building.

The largest area of infiltration/exfiltration is at the doors on all sides of the building. These doors would benefit from new weather-strip and door sweeps that would reduce energy consumption. Several penetrations and blank openings are located around the perimeter walls and sealing these would reduce air infiltration/exfiltration and energy loss.

Figure 56: Gaps in Building Envelope at the Water Division Office

2.20.4 Lighting

2.20.4.1 Main Building

Most of the interior lighting consists of 1’x4’ and 2’x4’ grid troffers with two or three 32W T-8 lamps in the common areas, offices, conference room, and kitchenette. 1’x4’ wraparounds illuminate the restrooms with two 32W T-8s and additional vanity wall mounted fixture with 60W incandescent lamps. Wall switches with occupancy sensors are typically found in offices and restrooms. In general, exterior lighting consists of wall pack fixtures with 70W metal halide (MH) lamps and knuckle floodlights with two 70W MH lamps. Additionally, there are floodlights with 250W MH lamps and surface mounted fixtures with 40W LED lamps.

2.20.4.2 Transmission & Distribution (T&D)

The majority of the interior lighting consists of 1’x4’ and 2’x4’ grid troffers with two or three 32W T-8 lamps in the offices, common areas, conference room, and kitchenette. 1’x4’ wraparounds illuminate the restrooms with two 32W T-8s. There are no lighting controls in this building. Exterior lighting consists of either wall pack fixtures with a 40W LED lamp or surface mounted canopy fixtures with a 25W LED lamp.

2.20.4.1 Water Conservation Office (WCO)

Most of the interior lighting consists of 1’x4’ wrap around fixtures with two 32W T-8 lamps. There are no lighting controls in this building. Exterior lights consist of knuckle floodlights with two 150W incandescent lamps.

A large number of T-8 lamps and high wattage exterior lamps make these facilities good candidates for a lighting retrofit.

Refer to **Appendix D1** for a lighting fixture inventory.

2.20.5 HVAC Equipment

2.20.5.1 Main Building

This building Heating, Ventilation, and Air Conditioning (HVAC) systems comprise a number of different systems. Several single-zone packaged rooftop units (RTU) with DX cooling and natural gas heating are located on the roof. A chiller/boiler hydronic system provides heating and cooling to boxes located in the zones. Unit heaters are also located in the open work and storage areas and several split systems located at the perimeter of the building condition IT/ communication rooms.

2.20.5.2 Transmission & Distribution (T&D)

The Heating, Ventilation, and Air Conditioning (HVAC) systems comprise of single-zone packaged rooftop units (RTU) with DX cooling and natural gas heating.

2.20.5.3 Water Conservation Office (WCO)

The Heating, Ventilation, and Air Conditioning (HVAC) systems comprise of one split system.

Additional information is available in **Appendix C1**.

2.20.6 Plug Loads

2.20.6.1 Main Building

The plug loads associated with this building vary by space type and are typical for offices and customer service. There are office plug loads such as computers, monitors, and printers. Breakroom equipment includes coffee machines, microwaves, electric range, refrigerators, and water coolers. There are multiple TVs in the customer service area. A server is stored in a small room. The building includes a couple of vending machines.

2.20.6.2 T&D Building

The plug loads associated with this building vary by space type and are typical for a couple of offices, a conference room, and a kitchen. There are office plug loads such as computers, monitors, and printers. Breakroom equipment includes a coffee machine, two microwaves, an electric range, and a refrigerator. There is also a vending machine and laundry closet with washer and dryer.

2.20.6.3 WCO Building

This building was not available a number of times during the survey. From outside it appears this building has three offices, a small conference room, and a kitchenette.

Refer to **Appendix C3** for detailed plug load inventory and **Appendix D3** plug load power densities.

2.20.7 Domestic Hot Water

The domestic hot water (DHW) system is a small portion of the energy consumption and units are typically located in a mechanical closet and include a tank natural gas heater that varies by size. The available data collected during the field survey are tabulated in **Appendix C1.**

2.20.8 Other

Solar Carports

Two city-owned solar PV carports sized at 49.1kW and 33.4kW and shown in Figure 57, were installed in approximately 2014. Additional information regarding rate and production is available in the Baseline Utility Analysis section of this report.

Figure 57: Existing Solar PV Carport at Water Division Office

2.21 Wastewater Treatment Plant

Facility Facts:

Facility Name	Wastewater Treatment Plant
Street Address	73 Paseo Real
City, State, Zip	Santa Fe, NM 87507
Gross Area (ft²)	
Old DAF	5,300
Administration Bldg.	11,300
Maintenance House	2,400
Laboratory	1,600
IP-Engineering	2,000
New DAF-Conference	3,800
Collections	8,000
Hoffman Blower Building	600
Supply Office	500
Maintenance Garage	6,900
Headworks	6,700
Grit Building	400
Ferric Chloride Building	700
Old Digester Building	5,000

Tertiary Treatment Facility	24,000
Non-Portable Water Building	600
Digester Equipment Building	5,000
Dewatering and Compost	92,600
Total	177,400
Year Built	1960
Avg. Daily Occupancy	41

The City originally instructed YE to evaluate only the lighting at the Dewatering and Composing Buildings. During the later stages of the IGA development the City requested YE add the entire Wastewater Treatment Plant to the lighting scope of work. Because of the large number of transformers and importance of the site to the City's infrastructure and operation, YE included a survey of the electric transformers. Due to the limited scope of work, limited time and travel restrictions of the Coronavirus YE conducted a full lighting and electric transformer survey and did not include surveys of the HVAC systems, plug loads, wastewater treatment equipment. The following site description focused on the original Dewatering and Composting Building and the solar arrays onsite.

2.21.1 Facility Description

This facility is located at 73 Paseo Real and is part of the city's main wastewater treatment plant. This facility, constructed in 2009, has a 450'x200' open Composting Windrow Processing Building and a smaller 70'x59' attached Dewatering Building. The processing area is an open space where compost is laid out in an evenly stacked row to dry. The dewatering building contains two large belt press processing machines in the belt filter press room. Additional rooms in this building include a chemical room, electrical room, private restroom, and office.

Figure 58: Wastewater Treatment Plant Site Aerial View

2.21.2 Hours of Operation

Monday	24 hours
Tuesday	24 hours
Wednesday	24 hours
Thursday	24 hours
Friday	24 hours
Saturday	24 hours
Sunday	24 hours

2.21.3 Building Envelope

The Composting Windrow Processing Area

This building is a premanufactured metal building with exterior metal wall panels and a sloped metal roof; both are insulated. There are several large metal sliding hangar doors and smaller personnel doors. There are no windows; approximately 120 skylights assist in illuminating the space.

Figure 59: Interior of Wastewater Treatment Plant Composting Building

Dewatering Area

The walls of this building are constructed from split face concrete masonry unit (CMU) blocks with no additional insulation. The roof structure is precast concrete with a toping slap supporting a single-ply roofing system over polyisocyanurate tapered rigid insulation. There is one large window that looks out to the composting area. Three large metal overhead coil doors face the south. There are four metal doors located on the perimeter of the building, with one double-door leading into the chemical room.

2.21.4 Lighting

The Composting Windrow Processing Area

High bay fixtures illuminate this area with a 250W metal halide (MH) lamp.

Dewatering Area

The open belt press room is illuminated by ceiling hanging pendant fixtures with 175W high-pressure sodium (HPS) lamps. The remainder of the areas are is illuminated by industrial type 1'x4' fixtures with two 32W T-8 lamps. Wall-mounted shoebox fixtures provide exterior lighting with 100W HPS lamps. A large amount of high wattage fixtures makes this building a good candidate for a lighting retrofit.

Refer to **Appendix D1** for a lighting fixture inventory.

2.21.5 HVAC System

The Composting Windrow Processing Area

The only system that conditions this area are side-mounted supply fans on the east wall and matching larger exhaust fans on the west wall.

Dewatering Area

This building has an exhaust fan system with make-up air (MUA) unit located on the roof. The MUA unit has evaporative cooling and natural gas heating sections. Two additional split systems condition the electrical room and office. A small unit heater (UH) conditions the chemical room and a 2'x4' electrical radiant heater panel in the restroom.

Additional information is available in **Appendix C1**.

2.21.6 Plug Loads

Plugs load for this facility include typical equipment for a small office that does not get used frequently. In the chemical room, there is a set of industrial-size compressors with storage tanks.

2.21.7 Domestic Hot Water

The domestic hot water (DHW) system is a small portion of the energy consumption and the available data collected during the field survey are tabulated in **Appendix C1**.

2.21.8 Other

Utility Set

Two large industrial units are used in the preparation of the composting material. This equipment includes natural gas heating sections and electric motors that run belts that process the material. There is an additional pressure steamer located in the chemical room used to clean the equipment in the press room.

Figure 60: Compost Material Preparation Units

Solar PV Systems

The city entered a power purchase agreement (PPA) with Cripple Creek Solar, LLC and later transferred to Dissigno Holdings, LCC in July 2016. A revised second contract amendment revised the system size from 100kW to 94.9kW DC. The system is a ground-mounted PV system as shown Figure 61. Additional information regarding rate and production is available in the Baseline Utility Analysis section of this report.

Figure 61: Existing Solar PV Array at Wastewater Treatment Plant Adjacent to Composting Building

The city entered a power purchase agreement (PPA) with SunEdison Orgination2, LLC. The original PPA indicates that the system size is 1,114kW DC. The system is a ground-mounted PV system as shown Figure-62. Additional information regarding rate and production is available in the Baseline Utility Analysis section of this report.

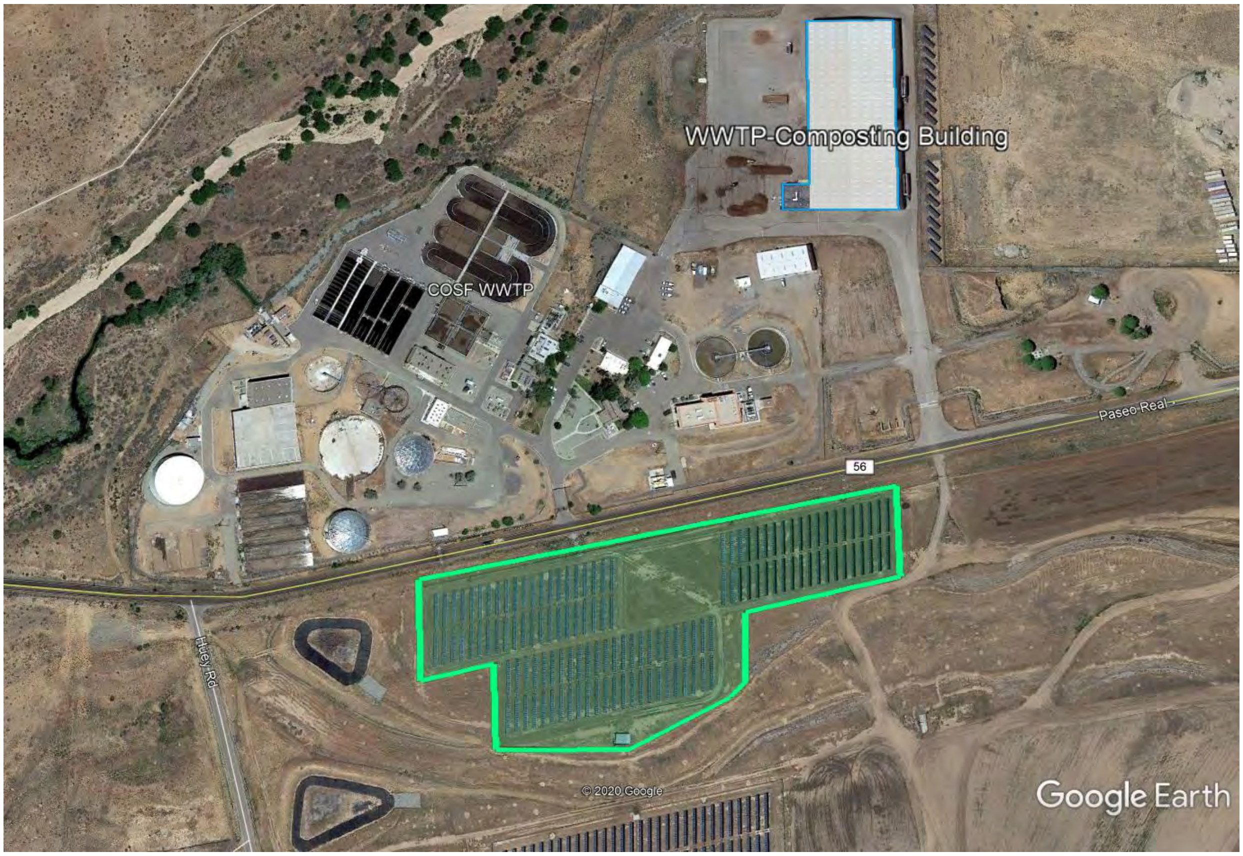


Figure 62: Existing Solar PV Array at Wastewater Treatment Plant Main

2.22 Pump Houses

2.22.1 Facility Description

Although these facilities are spread throughout the city and county area, the majority are located on the east side of the city along the Santa Fe River and the west side along the Old Buckman Road that leads down to the Rio Grande River where the lift station is located. The Rio Grande River and Santa Fe River along with the San Juan River Diversion provide the water sources delivered to the City. The Buckman Diversion Project is a joint project between the City and County of Santa Fe "to build a reliable and sustainable water supply."

The majority of energy consumption for these sites is from the electric motors that drive the pumps, and these are tabulated below:

Table 8: Water Division Pump House Facility Information

No.	Name	Lat.	Long.	Pump HP	Pump Qty	Notes
1.22	10M Gallon Tank	35.717	-105.961	110	1	
1.23	10M Gallon Tank Booster Station #1	35.717	-105.961	15	4	
				150	2	
				250	1	
				400	1	
1.24	Buckman Booster Station #1	35.870	-106.065	400	2	
1.25	Buckman Booster #3 & Well #13	35.737	-106.073	250	1	
				N/A	2	
1.26	Buckman Booster Station #4	35.713	-106.017	400	2	Plans to upgrade to (3) 600HP
1.27	Buckman Well #1	35.835	-106.159	400	1	Being Renovated
1.28	Buckman Well 10 (Booster D)	35.776	-106.114	200	1	
				400	1	
1.29	Calle de Agua Tank (Summit Booster)	35.706	-105.907	75	2	
1.30	Camino La Canada	35.678	-105.971	200	1	
1.31	Cristo Rey Church Pump	35.680	-105.916	200	1	
				150	2	

No.	Name	Lat.	Long.	Pump HP	Pump Qty	Notes
1.32	Dempsey Booster Station	35.687	-105.896	100	3	
1.33	St. Michaels & Railroad Pump	35.659	-105.966	125	1	
1.34	Well Los Montoyas	35.713	-105.972	300	1	

Figure 63: Aerial View of 10M Gallon Tank and 10M Gallon Tank Booster IGA Buildings

2.22.2 Hours of Operation

Hours of operation vary daily, seasonally, and annually depending on demand and annual snowpack.

2.22.3 Building Envelope

These facilities are typically constructed with concrete masonry unit (CMU) blocks, precast, and poured in place concrete walls. The roof structure is typically steel bar joist supporting metal decking with a built-up insulated roof membrane. Typically, there are no windows. Doors include single or double metal doors. Most facilities include a metal roll-up door for pump access.

2.22.4 Lighting

Typical interior lighting is provided by 1’x4’ or 2’x4’ fixtures with 32W T-8 lamps. Several of the larger sites include low bay fixtures with 150W lamps. Exterior lighting is from wall pack and wall wash fixtures with 75, 100, 150, or 175W lamps. The high wattage fixtures make these sites good candidates for a lighting retrofit.

2.22.5 HVAC System

These systems vary by site. Typically, electric unit heaters (UH) provide heating and make-up air units with evaporative cooling section or air handler units (AHU) with mechanical cooling systems provide cooling.

2.22.6 Plug Loads

Plug loads typically include a mid-size industrial compressor with an air storage tank. Some sites include a refrigerator and microwave. Desktop computers are at some locations.

2.22.7 Domestic Hot Water

The domestic hot water (DHW) system is a small portion of the energy consumption and the available data collected during the field survey are tabulated in **Appendix C1**.

2.22.8 Other

NG Generators

Sites typically have a backup natural gas generator that energizes the facilities in case of an electric grid failure.

Booster Station #4 Upgrade

A site upgrade is currently under design by COSF that included replacing the existing two pumps with 400HP motors with three new pumps with 600HP motors. According to the city, this will significantly increase the pump operating load from 792 KVA to 1,926 KVA requiring the replacement of the existing 1,500 KVA transformers to 3,000 KVA transformers.

2.35 Buckman Direct Diversion Facility (BDD)

Facility Facts:

Facility Name	Buckman Direct Diversion Facility
Street Address	341 Caja Del Rio Rd
City, State, Zip	Santa Fe, NM 87506
Gross Area (ft²)	
RWLS Pump RM	2,000
Elec/Mech	2,040
BS1A	7,460
BS2A	6,090
Administration	10,770
Flash mix	880
ATF	16280
Maintenance	9,380
Switch Gear	1,620
Booster 4A/5A	3,680
Centrifuge	4,390
Chemical	8,580
Membrane Feed	1,830
Total	75,000
Year Built	2010
Avg. Daily Occupancy Full-Time Staff / Visitors	33 / 5,200 per Year

2.35.1 Facility Description

This facility is jointly owned and run by the city and Santa Fe County (SFC) through the Buckman Direct Diversion (BDD) initiative. The complex houses an administration building with offices, control room, locker rooms, breakroom, and testing laboratory. Additional facilities include a centrifuge building, maintenance building, chemical building, Advance Treatment Facility (ATF), and pump house containing booster pumps 4A and 5A.

Figure 64: BDD Main Aerial View of IGA Buildings

2.35.2 Hours of Operation

Monday	24 hours
Tuesday	24 hours
Wednesday	24 hours
Thursday	24 hours
Friday	24 hours
Saturday	24 hours
Sunday	24 hours

2.35.3 Building Envelope

This facility includes the main administration building with traditional single-story construction. The additional facilities including a centrifuge building, maintenance building, chemical building, Advance Treatment Facility (ATF), and pump house containing booster pumps 4A & 5. These buildings are all metal buildings.

2.35.3.1 Administration Building

The roof was not accessed at the time of visit but is flat with what appears to be a TPO exterior supported by steel joists with metal decking and batt insulation in the ceiling space. The exterior walls are 2"x6" metal at 16" on center, filled with batt insulation, covered with a tan stucco exterior, and sheet rocked interior. The majority of windows throughout the building are double paned, including a large window wall at the entrance. The main entrance on the east side of the building is through a set of metal double-doors with windows. An additional metal door with windows is located on the west side. Auxiliary entrances located around the building are single doors made of wood or metal. The largest area of infiltration/exfiltration is at the doors on the building perimeter. These doors would benefit from new weather-strip and door sweeps that would reduce energy consumption. Sealing several penetrations around the perimeter walls would reduce air infiltration/exfiltration and energy loss.

Figure 65: Gaps in Building Envelope at BDD Main

2.35.3.2 Other (Metal) Buildings

These buildings have green sloped metal roofs and the walls that are also metal with tan exterior stucco. Windows are double paned, and doors are metal. There are several large sliding metal doors on a number of the buildings.

2.35.4 Lighting

2.35.4.1 Administration Building

Interior lighting consists of mostly 2’x4’ grid troffers with two or three 32W T-8 lamps in the common areas, and offices. The locker rooms and restrooms are illuminated from 1’x4’ wrap around and vanity wall-mounted fixtures with two lamps 32W T-8’s and 8” recessed cans with one 32W compact fluorescent lamp. Exit signs have 4W LED lamps. The fact that the majority of the space illumination is from the existing 32W T-8 lamps makes this building a good candidate for a lighting retrofit.

2.35.4.2 ATF Building

The majority of the space is illuminated by high bay fixtures, with one, 400W metal halide (MH) lamp. Additional lighting consists of mostly 1’x4’ vapor tight or industrial hood fixtures, with two or three lamps, 32W T-8 fixtures. The existing 400W MH lamps make this building a good candidate for a lighting retrofit. Exit signs have 4W LED lamps.

2.35.4.3 Booster 4A/5A

Interior lighting consists of mostly 1’x4’ vapor tight or industrial hood fixtures, with two or three, 32W T-8 lamps, which make this building a good candidate for a lighting retrofit. Exit signs have 4W LED lamps.

2.35.4.4 Centrifuge Building

This building is illuminated by high bay fixtures, with one, 400W metal halide (MH) lamp, and 1’x4’ vapor tight or industrial hood fixtures, with two or three, 32W T-8 lamps which make this building a good candidate for a lighting retrofit.

2.35.4.5 Chemical Building

The majority of this building is illuminated by high bay fixtures, with one, 400W metal halide (MH) lamp and 1’x4’ vapor tight or industrial hood fixtures, with two or three, 32W T-8 lamps which make this building a good candidate for a lighting retrofit. Exit signs have 4W LED lamps.

2.35.4.6 Maintenance Building

This building is illuminated by high bay fixtures, with one, 400W metal halide (MH) lamp, and 1’x4’ vapor tight fixtures, with two or three, 32W T-8 lamps which make this building a good candidate for a lighting retrofit.

2.35.4.7 Membrane Feed Building

The majority of this building is illuminated by high bay fixtures, with one, 400W metal halide (MH) lamp and 1’x4’ vapor tight or industrial hood fixtures, with two or three, 32W T-8 lamps which make this building a good candidate for a lighting retrofit. Exit signs have 4W LED lamps.

2.35.4.8 Switch Gear Building

This building is illuminated by 1'x4' vapor tight fixtures, with three, 32W T-8 lamps, which make this building a good candidate for a lighting retrofit. Exit signs have 4W LED lamps. Wall switches with occupancy sensors are typically found in offices and restrooms.

2.35.4.9 Exterior Lighting

The exterior is illuminated by wall pack fixtures, with one, 40W, or 120W LED lamp.

Refer to **Appendix D1** for a lighting fixture inventory.

2.35.5 HVAC Equipment

The Heating, Ventilation, and Air Conditioning (HVAC) systems are as explained in the following sections.

2.35.5.1 Administration Building

Air handlers condition this building with a chiller/boiler hydronic system. Additional split systems condition the IT and communication rooms.

2.35.5.2 Other Buildings

These buildings are typically conditioned by either ground-mounted package units with DX cooling and natural gas heating or air handlers. There are additional unit heaters typically hung from the ceiling in open spaces and split systems in computer and communication rooms.

Additional information is available in **Appendix C1**.

2.35.6 Plug Loads

The Administration Building and the Maintenance Building are the two buildings in this facility that have associated plug loads. The rest of the buildings are industrial with equipment associated with the water treatment and pump houses.

2.35.6.1 Administration Building

The plug loads associated with this building vary by space type. The plug loads are typical for an office and include computers, monitors, and printers. The breakroom has standard equipment, including a coffee machine, two microwaves, two electric ranges, and two refrigerators along with a couple of vending machines. The control room includes several computer stations with multiple monitors. There is also a server located in dedicated rooms and a small water testing laboratory.

2.35.6.2 Maintenance Shop

The plug loads associated with this building vary by space type. An open office room has cubicle spaces with office plug loads such as computers, monitors, and printers. Adjacent to the offices is a small break/kitchen space that has standard equipment, including a coffee machine, microwave, and refrigerator. This building has various workshop equipment, including welding machines (not all plugged in), a drill press and so forth.

Refer to **Appendix C3** for detailed plug load inventory and **Appendix D3** plug load power densities.

2.35.7 Domestic Hot Water

The domestic hot water (DHW) system is a small portion of the energy consumption and units are typically located in a mechanical closet and include a tank natural gas heater that varies by size. The available data collected during the field survey are tabulated in **Appendix C1.**

2.35.8 Other

Water Treatment Equipment

There is a large amount of energy-consuming equipment related to the moving and treatment of water. The available data collected during the field survey are tabulated in **Appendix C2.**

Solar PV System

The city entered a power purchase agreement (PPA) with American Capital Energy, LCC that installed a 1,166kW DC capacity ground-mounted solar PV system that includes (4,320) 250W panels.

Additional information regarding the Utility Baseline is included in the Section 3.0 of this report.

Figure 66: Existing Solar PV Array at BDD Main Site

2.36 Pump Houses

2.36.1 Facility Description

These facilities are located along the Old Buckman Road that leads down to the Rio Grande River where the BDD lift station is located.

The majority of energy consumption for these sites is from the electric motors that drive the pumps, and these are tabulated below:

Table 9: BDD Sites Facility Information

No.	Name	Lat.	Long.	Pump HP	Pump Qty	Notes
1.36	BDD Booster Station 1A	35.830	-106.160	15	5	
				800	4	
1.37	BDD Booster Station #2A	35.777	-106.110	700	1	
				250	3	
1.38	BDD Lift Station	35.836	-106.160	400	5	2 pumps being rebuilt
				50	5	

2.36.2 Hours of Operation

Hours of operation vary daily, seasonally, and annually depending on demand and annual snowpack.

2.36.3 Building Envelope

These facilities are typically constructed with concrete masonry unit (CMU) blocks, precast, and poured in place concrete walls. The roof structure is typically steel bar joist supporting metal decking with a built-up insulated roof membrane. Typically, there are no windows. Doors include single or double metal doors. Most facilities include a metal roll-up door for pump access.

2.36.4 Lighting

Typical interior lighting is provided by 1’x4’ or 2’x4’ fixtures with 32W T-8 lamps. Several of the larger sites include low bay fixtures with 150W lamp. The exterior lighting is from wall pack and wall wash fixtures with 75, 100, 150, or 175W lamps. The high wattage fixtures make these sites good candidates for a lighting retrofit.

Refer to **Appendix D1** for a lighting fixture inventory.

2.36.5 HVAC System

These systems vary by site. Typically, electric unit heaters (UH) provide heating and make-up air units with evaporative cooling section or air handler units (AHU) with mechanical cooling systems provide cooling.

2.36.6 Plug Loads

Plug loads typically include a mid-size industrial compressor with an air storage tank. Some sites include a refrigerator and microwave. Desktop computers are at some locations.

2.36.7 Domestic Hot Water

The domestic hot water (DHW) system is a small portion of the energy consumption and the available data collected during the field survey are tabulated in **Appendix C1**.

2.36.8 Other

Solar PV System at BDD 2A

Two meters service this site and the city installed a 753.41 kW DC / 1,000 kW AC ground-mounted system on each meter. Additional information regarding rate and production is available in the Baseline Utility Analysis section of this report.

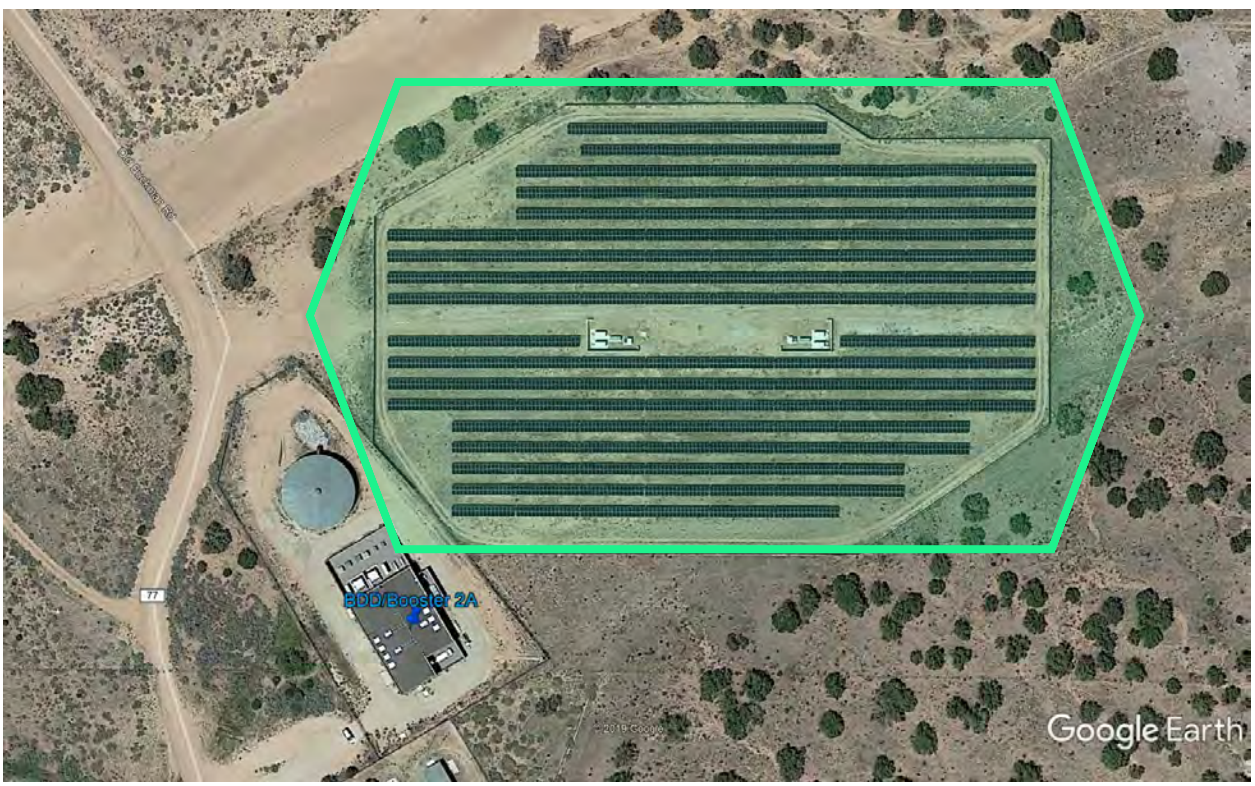


Figure 67: Existing Solar PV Array at BDD Booster 2A

NG Generators

Sites typically have a backup natural gas generator that energizes the facilities in case of an electric grid failure.

3.0 Baseline Utility Analysis

The baseline utility analysis was performed by evaluating utility records from 2016 through 2019. The baseline selected was from October 2016 through September 2019 which represents 36 months of data. The utility records consisted of electricity, natural gas, and water/sewer data from 154 meters. Refer to the following sections for information on all utilities and meters, and to **Appendix B1** for more detailed baseline utility information.

The following table and pie chart depict the baseline annual cost by utility type for all facilities included in the IGA.

Table 10: All Facilities Baseline Annual Cost Breakdown by Utility Type ($/year)

Facilities Baseline Utility Cost Summary

Utility	$/Year
Electricity	$3,888,817
Natural Gas	$335,028
Water & Sewer	$317,231
Total	$4,541,076

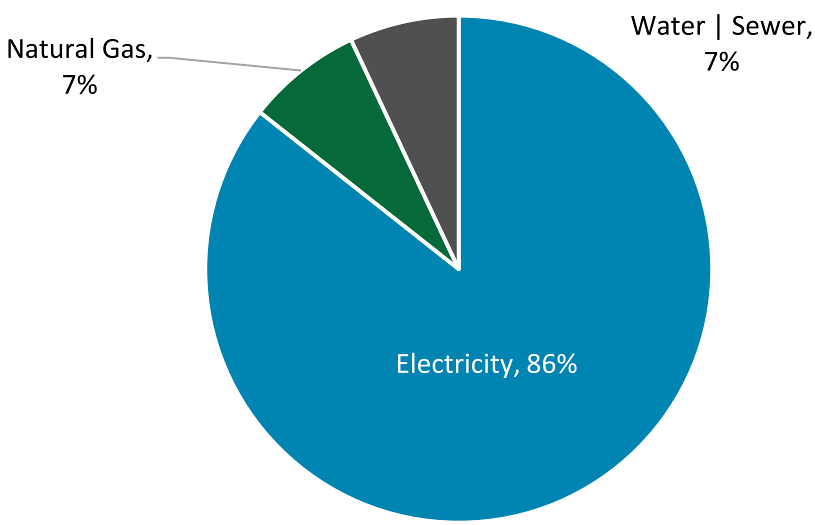


Figure 68: All Facilities Baseline Annual Utility Cost Breakdown by Utility Type ($/year)

The following table and pie chart depict the baseline annual energy consumption by utility type for all the facilities included in the IGA.

Table 11: All Facilities Baseline Annual Energy Consumption by Utility Type (kBTU/year)

Facilities Baseline Energy Summary

Utility	kBTU/Year
Electricity	159,107,773
Natural Gas	75,732,660
Total	234,840,433

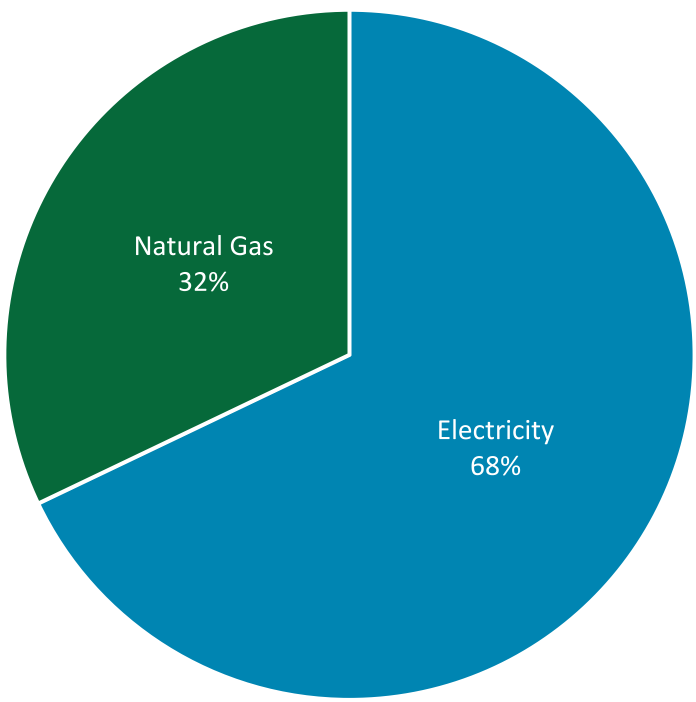


Figure 69: All Facilities Baseline Annual Energy Consumption by Utility Type (kBTU/year)

3.1 City of Santa Fe Facilities

As agreed with the COSF, there was no baseline established for the Fire Station #2 & Southside Transit. The Fire Station #2 is a new building that has not been constructed, therefore there is no historical data. The Southside Transit facility has not been used for a long period of time and is currently undergoing renovation. The new facility utilization will vary significantly from the original and upon the advice of the COSF, no baseline was established for this building.

Table 12 and Table 13 depict the baseline annual utility cost and consumption for each cities IGA facilities, respectively.

Table 12: COSF Facilities Baseline Annual Utility Cost Summary by Facility

Facility	Electric	Natural Gas	Water & Sewer	Total Cost
Bicentennial/ Alto Park Complex	$56,890	$12,104	$57,296	$126,290
Fire Station #8	$12,902	$3,557	$518	$16,978
Fort Marcy Recreation Complex	$42,558	$14,886	$7,612	$65,056
Genoveva Chavez Community Center	$329,938	$86,149	$158,498	$574,585
La Familia Medical Center	$44,687	$4,701	$2,401	$51,789
Municipal Recreation Complex	$87,701	$7,470	$0	$95,170
Police Dept- Admin	$52,405	$6,146	$1,367	$59,919
Public Library- Main	$30,557	$3,709	$1,266	$35,533
Public Library- Southside	$50,680	$8,507	$1,000	$60,187
Salvador Perez Swimming Pool	$44,062	$11,874	$56,538	$112,474
Sandoval Parking Garage Lot B	$21,576	$0	$372	$21,948
Santa Fe Convention Center	$155,846	$23,811	$10,015	$189,672
Santa Fe Regional Airport	$48,233	$7,629	$460	$56,323
Siler Complex	$59,720	$17,081	$4,587	$81,388
Siringo Complex	$30,789	$9,782	$6,796	$47,368
Transit Administration	$75,611	$9,629	$6,558	$91,799
Total	$1,144,155	$227,035	$315,286	$1,686,477

Table 13: COSF Facilities Baseline Annual Utility Consumption Summary by Facility

Facility	Electric	Natural Gas	Water & Sewer	Total
	kWh	therm	kgal	kBTU
Bicentennial/ Alto Park Complex	457,634	26,997	4,489	4,261,114
Fire Station #8	99,360	7,547	81	1,093,750
Fort Marcy Recreation Complex	379,867	34,827	1,166	4,778,772
Genoveva Chavez Community Center	3,792,381	204,408	9,355	33,380,403
La Familia Medical Center	367,040	10,175	377	2,269,807
Municipal Recreation Complex	677,194	15,559	0	3,866,519
Police Dept- Admin	556,107	14,243	215	3,321,703
Public Library- Main	239,900	7,816	199	1,600,139
Public Library- Southside	454,853	19,410	157	3,492,926
Salvador Perez Swimming Pool	451,758	27,103	4,276	4,251,647
Sandoval Parking Garage Lot B	166,620	0	49	568,507
Santa Fe Convention Center	1,529,079	54,504	1,244	10,667,618
Santa Fe Regional Airport	401,178	16,289	72	2,997,752
Siler Complex	475,433	36,717	706	5,293,845
Siringo Complex	248,727	18,983	736	2,746,983
Transit Administration	722,460	20,475	871	4,512,550
Total	11,019,590	515,052	23,995	89,104,035

3.2 Public Utility Facilities

Table 14 and Table 15 depict the baseline annual utility cost and consumption for each of the Public Utility's IGA facilities, respectively. The Water Treatment Plant (WTP) and Wastewater Treatment Plant (WWTP), along with the pump houses are not charged for their water consumption, therefore no data was available.

Table 14: Public Utility Facilities Baseline Annual Utility Cost Summary by Facility

Facility	Electric	Natural Gas	Water & Sewer	Total Cost
Canyon Road Water Treatment Plant	$71,913	$6,839	----	$78,752
Santa Fe Water Division Office	$32,468	$2,877	$1,944	$37,290
WWTP	$544,839	$52,885	----	$597,724
10M Gallon Tank	$35,782	$0	----	$35,782
Camino La Canada	$27,290	$0	----	$27,290
Cristo Rey Church Pump	$67,162	$0	----	$67,162
Dempsey Booster Station	$30,358	$0	----	30,358
10M Gallon Tank Booster Station #1	$22,948	$0	----	$22,948
Well Los Montoyas	$35,790	$749	----	$36,538
St. Michaels & Railroad Pump	$28,221	$0	----	28,221
Calle de Agua Tank (Summit Booster 1212)	$17,157	$0	----	$17,157
Buckman Well 10 (Booster D)	$43,811	$1,401	----	$45,212
Buckman Booster Station #1	$35,880	$1,771	----	37,651
Buckman Booster Station #4	$217,463	$1,996	----	$219,460
Buckman Well #1	$29,537	$0	----	$29,537
Buckman Booster #3 & Well #13	$218,596	$2,388	----	220,983
Total	$1,459,215	$70,906	$1,944	$1,532,065

Table 15: Public Utility Facilities Baseline Annual Utility Consumption Summary by Facility

Facility	Electric	Natural Gas	Water	Total
	kWh	therm	kgal	kBTU
Canyon Road Water Treatment Plant	825,973	15,253	----	4,343,521
Santa Fe Water Division Office	349,685	5,506	306	1,743,757
WWTP	7,823,142	129,738	----	39,666,327
10M Gallon Tank	345,757	0	----	1,179,722
Camino La Canada	250,175	0	----	853,598
Cristo Rey Church Pump	698,377	0	----	2,382,863
Dempsey Booster Station	267,600	0	----	913,051
10M Gallon Tank Booster Station #1	175,280	0	----	598,055
Well Los Montoyas	348,994	1,073	----	1,298,069
St. Michaels & Railroad Pump	277,865	0	----	948,075
Calle de Agua Tank (Summit Booster 1212)	125,548	0	----	428,370
Buckman Well 10 (Booster D)	461,240	521	----	1,625,851
Buckman Booster Station #1	361,600	1,734	----	1,407,179
Buckman Booster Station #4	2,584,000	2,468	----	9,063,408
Buckman Well #1	291,085	0	----	993,183
Buckman Booster #3 & Well #13	2,650,600	3,830	----	9,426,814
Total	17,836,922	160,123	306	76,871,845

3.3 BDD Sites

Table 16 and Table 17 depict the baseline annual utility cost and consumption for each the BDD IGA facilities, respectively. The BDD sites are not charged for their water consumption therefore no data was available.

Table 16: BDD Sites Baseline Annual Utility Cost Summary by Facility

Facility	Electric	Natural Gas	Water & Sewer	Total Cost
BDD Main	$511,270	$35,317	----	$546,586
BDD Booster Station #2A	$166,037	$0	----	$166,037
BDD Lift Station	$165,422	$1,771	----	167,193
BDD Booster Station 1A	$442,718	$0	----	$442,718
Total	$1,285,446	$37,088	----	$1,322,534

Table 17: BDD Sites Baseline Annual Utility Consumption Summary by Facility

Facility	Electric	Natural Gas	Water & Sewer	Total
	kWh	therm	kgal	kBTU
BDD Main	4,532,933	80,420	----	23,508,366
BDD Booster Station #2A	5,240,350	0	----	17,880,075
BDD Lift Station	2,114,857	1,732	----	7,389,093
BDD Booster Station 1A	5,887,168	0	----	20,087,019
Total	17,775,309	82,152	----	68,864,553

3.4 Benchmarking

Benchmarking is comparing indices of performance from “typical” buildings to those of the Agency of the same type and function. This allows for inter-Agency comparisons to occur as well in order to understand which of the buildings have the greatest potential for savings. In this instance, the COSF has some building typologies which do not have benchmarked data to compare against. Therefore, the benchmarking excludes the pump houses.

3.4.1 Baseline Energy Utilization Index (EUI)

A common approach to benchmarking a facility is through the comparison of the facility’s Energy Utilization Index (EUI) against that of similar facilities. The EUI is determined by dividing the total annual energy consumption by the area of the facility (kBTU/ft^2/Year). The lower the EUI, the better the energy performance of the facility in the IGA.

3.4.1.1 City Facilities

Table 18 and Figure 70 depicts the EUI for each of the city's facilities included in the IGA.

Table 18: COSF Facilities Baseline EUI Summary (kBTU/ft^2/Year)

Facility	EUI kBTU/ft^2/Yr.
Bicentennial/ Alto Park Complex	127.20
Fire Station #8	104.17
Fort Marcy Recreation Complex	183.80
Genoveva Chavez Community Center	214.94
La Familia Medical Center	90.79
Municipal Recreation Complex	203.50
Police Dept- Admin	110.72
Public Library- Main	57.15
Public Library- Southside	134.34
Salvador Perez Swimming Pool	250.10
Sandoval Parking Garage Lot B	4.37
Santa Fe Convention Center	148.16
Santa Fe Regional Airport	133.23
Siler Complex	120.04
Siringo Complex	77.38
Transit Administration	179.30

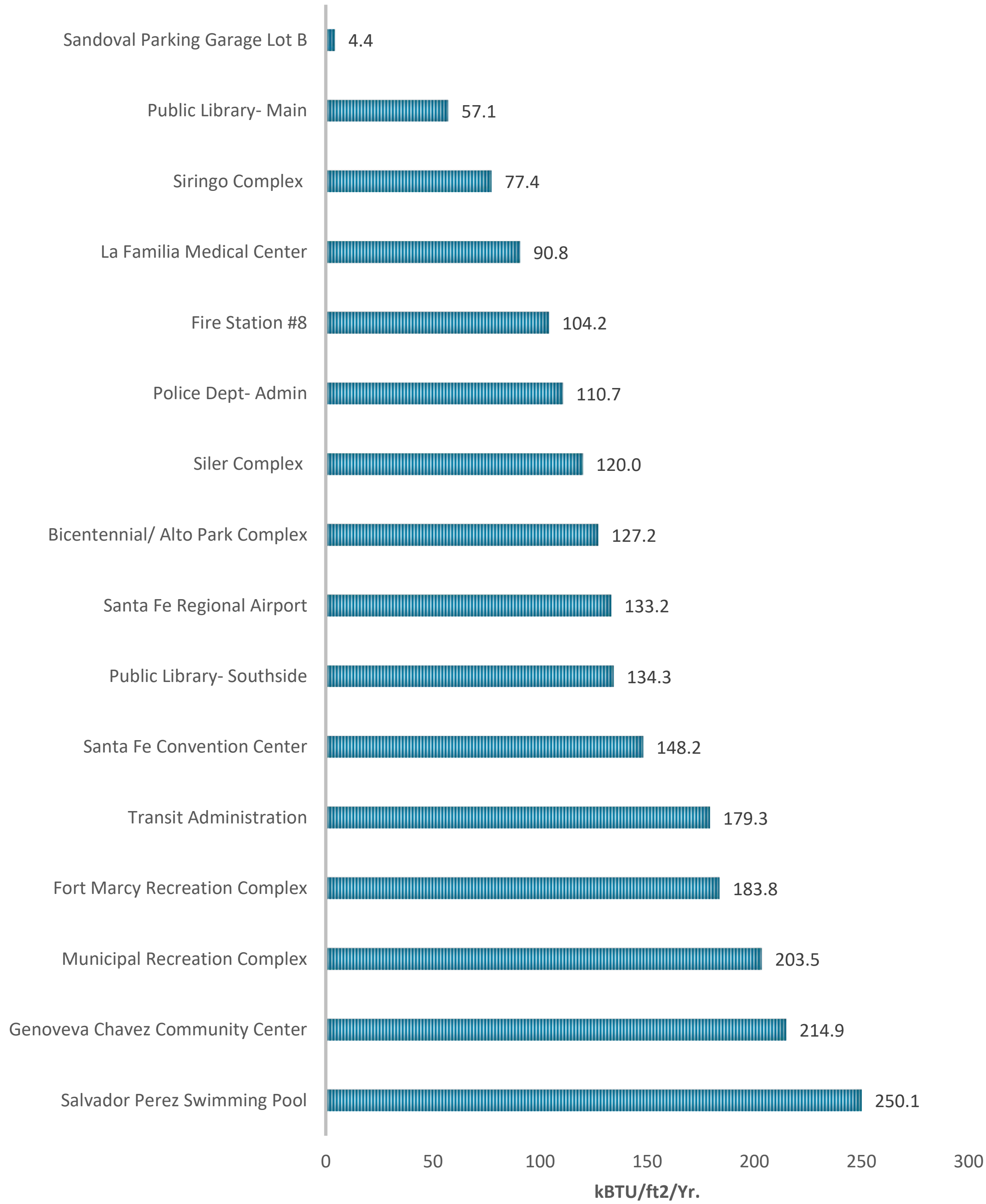


Figure 70: COSF Facilities Baseline EUI Comparison (kBTU/ft^2/Year)

Based on the EUI Benchmarking analysis above:

- The Salvador Perez Swimming Pool has a high EUI due to a large amount of natural gas used for pool water and building heating.
- The Municipal Recreation Center has a relatively high EUI due to the small area and the additional two pump houses associated with the energy consumption of that facility.
- The Genoveva Chavez Community Center has a large area and this facility includes three swimming pools and an ice hockey rink that all consume large amounts of energy.
- The Sandoval Parking Garage has a low EUI as this is an open-air parking facility with limited heating and cooling and the lighting system was previously upgraded to LED technology several years ago.

3.4.1.2 Public Utility Facilities

Table 19 and Figure 71 depict the EUI for each facility included in the IGA. The pump houses and booster stations have very high consumption and very small space therefore they are not benchmarked.

Table 19: Public Utility Facilities Baseline EUI Summary (kBTU/ft²/Year)

Facility	EUI kBTU/ft²/Yr.
Canyon Road Water Treatment Plant	203.92
Santa Fe Water Division Office	60.76
WWTP	223.60

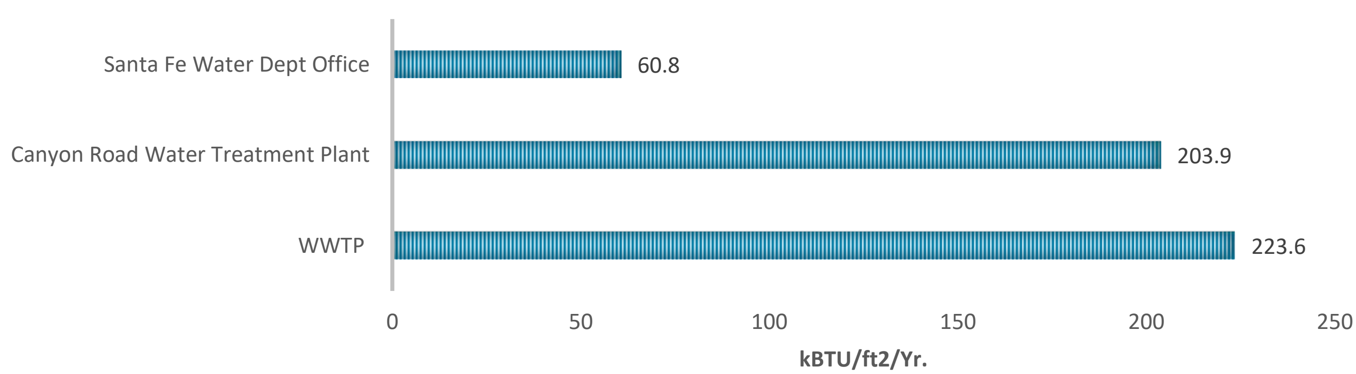


Figure 71: Public Utility Facilities Baseline EUI Comparison (kBTU/ft²/Year)

Based on the EUI Benchmarking analysis above:

- The WWTP has a high EUI because of the small building area and high energy consumption typical to a WWTP.
- Canyon Road Treatment Plant & BDD has a large amount of equipment that is used to pump and treat water that consumes energy.

3.4.1.3 BDD Sites

The BDD pump houses and booster stations have very high consumption and very small space therefore they are not benchmarked.

3.4.2 Baseline Energy Utilization (EUI) Comparison

The following table and chart depict the EUI for each facility included in the IGA. Where applicable, the baseline EUI of each facility is benchmarked against similar type facilities located in a similar climate region using the Commercial Buildings Energy Consumption Survey (CBECS) 2012, a national sample survey that collects energy-related information on the stock of U.S. commercial buildings (CBECS 2012 Table C10).

Table 20: Baseline EUI Comparison to CBECS

Facility	COSF EUI kBTU/ft²/yr.	CBECS Mean EUI kBTU/ft²/yr.	CBECS Category
Bicentennial / Alto Park Complex	127.2	82.4	Public Assembly
BDD Main	313.4	N/A	N/A
Canyon Road Water Treatment Plant	203.9	N/A	N/A
Fire Station #8	104.2	82.8	Public Order and Safety
Fort Marcy Recreation Complex	183.8	82.4	Public Assembly
Genoveva Chavez Community Center	214.9	82.4	Public Assembly
La Familia Medical Center	90.8	166.8	Healthcare
Municipal Recreation Complex	203.5	N/A	N/A
Police Dept – Admin	110.7	85.3	Office

Facility	COSF EUI kBTU/ft²/yr.	CBECS Mean EUI kBTU/ft²/yr.	CBECS Category
Public Library – Main	57.1	82.4	Public Assembly
Public Library – Southside	134.3	82.4	Public Assembly
Salvador Perez Swimming Pool	250.1	82.4	Public Assembly
Santa Fe Convention Center	148.2	82.4	Public Assembly
Santa Fe Regional Airport	133.2	82.4	Public Assembly
Santa Fe Water Division Office	60.8	85.3	Office
Siler Complex	120.0	85.3	Office
Siringo Complex	77.4	85.3	Office
Transit Administration	179.3	85.3	Office
Wastewater Treat	223.60	N/A	N/A

3.4.3 Baseline Energy Cost Index (ECI)

Another common method for benchmarking a facility is through the comparison of the facility's Energy Cost Index (ECI) against that of similar facilities. The ECI is determined by dividing the total annual energy utility cost by the square footage of the facility ($/ft²/Year). The lower the ECI, the better the energy cost performance of the facility.

3.4.3.1 City Facilities

The following table and chart depict the baseline ECI for all facilities included in the feasibility study.

Table 21: COSF Facilities Baseline ECI Summary ($/ft²/Year)

Facility	ECI $/ft²/Yr.
Bicentennial/ Alto Park Complex	$2.06

Facility	ECI $/ft²/Yr.
Fire Station #8	$1.57
Fort Marcy Recreation Complex	$2.21
Genoveva Chavez Community Center	$2.68
La Familia Medical Center	$1.98
Municipal Recreation Complex	$5.01
Police Dept- Admin	$1.95
Public Library- Main	$1.22
Public Library- Southside	$2.28
Salvador Perez Swimming Pool	$3.29
Sandoval Parking Garage Lot B	$0.17
Santa Fe Convention Center	$2.50
Santa Fe Regional Airport	$2.48
Siler Complex	$1.74
Siringo Complex	$1.14
Transit Administration	$3.38

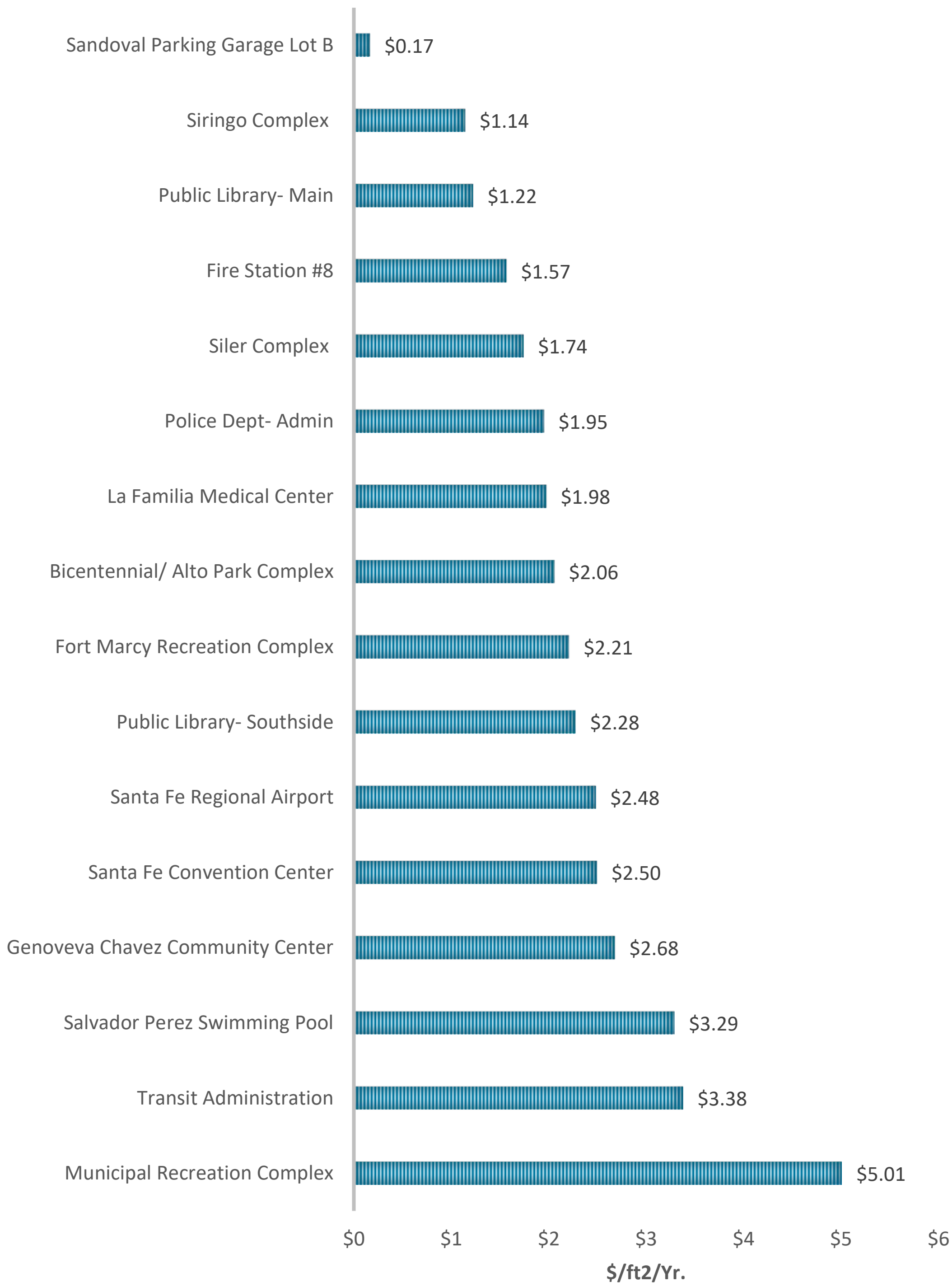


Figure 72: COSF Facilities Baseline EUI Comparison ($/ft²/Year)

3.4.3.2 Public utility Facilities

The following table and chart depict the baseline ECI for all facilities included in the feasibility study. The pump houses and booster stations have very high consumption and very small space therefore they are not benchmarked.

Table 22: Public utility Facilities Baseline ECI Summary ($/ft²/Year)

Facility	ECI $/ft²/Yr.
Canyon Road Water Treatment Plant	$3.70
Santa Fe Water Division Office	$1.23
WWTP	$3.37

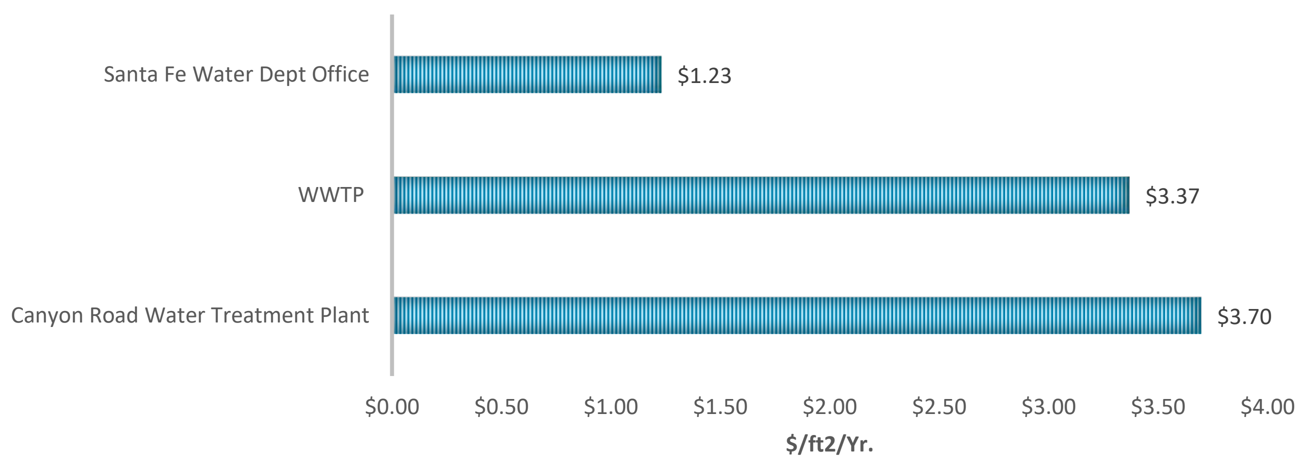


Figure 73: Public utility Facilities Baseline EUI Comparison ($/ft²/Year)

3.4.3.3 BDD Sites

The BDD pump houses and booster stations have very high consumption and very small space therefore they are not benchmarked.

3.5 Baseline Utility Rates

Refer to **Appendix B2** for more detailed baseline utility rate analysis information.

3.5.1 Electric

Public Service Company of New Mexico (PNM) is the electric utility provider for all sites and the rates are tabulated below.

Table 23: Electric Rates

Rate No.	Provider	Rate Description	Effective Date	On-Peak Demand $/kW	On-Peak Energy $/kWh	Off-Peak Energy $/kWh
2A	PNM	Small Power Service	Jan 1 2019	$0.0000	$0.1237	$0.1237
3B	PNM	General Power Service TOU	Jan 1 2019	$21.2998	$0.0534	$0.0397
3D	PNM	Pilot Muni/Counties General Power Service TOU	Jan 1 2019	$21.2998	$0.0534	$0.0397
3E	PNM	Pilot Muni/Counties General Power Service Low LF TOU	Jan 1 2019	$6.7747	$0.1210	$0.0762
4B	PNM	Large Power Service TOU	Jan 1 2019	$20.8558	$0.0497	$0.0398
11B	PNM	Water & Sewer Pumping Service TOU	Feb 1 2018	$0.0000	$0.1449	$0.0447

Time of use (TOU) rates have On-Peak and Off-Peak components. PNM On-Peak hours are Monday thru Friday, 8:00 am – 8:00 pm. All other hours are considered Off-Peak. There is also a seasonal difference in rates. Summer rates which apply during June, July, and August are higher.

3.5.2 Natural Gas

The natural gas for the City of Santa Fe is provided and billed through a contract with the domestic energy transportation company CenterPoint Energy. Natural gas is bought through the deregulated market by CenterPoint in block amounts agreed to by the city of Santa Fe on the first of the month market (FOM). The agreed upon amount is estimated based on approximate usage and current commodity prices. CenterPoint charges the city a variable first of the month index, reflective of gas market price, plus $0.095 per MMBtu supply fee and a 1% New Mexico Gas Company (NMGC) fee for their system. To meet the actual gas usage for that month, gas must be purchased or sold on the daily market. This rate is calculated as the weighted average cost of gas (WACOG) from the previous month plus $0.095/MMBtu supply fee if being purchased and credited as WACOG if being sold back.

Table 24: Natural Gas Rates

Rate No.	Provider	Rate Description	Effective Date	$/ therm
54	CenterPoint	CenterPoint & NMGC Transmission Rate 54	July 19, 2019	$0.3822
200	CenterPoint	CenterPoint & NMGC Transmission Rate 200 (Rate 34 in Analysis)	July 20, 2019	$0.3183

3.5.3 Water and Sewer

The City of Santa Fe is the water and sewer utility provider. The city currently does not charge itself for sewer services even though they should according to the published ordinance. Should the COSF elect to charge for sewer in the future, the COSF would see an increase in their utility bill for these services. As a result, the proposed annual savings would also increase due to the reduction in sewer consumption.

Table 25: Water and Sewer Gas Rates

Rate No.	Provider	Rate Description	Effective Date	Water	Sewer
				$/kgal	$/kgal
COM	COSF	Commercial Base Rate | All Meter Sizes	March 1, 2018	$6.0600	$0.0000

3.6 Existing City-Owned Solar PV Arrays

Prior to this IGA, various locations within the COSF had opted to build solar PV arrays for their benefit. The following table provides details pertaining to those systems.

Table 26: Existing City-Owned Solar PV Arrays

Site	Owner	Electric Meter	System Size (kW DC)
BDD 2A	BDD	740524	753.41
		742480	
Water Division Office	Water Division	924088	49.10 & 33.40
GCCC	COSF	752393	96.00
		740514	528.00

3.7 Solar Power Purchase Agreements (PPA)

A power purchase agreement is a contract between two parties, one who owns and maintains a power plant, in this case solar PV, and the other who typically hosts the power plant and agrees to purchase the power produced. The COSF has entered into several of these agreements and is hosting several solar photovoltaic power plants on-site at their facilities. Table 27 summarizes the key details of the existing PPA agreements (**Appendix E6**). The PPA rates ($kWh) outlined below do not include fixed meter charges and are extracted directly from the PPA contracts provided by the COSF with exception to BDD site. No PPA contract was available for this site, but upon confirmation from BDD site Management, the agreement does not include any fixed monthly cost. Therefore, YE calculated the PPA Rate for this system by dividing cost by energy produced. YE confirmed this approach as every month returned $/kWh. This would not be the case if there were any fixed meter charges applied.

Table 27: PPA Agreement Summary

Site Information			PPA Information			
Site	Electric Meter	System Size (kW DC)	System Owner	PPA Rate ($/kWh)	Contract Start Date	Contract End Date
BDD	743968	1166.0	American Capital Energy	0.155	January 1, 2011	January 1, 2031
WWTP Main	778050/778070	1,114.0*	SunEdision	0.0658	June 24, 2009	January 24, 2029
WWTP	740513	94.9**	Dissigno Holdings	0.1475	November 30, 2011	November 30, 2031
SFCC	777759	96.0*	Dissigno Holdings	0.1475	May 1, 2016	May 1, 2031
Transit Admin	778000	163.0***	RSBF	0.155	January 1, 2012	January 1, 2032

*According to original SunEdision PPA.
** Original SunEdison PPA showed 170 kW DC
*** Original SunEdison PPA showed 46 kW DC

In the case of the array adjacent to the WWTP Composting Bldg., according to the PPA contract, the purchase price is 0.1475, however, Dissigno Holdings is crediting the COSF with the monthly REC payments. Therefore, the actual rate paid is lower.

3.8 Renewable Energy Certificates (REC)

Renewable energy certificates are an incentive program offered by some utilities. Under these agreements, the utility pays system owners for the solar energy produced on-site. Purchase of these certificates are used by the utility to offset their GHG emissions. Table 28 depicts the existing REC Agreements for PV Production on COSF sites.

Note: The city should be aware when the REC agreements end, they will no longer receive these credits and there will be an increase in their bill. Therefore, in locations where the city receives these directly, they were not included in baseline analysis.

Table 28: REC Agreement Summary

Site Information			Renewable Energy Certificates				
Site	Electric Meter	System Size (kW DC)	REC Owner	REC Rate ($/kWh)	Avg. Annual REC Payment Received	Contract Start Date	Contract End Date
BDD Main	721790	1166.00	COSF	0.1500	$303,570	January 1, 2011	January 1, 2031
BDD 2A	537846	753.41	COSF	0.0200	$55,174	May 17, 2013	December 31, 2020
	413482		COSF	0.0153		May 17, 2013	December 31, 2020
WWTP-Compost	-	94.90	Dissigno Holdings	0.0800	NA	-	-
WWTP-Main	816595	1,114.00	COSF	0.1500	$363,495	-	-
SFCC	-		Dissigno Holdings	0.0800	NA	-	-
Transit Admin	-	163.00	RSBF	-	NA	-	-
Water Division Office	947604		COSF	0.5000	$5,173	unavailable	unavailable
GCCC	752366	96.00	COSF	0.0200	$4,377	unavailable	unavailable
GCCC	581129	528.00	COSF	0.0500	$4,634	unavailable	unavailable

As mentioned previously, despite being the owner of the REC, Dissigno Holdings credits COSF with the REC payments for the WWTP-Compost.

3.9 PNM Service Entrance Agreements at BDD

PNM had to build specific infrastructure to supply the BDD sites. Due to these costs, there was an agreement made between PNM and BDD to purchase a minimum of electricity annually for a specified duration. This agreement includes a financial penalty ($/kWh) on the difference between the Annual On-Peak Energy Requirement (kWh) and the actual amount (kWh) consumed. The details of these agreements can be seen in Table 29. YE and the COSF have reviewed these agreements and concluded that due to the agreement end date and project timeline this will have a minimal effect.

These agreements can be found in **Appendix B4**.

Table 29: PNM/BDD Service Entrance Agreement Summary

Point of Delivery	PNM Agreement No.	PNM Account No.	In-Service Date	Agreement End Date	Sub-Sta. Annual On-Peak Energy Requirement
BDD Service Entrance 1: Diversion Structure and Raw Water Lift Station	1025007	1025007	07/01/11	07/01/21	254,040 kWh
BDD Service Entrance 2: Sediment Removal and Booster Station 1A	1025008	1025008	07/01/11	07/01/21	613,200 kWh
BDD Service Entrance 3: Booster Station 2A	1025009	11025009	07/01/11	07/01/21	639,480 kWh
BDD Service Entrance 4: City/County Water Treatment Plant	1025010	1025010	07/01/11	07/01/21	963,984 kWh
Total	-----	-----	-----	-----	2,470,704 kWh

3.10 Baseline Utility meters

When discussing the utility meters, the following acronyms have been applied for the utility types:

ELEC: Electricity
NG: Natural Gas
WATER: Water

3.10.1 City Facilities

3.10.1.1 Bicentennial/ Alto Park Complex

Table 30: Bicentennial/Alto Park Complex Utility Meters and Rates

Utility Type	Area Served	Account #	Meter #	Rate
ELEC	Early Prevention	041257901-0453671-2	63271	ELEC-PNM-2A
ELEC	Senior Center	039050301-0434786-0	947566	ELEC-PNM-3D
ELEC	Head Start	043564500-0472091-8	760012	ELEC-PNM-2A
ELEC	Pool	042811500-0466425-0	526169	ELEC-PNM-2A
ELEC	Ball Park Lighting & Concession Stand	115942999-1249111-8	681172	ELEC-PNM-2A
NG	Head Start & Early Prevention	00000000-000000	N077271/ N077269	NG-CenterPoint-54
NG	Bicentennial Pool & Sr Citizen	080976621-0829521	5416790	NG-CenterPoint-54
NG	Sr Center Kitchen	080976620-0834937	6151086	NG-CenterPoint-54
NG	Alto Park Concession	080976624-1163476	1596805	NG-CenterPoint-54
WATER	4" Commercial-Irrigation	360217	1345581/ 1345582	WATER-COSF-COM
WATER	2" Commercial	360217	134365	WATER-COSF-COM
WATER	1"- Irrigation	360217	119295	WATER-COSF-COM
WATER	NA	360217	9941694	WATER-COSF-COM

Head Start and Early Prevention are served by meters N077271 and N077269. Early Prevention has been vacant and shortly after the natural gas was shut off due to a leak. No account data was available for this site, therefore no natural gas savings where attributed.

3.10.1.2 Fire Station #2

Table 31: Fire Station #2 Utility Meters and Rates

Utility Type	Area Served	Account #	Meter #	Rate
ELEC	All	115942762-0462227-1	594570	ELEC-PNM-2A
NG	All	080976605-1170459	269020	NG-CenterPoint-54

3.10.1.3 Fire Station #8

Table 32: Fire Station #8 Utility Meters and Rates

Utility Type	Area Served	Account #	Meter #	Rate
ELEC	All	115942916-1269792-6	662544	ELEC-PNM-2A
NG	All	080976640-1333588	44863	NG-CenterPoint-54
WATER	All	531195.00	134144	WATER-COSF-COM

3.10.1.4 Fort Marcy Recreation Complex

Table 33: Fort Marcy Utility Meters and Rates

Utility Type	Area Served	Account #	Meter #	Rate
ELEC	Main	039986902-0442716-2	947565	ELEC-PNM-3D
NG	All	080976626-0826059	8274066	NG-CenterPoint-54
WATER	All	357026.00	1345292/ 1345291	WATER-COSF-COM

3.10.1.5 Genoveva Chavez Community Center

Table 34: GCCC Utility Meters and Rates

Utility Type	Area Served	Account #	Meter #	Rate
ELEC	Main Meter	115942967-0474238-8	752393	ELEC-PNM-4B
ELEC	Main meter Solar REC	115942967-0474238-8	752366	ELEC-PNM-4B
ELEC	Smaller meter	115447884-1174415-5	740514	ELEC-PNM-2A
ELEC	Smaller Meter Solar REC	115447884-1174415-5	581129	ELEC-PNM-2A
NG	All	080976666-1180330	9728379	NG-CenterPoint-54
WATER	(2) 4" Meters combined on bill	267792.00	1360012/ 1360011	WATER-COSF-COM
WATER	2" Meter-Irrigation	554456	134270	WATER-COSF-COM

This site has a solar carport PV system owned by the City and issues regarding this system can be found in section 2.5.8.3. Electricity is billed on two PNM account each with one main meter and an associated REC meter. The baseline consumption includes the PNM account and the solar electric production. The REC credit ($) are calculated separately and the saving the city receives from the REC's are not included in the baseline cost.

3.10.1.6 La Familia Medical Center

Table 35: La Familia Medical Center Utility Meters and Rates

Utility Type	Area Served	Account #	Meter #	Rate
ELEC	All	115657953-1261988-5	947567	ELEC-PNM-3D
NG	All	080976622-1170453	1777684	NG-CenterPoint-54
WATER	(2) 3" Meters billed together	338765.00	1344972/1344971	WATER-COSF-COM

3.10.1.7 Municipal Recreation Complex

Table 36: MRC Utility Meters and Rates

Utility Type	Area Served	Account #	Meter #	Rate
ELEC	Pump House Great 28 Golf	043554101-0472018-7	473503	ELEC-PNM-3E
ELEC	Pump Stat. Hill Pond Soccer	43554000-0472017-2	947578	ELEC-PNM-2A
ELEC	Admin Bldg.	043929700-0474586-2	360455	ELEC-PNM-2A
ELEC	Clubhouse	043680100-0472932-9	947623	ELEC-PNM-3B
ELEC	Maintenance Building	043468801-0471344-4	688796	ELEC-PNM-2A
NG	MRC Admin Bldg.	080976662-0838904	9552525	NG-CenterPoint-54
NG	MRC Cart Barn	080976663-0839667	1402190	NG-CenterPoint-54
NG	MRC Restaurant Pro2	080976664-1169315	1780401	NG-CenterPoint-54

3.10.1.8 Police Dept- Admin

Table 37: Police Department Admin Utility Meters and Rates

Utility Type	Area Served	Account #	Meter #	Rate
ELEC	All	15942800-0448065-3	947609	ELEC-PNM-3D
NG	COSF 12057- SFPD Admin Bldg.	080976617-0816267	1004160	NG-CenterPoint-54
WATER	2" Commercial	338571.00	134370	WATER-COSF-COM

3.10.1.9 Public Library- Main

Table 38: Main Public Library Utility Meters and Rates

Utility Type	Area Served	Account #	Meter #	Rate
ELEC	All	040919201-0450981-0	947564	ELEC-PNM-3D
NG	All	080976623-0824821	475942	NG-CenterPoint-54
WATER	All	299022.00	136249	WATER-COSF-COM

3.10.1.10 Public Library- Southside

Table 39: Southside Public Library Utility Meters and Rates

Utility Type	Area Served	Account #	Meter #	Rate
ELEC	All	115727805-1262782-9	947588	ELEC-PNM-3D
NG	All	080976641-1332449	643007	NG-CenterPoint-54
WATER	All	534692.00	134371	WATER-COSF-COM

3.10.1.11 Salvador Perez Swimming Pool

Table 40: Salvador Perez Swimming Pool Utility Meters and Rates

Utility Type	Area Served	Account #	Meter #	Rate
ELEC	Park Lights Soccer Field	115927248-1354618-5	847985	ELEC-PNM-2A
ELEC	Main Bldg. & Ballpark Lights	115458445-0434757-6	947605	ELEC-PNM-3D
NG	Salvador Perez Pool	080976628-0824084	6353037	NG-CenterPoint-54
WATER	2" Meter	560883.00	134269	WATER-COSF-COM
WATER	(2) 4" Meters combined on bill-Irrigation	560885.00	1345571/ 1345572	WATER-COSF-COM
WATER	5/8" Meter- very limited data- Irrigation	545644.00	120386	WATER-COSF-COM

3.10.1.12 Sandoval Parking Garage Lot B

Table 41: Sandoval Parking Garage Lot B Utility Meters and Rates

Utility Type	Area Served	Account #	Meter #	Rate
ELEC	All	041275601-0453803-7	947554	ELEC-PNM-3D
WATER	All	352006.00	119359	WATER-COSF-COM

3.10.1.13 Santa Fe Convention Center

Table 42: SFCC Utility Meters and Rates

Utility Type	Area Served	Account #	Meter #	Rate
ELEC	SFC Main Meter	115993535-1268887-0	777759	ELEC-PNM-3D
ELEC	Dissigno Holdings Solar PPA at SFCC	6629310753.00	419428	ELEC-Dissigno Holdings-PPA-SFC
NG	SF Convention Center	080976642-1268887	825788	NG-CenterPoint-54
WATER	(2) 4" Meters combined onto one bill-99557172 Irrigation	544660.00	99557171/ 99557172	WATER-COSF-COM
WATER	3/4" Meter-Irrigation	544658.00	11602765	WATER-COSF-COM

This site includes a roof-mounted PV system owned by Dissigno Holdings. Electricity is provided on one PNM account with a main meter and a REC meter. The baseline consumption and cost include the PNM account and solar PV production and cost from the PPA. Dissigno Holdings receives the REC ($) and therefore not included in the baseline.

3.10.1.14 Santa Fe Regional Airport

Table 43: Santa Fe Regional Airport Utility Meters and Rates

Utility Type	Area Served	Account #	Meter #	Rate
ELEC	Main Terminal	115564459-12299994-4	947574	ELEC-PNM-3D
ELEC	Maintenance Shop	41908800-0459100-1	17209	ELEC-PNM-2A
ELEC	Runway Lights X Terminal	42013301-0459988-3	446691	ELEC-PNM-2A
ELEC	Gate 1 & 4 Parking Lot Lights	11594973-1205238-3	525232	ELEC-PNM-2A
ELEC	Fire Station #10	115929112-1345286	423855	ELEC-PNM-2A

Utility Type	Area Served	Account #	Meter #	Rate
NG	Airport Maintenance, fire station, medevac	080976667-0831851	1336725	NG-CenterPoint-54
NG	Airport Terminal B	080976668-0816120	2723923	NG-CenterPoint-54
WATER	5/8" Meter	387831.00	122819	WATER-COSF-COM
WATER	1.5" Meter	547445.00	134200	WATER-COSF-COM

3.10.1.15 Siler Complex

Table 44: Siler Complex Utility Meters and Rates

Utility Type	Area Served	Account #	Meter #	Rate
ELEC	Bldg. C	040951601-0451180-7	947602	ELEC-PNM-3D
ELEC	Bldg. A	041555900-0456138-3	662466	ELEC-PNM-2A
ELEC	Bldg. B	115942990-0456376-9	662433	ELEC-PNM-2A
ELEC	Empty Lot East	041555501-0456135-2	947579	ELEC-PNM-3D
NG	Siler Fleet Parks G	080976614-1170447	492885	NG-CenterPoint-54
NG	Siler Power Washer	080976615-0837053	477889	NG-CenterPoint-54
NG	Siler Traffic Solid waste	080976616-0830919	477896	NG-CenterPoint-54
NG	Siler Fiesta Bldg.	080976613-1170452	1309244	NG-CenterPoint-54
WATER	5/8" Meter	355768.00	134097	WATER-COSF-COM
WATER	2" Meter	360276.00	134364	WATER-COSF-COM
WATER	1" Meter	529442.00	119384	WATER-COSF-COM
WATER	2" Meter	355944.00	134394	WATER-COSF-COM

3.10.1.16 Siringo Complex

Table 45: Siringo Complex Utility Meters and Rates

Utility Type	Area Served	Account #	Meter #	Rate
ELEC	Bldg. 'C' & Likely J-IT Old Building	043161800-0469218-3	526161	ELEC-PNM-2A
ELEC	Warehouse	115942768-1186386-9	515748	ELEC-PNM-2A
ELEC	Bldgs. D/E/F/G/H/I	115942769-0469297-6	947583	ELEC-PNM-3D
NG	Facility Records	080976610-0821162	370587	NG-CenterPoint-54
NG	Facility Maint. Siringo	080976611-0821144	370595	NG-CenterPoint-54
NG	Facility Warehouse	080976612-1333589	1554782	NG-CenterPoint-54
NG	Property Ctrl Siringo 1	080976606-0837423	9955737	NG-CenterPoint-54
NG	Property Ctrl Siringo 2	080976607-0837424	1296173	NG-CenterPoint-54
NG	Property Ctrl Siringo 3	080976608-0837425	1296176	NG-CenterPoint-54
WATER	2" Meter	355952.00	134264	WATER-COSF-COM
WATER	2" Meter	355952.00	134282	WATER-COSF-COM

3.10.1.17 Southside Transit Center

Table 46: Southside Transit Utility Meters and Rates

Utility Type	Area Served	Account #	Meter #	Rate
ELEC	All	115727805-0420091-0	446431	ELEC-PNM-2A
WATER	All	565689.00	134384	WATER-COSF-COM

3.10.1.18 Transit Administration

Table 47: Transit Admin Utility Meters and Rates

Utility Type	Area Served	Account #	Meter #	Rate
ELEC	All	115971385-1160652-8	924072	ELEC-PNM-3D
ELEC	RSBF Solar PPA	----	681123	ELEC-RSB-PPA-TAF
NG	Transit Admin Bldg.	080976655-1170458	2877740	NG-CenterPoint-54
NG	Transit Maintenance	080976656-1155567	1309400	NG-CenterPoint-54
NG	Transit Wash Bay	080976657-1155412	387061	NG-CenterPoint-54
WATER	1" Meter	356390.00	122459	WATER-COSF-COM
WATER	2" Meter	356390	134299	WATER-COSF-COM
WATER	2" Meter	356390	134361	WATER-COSF-COM

This site includes a ground mounted and carport solar PV system owned by RSBF. Electricity is provided to the facility on one PNM account with one main meter and a REC meter. The baseline cost and consumption include the PNM account and the solar PV production and cost from the PPA. RSBF receives the REC and therefore not included in the baseline.

3.10.2 Public utility Facilities

3.10.2.19 Canyon Road Water Treatment Plant

Table 48: Canyon Road Water Treatment Plant Utility Meters and Rates

Utility Type	Area Served	Account #	Meter #	Rate
ELEC	WTP	040489203-0447256-0	413488	ELEC-PNM-11B
NG	COSF 52300- Water Upper Canyon1	080976654-1176875	3248679	NG-CenterPoint-54

3.10.2.20 Santa Fe Water Division Office

Table 49: Santa Fe Water Division Office Utility Meters and Rates

Utility Type	Area Served	Account #	Meter #	Rate
ELEC	Water Conservation	115942923-0472071-5	364935	ELEC-PNM-2A
ELEC	Back Bldg. / T&C Bldg.	115942944-1244172-1	650399	ELEC-PNM-2A
ELEC	Maintenance	115942942-1244171-6	650396	ELEC-PNM-2A
ELEC	Main Bldg.	036511603-0414064-3	924088	ELEC-PNM-3D
ELEC	Main Bldg. Solar REC	036511603-0414064-3	947604	ELEC-PNM-SOLAR-REC
NG	COSF 52300 – Water Admin Bldg.	080976645-0820837	1777635	NG-CenterPoint-54
NG	COSF 52300 WATER CONSERVATION BUILDING	080976652-0838397	1737113	NG-CenterPoint-54
WATER	2" Meter	294643.00	134311	WATER-COSF-COM
WATER	2" Meter	294643.00	134266	WATER-COSF-COM
WATER	2" Meter	294643.00	136339	WATER-COSF-COM
WATER	5/8" Meter	357405.00	119413	WATER-COSF-COM

This site includes a carport solar PV system owned by the city. Electricity is provided to the main building on one PNM account with one main meter and a REC meter. The baseline consumption for this site includes the PNM account and solar electric production. The REC credit ($) is calculated separately and the saving the city receives from the REC's are not included in the baseline cost.

3.10.2.21 WWTP

Table 50: WWTP Utility Meters and Rates

Utility Type	Area Served	Account #	Meter #	Rate
ELEC	Compost	116033203-1324334-5	740513	ELEC-PNM-11B
ELEC	Dissigno Holdings Solar REC at WWTP Compost	0000-000-00	581434	ELEC-Dissigno Holdings-PPA-WWTP
ELEC	Main Feed Camel Tracks	115946814-0447306-1	778050	ELEC-PNM-11B
ELEC	Beckner	115946814-0447306-1	778070	ELEC-PNM-11B
ELEC	Solar REC	115946814-0447306-1	816595	ELEC-PNM-SOLAR-REC
ELEC	Solar PPA	----	----	SunEdison-PPA
ELEC	Plant Non-Pot Pump Station	115372540-1185036-7	421692	ELEC-PNM-11B
ELEC	Supply, Maintenance Garages	115942958-1232654	342756	ELEC-PNM-2A
NG	Wastewater Sewer Compost Bldg. (COSF-52542)	080976659-1333587	490852	NG-CenterPoint-54
NG	Waste Wtr Sewer Admin Bldg. (COSF 52452)	080976658-0816122	049664-2	NG-CenterPoint-54
NG	Waste Wtr Sewer Header Bldg. (COSF 52452)	080976660-1185131	1671733	NG-CenterPoint-54

This site includes two ground mounted PV system which are described as follows:

Compost

This system is owned by Dissigno Holdings. Electricity is provided on one PNM account with one main meter and a REC meter. The baseline consumption and cost include the PNM account and the solar PV production and the cost from the PPA. Dissigno Holdings receives the REC ($) and therefore not included in the baseline. Although not required by contract Dissigno Holdings credits the RECs back to the city. No REC credits where received for the first three month of billing and therefore no credit was issued to the city.

Main

This PV system is owned by SunEdison. The majority of electricity to this site is provided on one account via two main meters, Camel Tracks and Beckner; although 100% of the electricity is fed through Camel Tracks, the Beckner meter is most likely used for redundancy.

The City receives the REC payment directly and the consumption and cost were extracted from the utility website. This was not included in the site's baseline cost and was tabulated separately.

The PPA billing information was not available from the city. The consumption used to calculate the baseline was the amount recorded by the REC meter. The total consumption was then distributed by 5/7 for On-Peak and 2/7 for Off-Peak. The cost ($) was calculated by multiplying the total metered by the original PPA flat rate.

The baseline consumption and cost include the PNM account and the solar PV production and the cost from the PPA. The REC credit ($) is calculated separately and the saving the city receives from the REC's are not included in the baseline cost.

3.10.2.22 10M Gallon Tank

Table 51: 10M Gallon Tank Utility Meters and Rates

Utility Type	Area Served	Account #	Meter #	Rate
ELEC	Pump	115942933-0445032	619725	ELEC-PNM-11B

3.10.2.23 10M Gallon Tank Booster Station #1

Table 52: 10M Gallon Tank Booster Station #1 Utility Meters and Rates

Utility Type	Area Served	Account #	Meter #	Rate
ELEC	Pump	115942925-12722444-5	644839	ELEC-PNM-3D

3.10.2.24 Buckman Booster Station #1

Table 53: Buckman Booster Station #1 Utility Meters and Rates

Utility Type	Area Served	Account #	Meter #	Rate
ELEC	Pump	115942932-1234139-9	407084	ELEC-PNM-11B
NG	Water Booster Sta 1	80976646-832952	340995	NG-CenterPoint-200

3.10.2.25 Buckman Booster #3 & Well #13

Table 54: Buckman Booster #3 & Well #13 Utility Meters and Rates

Utility Type	Area Served	Account #	Meter #	Rate
ELEC	Pump	115942926-1233031-2	752383	ELEC-PNM-11B
NG	Pump	080976648-0832956	116492	NG-CenterPoint-200

3.10.2.26 Buckman Booster Station #4

Table 55: Buckman Booster Station#4 Utility Meters and Rates

Utility Type	Area Served	Account #	Meter #	Rate
ELEC	Pump	115942938-1234140-3	473413	ELEC-PNM-11B
NG	COSF 52300 – Water Booster Station 4	080976649-0832937	128722	NG-CenterPoint-200

3.10.2.27 Buckman Well #1

Table 56: Buckman Well #1 Utility Meters and Rates

Utility Type	Area Served	Account #	Meter #	Rate
ELEC	Pump	040246303-0445033-6	619555	ELEC-PNM-11B

3.10.2.28 Buckman Well 10 (Booster D)

Table 57: Buckman Well #10 (Booster D) Utility Meters and Rates

Utility Type	Area Served	Account #	Meter #	Rate
ELEC	Pump	115942924-1233530-3	537827	ELEC-PNM-11B
NG	COSF 52300 STR Buckman Booster D & Well 10	080976647-0832954	220703	NG-CenterPoint-54

3.10.2.29 Calle de Agua Tank (Summit Booster 1212)

Table 58: Calle de Agua Tank (Summit Booster) Utility Meters and Rates

Utility Type	Area Served	Account #	Meter #	Rate
ELEC	Pump	115591332-0465925-5	758240	ELEC-PNM-3E

3.10.2.30 Camino La Canada

Table 59: Camino La Canada Utility Meters and Rates

Utility Type	Area Served	Account #	Meter #	Rate
ELEC	Pump	115907013-0447225	752370	ELEC-PNM-11B

3.10.2.31 Cristo Rey Church Pump

Table 60: Cristo Rey Church Pump Utility Meters and Rates

Utility Type	Area Served	Account #	Meter #	Rate
ELEC	Pump	040246003-0445030-5	752364	ELEC-PNM-11B

3.10.2.32 Dempsey Booster Station

Table 61: Dempsey Booster Station Utility Meters and Rates

Utility Type	Area Served	Account #	Meter #	Rate
ELEC	Pump	040246003-0445030-5	752364	ELEC-PNM-11B

3.10.2.33 St. Michaels & Railroad Pump

Table 62: St. Michaels & Railroad Pump Utility Meters and Rates

Utility Type	Area Served	Account #	Meter #	Rate
ELEC	Pump	040486803-0447233-8	619728	ELEC-PNM-11B

3.10.2.34 Well Los Montoyas

Table 63: Well Los Montoyas Utility Meters and Rates

Utility Type	Area Served	Account #	Meter #	Rate
ELEC	Pump	115942947-1170495-1	438752	ELEC-PNM-11B
NG	Water NW Well 3	080976653-1171920	1069402	NG-CenterPoint-54

3.10.3 BDD Sites

3.10.3.1 BDD Main

Table 64: BDD Main Utility Meters and Rates

Utility Type	Area Served	Account #	Meter #	Rate
ELEC	BDD Main – All	115915784-1346251-1	743968 /740515	ELEC-PNM-11B
ELEC	BDD Main – Solar REC	----	740515	ELEC-PNM-SOLAR-REC
ELEC	BDD Main – Solar PPA	----	----	ELEC-ACE-PPA-BDD-Main
NG	COSF BU 72140 BDDP	080976669-1345618	1025768	NG-CenterPoint-54

This site includes a ground mounted PV system owned by American Capital Energy. Electricity is provided on one account via two main meters. One of the main meters includes the REC meter and a Solar PV production meter. The baseline includes both the solar PV production and the cost paid for the PPA. The city receives the REC payments directly and this was not included in the site's baseline cost and was tabulated separately.

For several BDD sites there were discrepancies between the historic data tabulated and copies of the bills available on the utility companies' website. These were reviewed by the utility company and a sperate spreadsheet was provided for the BDD sites that included BDD Main, Booster 2A, Booster 1A, BDD Lift Station.

The REC consumption and cost were extracted from the utility company spreadsheet. The On-Off-Peak consumption was estimated by distributing the total consumption by 5/7 for On-Peak and 2/7 for Off-Peak. This was not included in the site's baseline cost and was tabulated separately.

The PPA billing information was provided by the city. With the city's guidance, the consumption was calculated by taking the total cost ($) and divided by the rate ($/kWh). The total consumption was then distributed by 5/7 for On-Peak and 2/7 for Off-Peak.

The BDD PNM account consumption (kWh) was calculated by subtracting the Net Export from the Net Import for both On- and Off-Peak and adding these together provided the Total Consumption.

The baseline consumption and cost include the PNM account and the solar PV production and the cost from the PPA. The REC credit ($) is calculated separately and the savings the city receives from the REC's are not included in the baseline cost.

3.10.3.2 BDD Booster Station #1A

Table 65: BDD Booster Station #1A Utility Meters and Rates

Utility Type	Area Served	Account #	Meter #	Rate
ELEC	Pump	115915784-1347615-0	0438753 / 476161	ELEC-PNM-11B

In some case the full baseline period data was not available and additional information per meter is tabulated in **Appendix B**.

3.10.3.3 BDD Booster Station #2A

Table 66: BDD Booster Station #2A

Utility Type	Area Served	Account #	Meter #	Rate
ELEC	Pump	115915784-1348372-1	0740524/ 0742480	ELEC-PNM-11B
ELEC	Pump – Solar REC	115915784-1348372-1	537846/ 0413482	ELEC-PNM-SOLAR-REC

This site includes a ground mounted solar PV system owned by the city. Electricity is provided to the site on one PNM account via two meters each with a REC meter.

The REC consumption and cost were extracted from the utility company spreadsheet. The On-Off-Peak consumption was estimated by distributing the total consumption by 5/7 to On-Peak and 2/7 to Off-Peak. This was not included in the site's baseline cost and was tabulated separately.

The PNM account consumption (kWh) was calculated by subtracting the Net Export from the Net Import for both On & Off-Peak and adding these together provided the Total Consumption. The total billed amount included all charges except the REC payments.

The site baseline consumption was calculated by adding the PNM consumption and the Solar PV production recorded by the REC meter. The REC credit ($) is calculated separately and the savings the city receives from the REC's are not included in the baseline cost.

3.10.3.4 BDD Lift Station

Table 67: BDD Lift Station Utility Meters and Rates

Utility Type	Area Served	Account #	Meter #	Rate
ELEC	Pump	115915784-1347614-1	0418853/ 473487	ELEC-PNM-11B
NG	COSF 52300 – Water Booster Sta	080976646-0832952	1094791	NG-CenterPoint-54

4.0 Facility Improvement Measures

The two fundamental factors contributing to energy savings are performance and duration. Performance describes how much energy is being used to accomplish a task, while duration describes how much time the task operates.

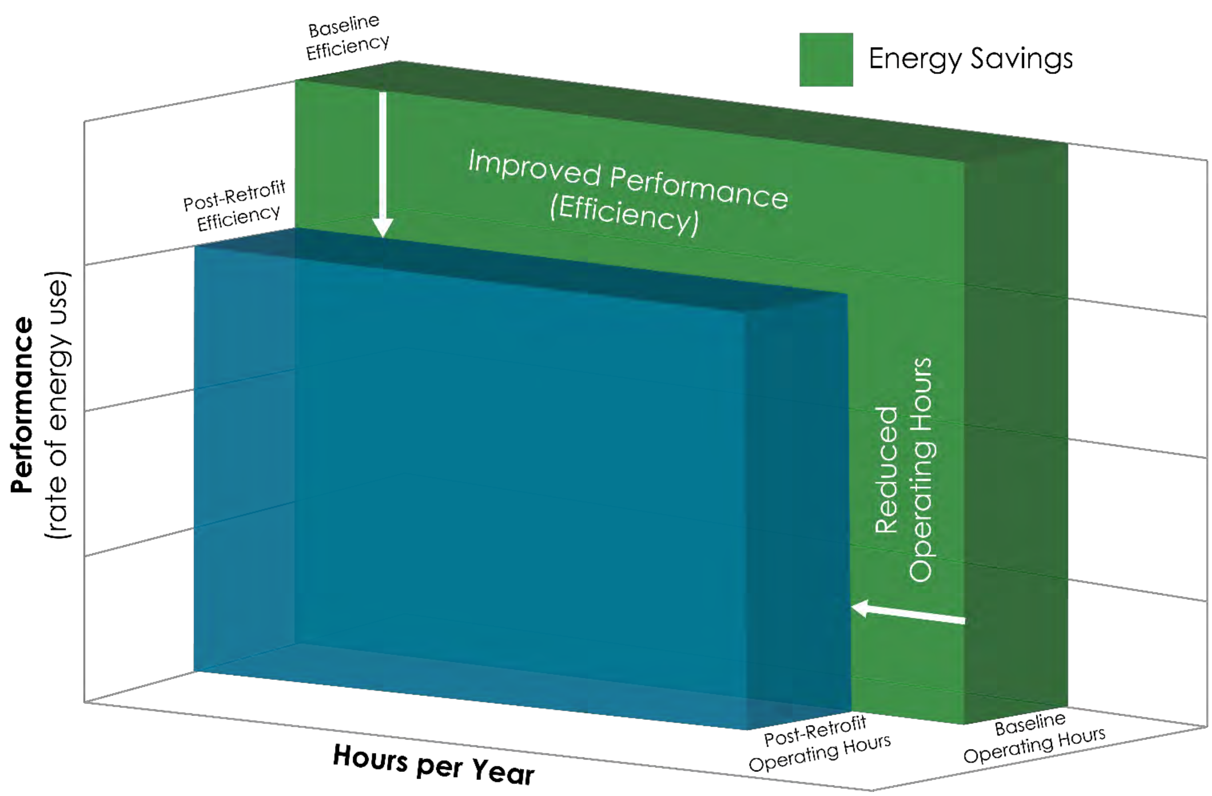


Figure 74: Facility Improvement Measures Diagram

A fundamental benefit of GESPC projects is that they allow for measures of varying financial returns to be bundled together to form a combined project that meets the Agency's financial and operational objectives. This process places the Agency at the project helm in terms of selecting which measures will be implemented as part of the final project scope within a targeted financing term.

A comprehensive Investment Grade Audit (IGA) was performed to establish the baseline condition and performance of each facility, and to identify and co-develop the following recommended FIMs. Not every FIM is applicable to each IGA building and only data and information for impacted buildings will be presented in the subsequent FIM sections of this report. Table 68: FIM Matrix clearly identifies where FIMs are applied.

Table 68: FIM Matrix

Site		1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00
		Lighting LED	Ren. Energy	Water Cons.	Bldg. Env.	HE Xfrms	Utility Mgt	GCCC Solar Repair	Replace Roof
COSF Facilities									
Bicentennial / Alto Park Complex	01	●	●	●	●	●			
Fire Station #2	02								
Fire Station #8	03	●	●	●	●				
Fort Marcy Recreation Complex	04	●		●	●				
Genoveva Chavez Community Center	05	●		●	●		●	●	
La Familia Medical Center	06	●		●	●				
Municipal Recreation Complex	07	●	●		●	●	●		
Police Dept - Admin	08	●	●	●	●				
Public Library - Main	09	●		●	●				
Public Library - Southside	10	●	●	●	●	●			
Salvador Perez Swimming Pool	11	●		●	●				
Sandoval Parking Garage Lot B	12			●					
Santa Fe Convention Center	13	●		●	●				

Site		1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00
		Lighting LED	Ren. Energy	Water Cons.	Bldg. Env.	HE Xfrms	Utility Mgt	GCCC Solar Repair	Replace Roof
Santa Fe Regional Airport	14	●	●		●				
Siler Complex	15	●		●	●				
Siringo Complex	16	●		●	●				
Southside Transit Center	17		●						
Transit Administration	18	●		●	●	●			
Water Utilities Department									
Canyon Road Water Treatment Plant	19		●		●	●			●
Santa Fe Water Dept Office	20	●		●	●				
WWTP	21	●				●			
10M Gallon Tank	22	●	●						
10M Gallon Tank Booster Station #1	23								
Buckman Booster Station #1	24	●	●						
Buckman Booster Station #3 & Well #13	25		●						
Buckman Booster Station #4	26		●						
Buckman Well #1	27	●							

Site		1.00 Lighting LED	2.00 Ren. Energy	3.00 Water Cons.	4.00 Bldg. Env.	5.00 HE Xfrms	6.00 Utility Mgt	7.00 GCCC Solar Repair	8.00 Replace Roof
Buckman Well #10	28	•	•						
Calle De Agua Tank	29								
Camino La Canada	30	•	•						
Cristo Rey Church	31	•							
Dempsey Booster Station	32	•							
St Michaels & SF Railroad	33								
Well Los Montoyas	34	•	•						
Buckman Direct Diversion (BDD)									
BDD Main	35	•							
BDD Booster Station #1A	36	•	•						
BDD Booster Station #2A	37	•							
BDD Lift Station	38	•	•						
Total Qty		29	17	15	17	6	2	1	1

4.1 FIM 1.00 LED Lighting

4.1.1 Existing Conditions

The existing lighting system consists primarily of T12 and T8 linear fluorescent lamps with either electronic or magnetic ballasts as depicted in the table below. In a handful of the newer facilities existing lighting controls are located in offices, conference rooms, hallways, and locations required by more recent codes. In the older facilities, limited lighting controls are typically found in restrooms, mechanical, electrical and janitor closets.

Refer to **Appendix D1** for a detailed baseline lighting inventory including lighting controls.

Table 69: Existing Lighting Fixture Inventory

Lamp Type	Existing Fixture Qty	% of Existing
Compact Fluorescent Lamp (CFL)	259	1.9%
Compact Fluorescent Lamp (PL)	1,437	10.8%
Halogen Lamp	558	4.2%
High-Pressure Sodium Lamp (HPS)	667	5.0%
Incandescent Lamp	476	3.6%
Light Emitting Diode (LED)-Linear Tube	151	1.1%
Light Emitting Diode (LED)-Luminaire	1,769	13.3%
Light Emitting Diode (LED)-Screw Base	423	3.2%
Metal Halide Lamp (MHL)	1,440	10.8%
T12 Linear Fluorescent Lamp	1,050	7.9%
T12 U-Tube Fluorescent Lamp	25	0.2%
T5 Linear Fluorescent Lamp	464	3.5%
T8 Linear Fluorescent Lamp	4,400	33.0%
T8 U-Tube Fluorescent Lamp	143	1.1%
T9 Circular Fluorescent Lamp	7	0.1%
Biax Fluorescent Lamp	74	0.6%
Total	13,343	100%

T8 Fluorescent Troffers

T8 fluorescent troffers, shown here with a prismatic lens, are by far the most common light fixture in the COSF. They are found in most office space areas. On average, each of these fixtures consumes 87 watts of power.

T12 Fluorescent Troffers

While not as widespread as T8s, T12 fluorescent troffers are common within COSF. On average, each of these fixtures consumes 107 watts of power.

4.1.2 Proposed Modifications

This measure will retrofit and/or replace the existing interior and exterior incandescent, fluorescent, metal-halide and other lighting equipment with new Light Emitting Diode (LED) technology. This will significantly reduce the energy consumption of the lighting system while also improving security and the working environment. In addition, the proposed solution would standardize the lighting system throughout the facilities, resulting in simplified inventory requirements and reduced maintenance costs and work.

The following table depicts the lighting fixture post retrofit upgrade. Refer to **Appendix D1** for a detailed proposed baseline lighting inventory.

Table 70: Proposed Lighting Fixture Inventory

Lamp Type	Proposed Fixture Qty	% of Proposed
Compact Fluorescent Lamp (CFL)	0	0.0%
Compact Fluorescent Lamp (PL)	47	0.4%
Halogen Lamp	176	1.3%
High-Pressure Sodium Lamp (HPS)	19	0.1%
Incandescent Lamp	216	1.6%
Light Emitting Diode (LED)-Linear Tube	2,950	22.1%
Light Emitting Diode (LED)-Luminaire	8,287	62.1%
Light Emitting Diode (LED)-Plug/Pin Base	418	3.1%
Light Emitting Diode (LED)-Screw Base	354	2.7%
Metal Halide Lamp (MHL)	359	2.7%
T12 Linear Fluorescent Lamp	0	0.0%
T12 U-Tube Fluorescent Lamp	0	0.0%
T5 Linear Fluorescent Lamp	0	0.0%
T8 Linear Fluorescent Lamp	33	0.2%
T8 U-Tube Fluorescent Lamp	0	0.0%
T9 Circular Fluorescent Lamp	0	0.0%
Biax Fluorescent Lamp	0	0.0
Unidentified	484	3.6%
Total	13,343	100%

Refer to **Appendix D2** for new equipment specifications.

Occupancy and dimming controls will be added to private offices and conference rooms. Adding controls will help drive down energy costs and improve occupant comfort. Occupancy sensors will ensure energy is not wasted by automatically turning lights off when a space is vacant. The lighting controls will be set to 'vacant mode' which follows a manual-on, auto-off operation. Lighting levels will be commissioned during project implementation to IESNA recommendations in each perspective space. Dimming will allow users to reduce/increase light levels to their preference.

The following table depicts the significant reductions in the lighting power density at each facility through the implementation of the proposed scope.

Table 71: Existing vs. Proposed Lighting Power Densities

Facility	Existing W/ft2	Proposed W/ft2	Reduction W/ft2	Reduction %
Bi-Centennial Park - Head Start	0.8682	0.2916	0.5766	66%
Bi-Centennial Park - Pool	1.2167	0.3448	0.8718	72%
Bi-Centennial Park - Senior Center	0.8291	0.2976	0.5314	64%
Buckman Direct Diversion Facility	0.7410	0.2539	0.4870	66%
Fire Station #8	0.8943	0.3895	0.5048	56%
Fort Marcy Recreation Complex	0.5881	0.2358	0.3523	60%
Genoveva Chavez Community Center	0.4731	0.1583	0.3148	67%
La Familia Medical Center	1.3725	0.4810	0.8914	65%
Municipal Recreation Complex - Administration Building	1.6773	0.4114	1.2659	75%
Municipal Recreation Complex - Maintenance Building	0.8095	0.2168	0.5927	73%
Municipal Recreation Complex - Restaurant Pro Shop Cart Barn	0.4758	0.1758	0.2999	63%
Police Dept - Admin	0.7895	0.3033	0.4862	62%
Public Library - Main	1.0034	0.4040	0.5994	60%
Salvador Perez Swimming Pool - Parks Ballfield/Main Building	0.3917	0.1289	0.2628	67%
Santa Fe Convention Center	1.4620	0.4248	1.0373	71%
Santa Fe Public Library - Southside	1.3573	0.5113	0.8460	62%
SF Regional Airport - Airport Main Terminal Building	0.5069	0.1913	0.3156	62%

Facility	Existing	Proposed	Reduction	Reduction
	W/ft2	W/ft2	W/ft2	%
SF Regional Airport - Airport Maintenance Shop South	0.5712	0.2142	0.3570	63%
SF Water Department - Back Bldg.	1.7392	0.5680	1.1713	67%
SF Water Department - Conservation Bldg.	0.6997	0.3027	0.3970	57%
SF Water Department - Main Bldg./Customer Service	0.5679	0.2267	0.3412	60%
SF Water Department - Maintenance Bldg.	0.5015	0.2040	0.2975	59%
Siler Complex - Bldg. A	1.1882	0.3989	0.7892	66%
Siler Complex - Bldg. B	0.9760	0.4539	0.5221	53%
Siler Complex - Bldg. C	1.3716	0.3384	1.0332	75%
Siringo Complex	0.7901	0.2751	0.5150	65%
Transit Administration	1.2983	0.4778	0.8205	63%
Wastewater Treatment Plant	0.3933	0.1487	0.2446	62%
TOTAL	0.7985	0.2759	0.5227	65%

4.1.3 Savings Methodology

Energy and demand savings for this FIM were calculated using the following equations.

Demand

The existing and proposed fixture/lamp wattage was calculated as follows:

[Demand (kW) = Lamp QTY x Lamp Wattage (W) x Ballast Factor / 1,000]

Demand Savings

The demand savings was calculated using the following equation:

[Demand Savings (kW) = Demand (kW) x (Existing – Proposed) x Diversity Factor (%)]

Energy Savings

The energy reduction was calculated using the calculated demand savings and stipulated burn hours and the diversity factors which can be found in **Appendices D6 and D7**.

[Energy Savings (kWh) = Demand Savings (kW) x Burn Hours (Hrs. /Year) x Occupancy Sensor Factor]

In locations where occupancy sensors are proposed, a 25% reduction factor was included. Additional savings, not considered, will come from installing dimming in private offices and conference rooms.

Additional detailed information regarding the Methodology is available in in **Appendix D1**.

Based on field data, interviews, and industry best practices annual burn hours have been established for each space type per facility. These are available in **Appendix D6.**

HVAC Interactions

Additional analysis was performed to account for the cooling credit and heating penalty associated with the reduction in internal heat gain from the proposed lower lamp wattage. The method used to determine the impact was based on ASHRAE article "Calculating Lighting and HVAC Interactions" (see **Appendix D4**).

Cooling Savings

[Cooling Energy Savings (kWh) = A X B / C]

where:

- A – Lighting Energy Savings (kWh)
- B – Fraction to Cooling- Tabulated value base on climate zone
- C – Cooling System MCOP- estimated depending on new building or retrofit

Heating Penalty

*[Heating Energy Penalty (therm) = A X B X C / D*E]*

where:

- A – Lighting Energy Savings (kWh)
- B – Fraction to Heating- Tabulated value base on climate zone
- C – Fraction building area within 15' of exterior walls to the total building area
- D – Heating System COP
- E – Fuel Fraction

4.1.4 FIM Guaranteed Year 1 Utility Savings

Table 72: COSF Facilities – LED Lighting FIM Guaranteed Year 1 Utility Savings

FIM No.	Facility	Electricity				Natural Gas	Water
		kW	On-Peak kWh	Off-Peak kWh	kWh	therm	kgal
1.01	Bicentennial / Alto Park Complex	98	56,985	15,600	72,585	(220)	0
1.03	Fire Station #8	0	28,141	0	28,141	(132)	0
1.04	Fort Marcy Recreation Complex	99	23,205	26,435	49,640	(137)	0
1.05	Genoveva Chavez Community Center	516	157,173	122,615	279,788	(446)	0
1.06	La Familia Medical Center	241	48,252	42,624	90,876	(291)	0
1.07	Municipal Recreation Complex	37	23,843	16,634	40,477	(199)	0
1.08	Police Department Admin	158	28,695	32,915	61,611	(195)	0
1.09	Public Library - Main	181	41,128	25,181	66,310	(310)	0
1.10	Public Library - Southside	238	50,349	68,450	118,799	(299)	0
1.11	Salvador Perez Swimming Pool	48	16,594	7,676	24,270	(82)	0
1.13	Santa Fe Convention Center	807	236,180	216,374	452,554	(1,181)	0
1.14	Santa Fe Regional Airport	24	82,061	17,994	100,055	(88)	0
1.15	Siler Complex	332	84,923	49,934	134,857	(385)	0
1.16	Siringo Complex	197	29,208	35,157	64,366	(299)	0
1.18	Transit Administration	146	33,666	70,680	104,345	(39)	0
Total		3,122	940,405	748,268	1,688,673	(4,305)	0

Table 73: Public Utility Facilities – LED Lighting FIM Guaranteed Year 1 Utility Savings

FIM No.	Facility	Electricity				Natural Gas	Water
		kW	On-Peak kWh	Off-Peak kWh	kWh	therm	kgal
1.20	Santa Fe Water Dept Office	81	26,320	14,399	40,720	(94)	0
1.21	WWTP	0	144,018	115,690	259,709	0	0
1.22	10M Gallon Tank	0	6,633	12,123	18,756	0	0
1.24	Buckman Booster Station #1	0	1,717	7,819	9,536	0	0
1.27	Buckman Well #1	0	809	1,280	2,089	0	0
1.28	Buckman Well #10 (Booster D)	0	1,400	2,215	3,615	0	0
1.30	Camino La Canada	0	682	2,740	3,422	0	0
1.31	Cristo Rey Church	0	1,437	2,273	3,709	0	0
1.32	Dempsey Booster Station	0	508	804	1,313	0	0
1.34	Well Los Montoyas	0	339	536	875	0	0
Total		81	183,864	159,879	343,743	(94)	0

Table 74: BDD Sites – LED Lighting FIM Guaranteed Year 1 Utility Savings

FIM No.	Facility	Electricity				Natural Gas	Water
		kW	On-Peak kWh	Off-Peak kWh	kWh	therm	kgal
1.35	BDD Main	0	94,551	126,335	220,886	(99)	0
1.36	BDD Booster Station #1A	0	5,785	9,151	14,936	0	0
1.37	BDD Booster Station #2A	0	5,623	8,895	14,518	0	0
1.38	BDD Lift Station	0	14,551	23,016	37,567	0	0
Total		0	120,510	167,397	287,907	(99)	0

4.1.5 FIM Financial Summary

Table 75: COSF Facilities – LED Lighting FIM Financial Summary

FIM No.	Facility	Year 1 Annual Utility Savings	Year 1 Annual O&M Savings	Year 1 Total Annual Savings	Labor, Equip & Material Costs	Estimated Utility Rebate	Net Cost
1.01	Bicentennial / Alto Park Complex	$8,452	$586	$9,038	$116,836	$9,155	$107,681
1.03	Fire Station #8	$3,429	$347	$3,776	$38,860	$2,333	$36,527
1.04	Fort Marcy Recreation Complex	$4,343	$363	$4,706	$59,037	$4,709	$54,328
1.05	Genoveva Chavez Community Center	$23,792	$2,195	$25,987	$224,274	$16,782	$207,492
1.06	La Familia Medical Center	$9,284	$989	$10,273	$166,332	$9,385	$156,947
1.07	Municipal Recreation Complex	$3,722	$450	$4,173	$50,949	$4,047	$46,902
1.08	Police Dept - Admin	$6,120	$474	$6,594	$94,159	$6,766	$87,393
1.09	Public Library - Main	$6,939	$751	$7,690	$63,277	$4,017	$59,259
1.10	Public Library - Southside	$10,352	$1,231	$11,582	$109,312	$9,049	$100,263
1.11	Salvador Perez Swimming Pool	$2,469	$205	$2,674	$20,371	$1,740	$18,631
1.13	Santa Fe Convention Center	$37,931	$6,693	$44,624	$321,887	$28,746	$293,141
1.14	Santa Fe Regional Airport	$10,815	$629	$11,444	$84,071	$10,500	$73,570
1.15	Siler Complex	$15,512	$754	$16,266	$173,494	$18,863	$154,631
1.16	Siringo Complex	$7,047	$521	$7,568	$87,816	$6,829	$80,987
1.18	Transit Administration	$7,702	$793	$8,495	$87,037	$9,846	$77,191
Total		$157,910	$16,980	$174,890	$1,697,712	$142,768	$1,554,944

Table 76: Public utility Facilities – LED Lighting FIM Financial Summary

FIM No.	Facility	Year 1 Annual Utility Savings	Year 1 Annual O&M Savings	Year 1 Total Annual Savings	Labor, Equip & Material Costs	Estimated Utility Rebate	Net Cost
1.20	Santa Fe Water Dept Office	$4,451	$298	$4,748	$72,194	$4,797	$67,397
1.21	WWTP	$26,560	$1,979	$28,539	$308,916	$25,325	$283,591
1.22	10M Gallon Tank	$1,502	$91	$1,594	$3,267	$360	$2,907
1.24	Buckman Booster Station #1	$598	$82	$679	$4,686	$754	$3,932
1.27	Buckman Well #1	$174	$25	$199	$602	$85	$518
1.28	Buckman Well #10 (Booster D)	$302	$40	$342	$1,451	$144	$1,307
1.30	Camino La Canada	$221	$31	$252	$1,741	$258	$1,482
1.31	Cristo Rey Church	$310	$48	$358	$1,839	$179	$1,659
1.32	Dempsey Booster Station	$59	$15	$74	$548	$53	$495
1.34	Well Los Montoyas	$73	$10	$83	$365	$36	$330
Total		$34,250	$2,619	$36,869	$395,609	$31,991	$363,618

Table 77: BDD Sites – LED Lighting FIM Financial Summary

FIM No.	Facility	Year 1 Annual Utility Savings	Year 1 Annual O&M Savings	Year 1 Total Annual Savings	Labor, Equip & Material Costs	Estimated Utility Rebate	Net Cost
1.35	BDD Main	$19,302	$1,501	$20,803	$87,186	$12,415	$74,771
1.36	BDD Booster Station #1A	$1,247	$166	$1,413	$10,654	$1,076	$9,578
1.37	BDD Booster Station #2A	$1,212	$130	$1,342	$8,526	$1,188	$7,339
1.38	BDD Lift Station	$3,136	$366	$3,502	$22,470	$2,593	$19,876
Total		$24,896	$2,163	$27,059	$128,836	$17,272	$111,564

4.1.6 Scope of Work

Please refer **Appendix D1** for a detailed baseline and proposed room-by-room lighting inventory.

Clarifications

1. Recycling of lamps will be executed in compliance with appropriate governmental regulations.
2. Disposal of PCB-laden ballasts will be executed in compliance with appropriate governmental regulations.
3. The installation will be executed in accordance with industry-standard safety practices and with the care, skill, and diligence provided by a contractor skilled in the performance of lighting retrofit services.
4. Installation of all equipment will be executed per manufacturer's recommendations.
5. Any conditions not meeting current codes, and any system deficiencies will be brought to the attention of the Agency. Any work required to remedy these situations is excluded.
6. Rebate estimates are subject to utility availability and award and are not guaranteed by Yearout Energy.

Exclusions

1. Removal of asbestos-containing materials, lead-containing materials or any other hazardous/suspect materials.
2. All fixtures not outlined for replacement or retrofit in **Appendix D**.
3. Grounding of new and existing luminaires that are not currently grounded in which the luminaire will be retrofitted (not replaced).
4. Seismic bracing of new and existing luminaries that are not currently braced.
5. Replacement of existing LED exit signs.
6. Lighting controls unless noted otherwise in **Appendix D**.
7. Yearout Energy has accounted for battery backups where existing. In the event additional battery backups are required, Yearout Energy will charge $400 per unit installed.
8. In-board, out-board double switching of existing fixtures (unless noted otherwise).

4.1.7 Equipment Service Life

The estimated service life for this FIM is as follows:

Table 78: LED Lighting FIM Estimated Service Life

FIM Component	% of FIM Total Cost	Median Service Life
LED Lighting & Controls	100%	15 Years
FIM Weighted Average Service Life		15 Years

4.1.8 Preliminary Commissioning Plan

The following preliminary commissioning plan is intended to serve as the outline from which the final commissioning plan will be developed during the pre-construction / design phase. The final commissioning plan will be primarily focused on validating the proposed equipment and strategies are implemented in accordance with the savings methodology associated with each measure.

1. Review equipment submittals to validate the specified performance criteria is in alignment with the proposed savings methodology
2. Perform a random inspection to validate the implemented lighting improvements align with the proposed scope of work (lamp, fixture, control device, etc.)

4.1.9 Warranty

An industry standard 1-year materials and workmanship warranty is provided by Yearout Energy. Any material warranties that extend beyond this period will be transferred to the Agency upon project closeout. All available warranty information can be found in **Appendix D2**.

The warranty period information for the major pieces of equipment associated with this measure is summarized in the table below.

Table 79: LED Lighting FIM Warranty Information

Equipment Description	Warranty Period
LED Luminaires	10 years
LED Tubes and Lamps	5 years

4.1.10 Training

Yearout Energy will co-develop a training plan with the Agency that is tailored to the needs and skill level of the building operators. Training sessions will be conducted during the project implementation phase. These sessions will be recorded and provided in electronic format to the Agency for future reference. Topics commonly covered during these training sessions include:

3. Equipment start-up, proper operation, shutdown, power failure, etc.
4. Sequences of operation
5. Operations and maintenance (O&M) manuals
6. Diagnosing and troubleshooting common equipment issues
7. Preventative maintenance and required documentation
8. Health and safety considerations
9. Warranty information
10. Identified system deficiencies
11. Measurement and Verification (M&V) plan and KPIs which directly impact savings

4.2 FIM 2.00 Renewable Energy

4.2.1 Existing Conditions

Many of the COSF IGA sites do not currently have solar PV arrays, however there are a few exceptions. Existing sites with Solar PV systems owned by the city or provided through a power purchase agreement (PPA) include the following sites:

- Genoveva Chavez Community Center – City owned
- Santa Fe Water Division – City owned
- Transit Administration – PPA
- WWTP Compost – PPA
- WWTP Main – PPA
- BDD Main – PPA
- BDD Booster Station #2A – City owned
- Sana Fe Convention Center – PPA

See Section 2.0 Facility Description and Section 3.0 Baseline Utility Analysis for additional information.

4.2.2 Proposed Modifications

This measure will install new solar PV systems that will generate clean, renewable energy onsite for the next 25 to 50 years and reduce the amount of power purchased from the utility grid. This measure will provide complete turnkey installation, interconnection, startup, and commissioning of the solar PV systems. Land use agreements will require further determination at Public utility and BDD sites.

See **Appendix E** for additional information.

Table 80: COSF Facilities – Proposed Solar PV Systems

City Facilities	PNM Account No	Meter No	PV System Size kW (DC)	Mounting	Landowner
Bi-Centennial Park	041257901-0453671-2	63271	6.16	Carport	COSF Land
Bi-Centennial Park	042811500-0466425-0	526169	51.04	Carport	COSF Land
Bi-Centennial Park	043564500-0472091-8	760012	16.72	Carport	COSF Land
Fire Station #8	115942916-1269792-6	662544	25.52	Ground	COSF Land
Municipal Recreation Complex	043468801-0471344-4	688796	36.96	Roof with Trenching	COSF Land
Municipal Recreation Complex	043554000-0472017-2	947578	40.48	Ground	COSF Land
Police Admin	115942800-0448065-3	947609	135.52	Carport	COSF Land
Public Library – Southside	115727805-1262782-9	947588	110.88	Carport	COSF Land
SF Regional Airport	115929112-1345286	423855	12.32	Ground	COSF Land
SF Regional Airport	041908800-0459100-7	17209	7.04	Ground	COSF Land
SF Regional Airport	042013301-0459988-3	446691	24.64	Ground	COSF Land
SF Regional Airport	115564459-1229994-4	947574	89.76	Carport	COSF Land
Southside Transit	115727805-0420091-0	446431	18.92	Roof	COSF Land
Total	-----	-----	575.96	-----	-----

Table 81: Public utility Facilities – Proposed Solar PV Systems

Water Utilities	Account No	Meter No	PV System Size kW (DC)	Mounting	Landowner
Canyon Road Water Treatment Plant	040489203-0447256-0	413488	62.04	Roof	COSF Land

Water Utilities	Account No	Meter No	PV System Size kW (DC)	Mounting	Landowner
10M Gallon Tank	115942933-0445032-8	0619725	58.96	Ground	COSF Land
Camino La Canada	115907013-0447225-5	0752370	44.88	Ground	COSF Land
Well Los Montoyas	115942947-1170495-1	0438752	57.20	Ground	COSF Land
Buckman Booster D & Well 10	115942924-1233530-3	0537827	73.92	Ground	BLM Land
Buckman Booster Station #1	115942932-1234139-9	0407084	59.84	Ground	BLM Land
Buckman Booster Station #4	115942938-1234140-3	0473413	396.00	Ground	BLM Land
Buckman Booster Station #3 & Well #13	115942926-1233031-2	0752383	404.80	Ground	BLM Land
Total	---	-----	1,157.64	-----	-----

Table 82: BDD Sites – Proposed Solar PV Systems

BDD	Account No	Meter No	PV System Size kW (DC)	Mounting	Landowner
BDD Lift Station	115915784-1347614-1	0418853	277.20	Ground	USFS Land
BDD Booster Station #1A	115915784-1347615-0	0438753	739.20	Ground	USFS Land
Total	-----	-----	1,016.40	-----	-----

Additional information including calculations and system renderings are available in **Appendix E1**.

4.2.3 Savings Methodology

Energy savings for this FIM are based on an offset of energy delivered by the electric utility grid.

A monthly On-Peak and Off-Peak basis for system design was provided to the solar provider as follows:

$$S = (E_B - F_s) \times D_f$$

where:

E_B = energy baseline (kWh)

F_s = FIM savings (kWh)
D_f = design factor

- 0.8 of Baseline On-Peak Energy Consumption for COSF facilities,
- 0.6 of Baseline On-Peak Energy Consumption for water utility sites,
- 2.5 of Baseline On-Peak Energy Consumption for airport main terminal

During the IGA, the COSF and YE established a target offset of the post-retrofit on-peak energy consumption through the installation of solar PV systems at select sites. The designed offset was set at 80% of post-retrofit on-peak energy consumption for the COSF Facility sites and 60% of post-retrofit on-peak energy consumption for the Water Utility and BDD sites. The lower target offset applied to the water utility and BDD sites was to account for potential load shifting of current on-peak operation to off-peak operation.

Due to the ongoing expansion of the airport main terminal which will increase square footage by approximately 250%, the design factor used 2.5. Approval from PNM will be required to allow for a system of this size which is considerably larger than the 120% threshold of baseline consumption. PNM may elect to approve a system of reduced capacity at which time Yearout Energy will coordinate with the COSF to amend the project scope.

Energy production from the proposed solar PV systems were estimated using NREL's System Advisor Model (SAM) tool, specifically the PVWatts modeling methodology. The results produced from this model are generally within 6.5% of the production estimates provided by our solar partner. The tool simulates production with a high degree of accuracy based on specific inputs which include:

1. Location, solar resource, weather
2. System design including orientation, losses, module type, inverter efficiency, etc.

When selecting PV modules in SAM/PVWatts, the choices are standard, premium, and thin film. It is not possible to specify the efficiency of the modules. This is definitely a source of the discrepancy between our solar partner's estimated production and that of SAM/PVWatts as the proposed modules have a higher efficiency than that of the premium option available in SAM/PVWatts.

To calculate savings, the total energy produced was allocated proportionally to On-Peak and Off-Peak hours that apply to this building's electric rate.

$$S = E \times R_{on} \times P_{on} + E \times R_{off} \times P_{off}$$

where:

S = cost savings ($)
E = total energy savings (kWh)
R_{on} = On-Peak energy rate ($/kWh)

R_{off} = Off-Peak energy rate ($/kWh)
P_{on} = proportion of energy produced during On-Peak hours = 5/7 days per week
P_{off} = proportion of energy produced during Off-Peak hours = 2/7 days per week

Although likely to occur at applicable sites, Yearout Energy has not accounted for any monthly demand savings due to the installation of solar PV. These additional savings will go directly to benefit the Agency.

YE anticipates that the COSF will receive additional REC payments from PNM of $0.0025/kWh due to the new solar PV systems' production. These savings were excluded from the savings analysis.

Detailed bases for calculations, output from the simulation, and additional information at each facility is provided in **Appendix E**.

4.2.4 Guaranteed Year 1 Utility Savings

Table 83: COSF Facilities – Renewable Energy FIM Guaranteed Year 1 Utility Savings

FIM No.	Facility	Electricity				Natural Gas	Water
		kW	On-Peak kWh	Off-Peak kWh	kWh	therm	kgal
2.01	Bicentennial / Alto Park Complex	0	110,184	0	110,184	0	0
2.03	Fire Station #8	0	40,533	0	40,533	0	0
2.07	Municipal Recreation Complex	0	111,106	0	111,106	0	0
2.08	Police Dept - Admin	0	141,360	56,544	197,904	0	0
2.10	Public Library - Southside	0	113,396	45,358	158,754	0	0
2.14	Santa Fe Regional Airport	0	169,807	39,333	209,140	0	0
2.17	Southside Transit Center	0	27,415	0	27,415	0	0
Total		0	713,801	141,235	855,036	0	0

Table 84: Public Utility Facilities – Renewable Energy FIM Guaranteed Year 1 Utility Savings

FIM No.	Facility	Electricity				Natural Gas	Water
		kW	On-Peak kWh	Off-Peak kWh	kWh	therm	kgal
2.19	Canyon Road Water Treatment Plant	0	60,614	24,245	84,859	0	0
2.22	10M Gallon Tank	0	67,709	27,084	94,793	0	0
2.24	Buckman Booster Station #1	0	68,725	27,490	96,215	0	0
2.25	Buckman Booster Station #3 & Well #13	0	468,472	187,389	655,861	0	0
2.26	Buckman Booster Station #4	0	451,864	180,746	632,610	0	0
2.28	Buckman Well #10 (Booster D)	0	84,940	33,976	118,916	0	0
2.30	Camino La Canada	0	51,841	20,737	72,578	0	0
2.34	Well Los Montoyas	0	65,726	26,290	92,016	0	0
Total		0	1,319,891	527,956	1,847,848	0	0

Table 85: BDD Sites – Renewable Energy FIM Guaranteed Year 1 Utility Savings

FIM No.	Facility	Electricity				Natural Gas	Water
		kW	On-Peak kWh	Off-Peak kWh	kWh	therm	kgal
2.36	BDD Booster Station #1A	0	847,942	339,177	1,187,119	0	0
2.38	BDD Lift Station	0	318,034	127,214	445,248	0	0
Total		0	1,165,976	466,391	1,632,367	0	0

4.2.5 Financial Summary

Table 86: COSF Facilities – Renewable Energy FIM Financial Summary

FIM No.	Facility	Year 1 Annual Utility Savings	Year 1 Annual O&M Savings	Year 1 Total Annual Savings	Labor, Equip & Material Costs	Estimated Utility Rebate	Net Cost
2.01	Bicentennial / Alto Park Complex	$13,625	$0	$13,625	$268,375	$0	$268,375
2.03	Fire Station #8	$5,012	$0	$5,012	$82,413	$0	$82,413
2.07	Municipal Recreation Complex	$13,739	$0	$13,739	$210,944	$0	$210,944
2.08	Police Dept - Admin	$9,796	$0	$9,796	$409,158	$0	$409,158
2.10	Public Library - Southside	$7,858	$0	$7,858	$343,224	$0	$343,224
2.14	Santa Fe Regional Airport	$15,653	$0	$15,653	$435,122	$0	$435,122
2.17	Southside Transit Center	$3,390	$0	$3,390	$52,053	$0	$52,053
Total		$69,073	$0	$69,073	$1,801,289	$0	$1,801,289

Table 87: Public Utility Facilities – Renewable Energy FIM Financial Summary

FIM No.	Facility	Year 1 Annual Utility Savings	Year 1 Annual O&M Savings	Year 1 Total Annual Savings	Labor, Equip & Material Costs	Estimated Utility Rebate	Net Cost
2.19	Canyon Road Water Treatment Plant	$9,864	$0	$9,864	$161,529	$0	$161,529
2.22	10M Gallon Tank	$11,019	$0	$11,019	$155,772	$0	$155,772
2.24	Buckman Booster Station #1	$11,184	$0	$11,184	$166,748	$0	$166,748
2.25	Buckman Booster Station #3 & Well #13	$76,236	$0	$76,236	$1,040,714	$0	$1,040,714
2.26	Buckman Booster Station #4	$73,534	$0	$73,534	$949,328	$0	$949,328
2.28	Buckman Well #10 (Booster D)	$13,823	$0	$13,823	$199,536	$0	$199,536
2.30	Camino La Canada	$8,436	$0	$8,436	$112,391	$0	$112,391

FIM No.	Facility	Year 1 Annual Utility Savings	Year 1 Annual O&M Savings	Year 1 Total Annual Savings	Labor, Equip & Material Costs	Estimated Utility Rebate	Net Cost
2.34	Well Los Montoyas	$10,696	$0	$10,696	$152,334	$0	$152,334
Total		$214,792	$0	$214,792	$2,938,351	$0	$2,938,351

Table 88: BDD Sites – Renewable Energy FIM Financial Summary

FIM No.	Facility	Year 1 Annual Utility Savings	Year 1 Annual O&M Savings	Year 1 Total Annual Savings	Labor, Equip & Material Costs	Estimated Utility Rebate	Net Cost
2.36	BDD Booster Station #1A	$137,989	$0	$137,989	$1,728,339	$0	$1,728,339
2.38	BDD Lift Station	$51,755	$0	$51,755	$699,933	$0	$699,933
Total		$189,744	$0	$189,744	$2,428,272	$0	$2,428,272

4.2.6 Scope of Work

Please refer **Appendix E** for a detailed explanation of the proposed solar PV systems including product specifications and production calculations.

1. Furnish and install the solar PV systems per Table 80, Table 81, and Table 82.
2. Install a single, dual-handled, Level 2 EV car charging at the Southside Library and Police Admin.
3. Complete and submit interconnection applications for required metering.
4. Support and supervise land acquisitions for solar PV array sites.
5. Obtain building and electrical permits as required.
6. Provide stamped engineered electrical and structural drawings by a Professional Engineer registered in the State of New Mexico as required by the AHJ.
7. Provide and install conduit between PV panels and inverter, inverter and combiner, combiner and recombiner, recombiner and AC disconnect, and AC disconnect and interconnect location.
8. Provide and install XHHW-2 and TWHN-2 wire sized per NEC 2017 for DC and AC voltage runs.
9. Installation to be performed by NABCEP-certified professionals.

10. Coordinate with Molzen-Corbin for construction access and timeline. Additionally, sizing for the carport PV systems are based on the initial drawings provided by Molzen-Corbin.

Clarifications

11. Installation will be executed in accordance with industry-standard safety practices and with the care, skill, and diligence provided by a contractor skilled in building envelope services.
12. Installation of all materials will be executed per manufacturer's recommendations.
13. Agency to provide Yearout Energy with internet connectivity at each site for remote monitoring. Connectivity can be provided through either hard-wired or wireless communication.
14. Any conditions not meeting current codes, and any system deficiencies will be brought to the attention of the Agency. Any work required to remedy these situations is excluded.
15. Completion of the Solar PV Carports is conditional upon completion of the general airport expansion project. Savings will not be realized until construction is completed.
16. The proposed solar scope at the Airport will require FAA review and approval due to glare concerns.
17. For carport systems, the associated parking areas will be closed during installation. Closures will be coordinated with the Agency.

Exclusions

1. Removal of asbestos containing materials, lead containing materials or any other hazardous / suspect materials.
2. Saw cutting, removal, patching, and replacement of landscaping, gravel ground cover, concrete, and asphalt.
3. Formed concrete, including equipment pads, leveling channels, conduit curbs, and pole bases other than defined for racking structure above.
4. Cutting, patching and painting and all other miscellaneous coatings not explicitly defined in the scope of work.
5. Fire sealing, fireproof patching, damp proofing, and water stops at conduit entrances/penetrations into buildings.
6. Tree removal and trimming.
7. Penetrations and sealing of roofing, under buildings and roof membranes.
8. Cathodic protection, snow melt and heat trace.
9. Independent testing laboratory services including concrete and compaction/density testing.

10. Surveying, dust control, seeding, erosion control and dewatering.
11. Repair or installation of any structural systems.
12. Cellular monitoring or infrastructure upgrades to support remote monitoring.

4.2.7 Equipment Service Life

The estimated service life for this FIM is as follows:

Table 89: Renewable Energy System FIM Estimated Service Life

FIM Component	% of FIM Total Cost	Median Service Life
PV modules	75%	40 years
Inverters	15%	20 years
Racking	10%	40 years
FIM Weighted Average Service Life	100%	37 years

4.2.8 Preliminary Commissioning Plan

The following preliminary commissioning plan is intended to serve as the outline from which the final commissioning plan will be developed during the pre-construction / design phase. The final commissioning plan will be primarily focused on validating the proposed equipment and strategies are implemented in accordance with the savings methodology associated with each measure.

1. Review equipment submittals to validate the specified performance criteria is in alignment with the proposed savings methodology
2. Functional performance testing on modules and inverters during installation to validate proper validation.
3. Review monitoring system to validate proper operation.

4.2.9 Warranty

An industry standard 1-year materials and workmanship warranty is provided by Yearout Energy. Any material warranties that extend beyond this period will be transferred to the Agency upon project closeout. All available warranty information can be found in **Appendix E2**.

The warranty period information for the major pieces of equipment associated with this measure is summarized in the table below.

Table 90: Renewable Energy FIM Warranty Information

Equipment Description	Warranty Period
PV Modules	25-Year Power Output 20-Year Product
String Inverters	10 years
Micro Inverters	12 years
Sunny HighPower Peak 3 VDC Modular Utility Inverters	5 years

4.2.10 Training

Yearout Energy will co-develop a training plan with the Agency that is tailored to the needs and skill level of the building operators. Training sessions will be conducted during the project implementation phase. These sessions will be recorded and provided in electronic format to the Agency for future reference. Topics commonly covered during these training sessions include:

1. Equipment start-up, proper operation, shutdown, power failure, etc.
2. Sequences of operation
3. Operations and maintenance (O&M) manuals
4. Diagnosing and troubleshooting common equipment issues
5. Preventative maintenance and required documentation
6. Health and safety considerations
7. Warranty information
8. Identified system deficiencies
9. Measurement and Verification (M&V) plan and KPIs which directly impact savings

4.3 FIM 3.00 Water Conservation

To develop this measure, Yearout Energy conducted a thorough on-site walkthrough audit of the facilities, including engineering evaluations of water and energy savings opportunities. These evaluations include an examination of a sample of water-use equipment, measurements of existing water consumption, and analysis of historical water use data and facility demographics.

4.3.1 Existing Conditions

A variety of plumbing fixture configurations and flow rates were identified during the audit.

1. Domestic water fixtures throughout the buildings include a mixture of high efficiency fixtures and older standard fixtures.
2. Most toilets are flushometer (flush valve) type. Toilet flush rates are typically 1.60 gallons per flush (gpf).
3. Both wall-mount and floor-mount toilet china is present.
4. Urinals vary from facility and include waterless urinals too, the majority of, 1.0 gpf and also 1.5 gpf.
5. During the audit, a wide range of water pressures were recorded (ranging from 40 – 90 psi) among the buildings. With these ranging pressures, performance testing with diaphragm valves will be performed at several the buildings before recommending piston valves throughout the facilities. The diaphragm testing is used to measure flushometer volume by using a direct-read, in-line flow meter which has a computer that sums the volume. This flow meter is installed in series with the flushometer, ensuring that the same volume of water passes through both and allowing for accurate measurement of flush volume. These measurements are conducted in accordance with FEMP Method A Guidelines, 80/20.

Flushometers

Flushometers like those shown at right are prone to leakage and in many cases have fallen into disrepair, resulting in a release of much more water than is necessary. This measure will rebuild and re-tune flushometer assemblies to combat water waste.

Sink Aerators

This faucet is an example of a fixture whose aerator has either been removed or was never present. Installation of flow control devices will reduce water consumption at these fixtures.

4.3.2 Proposed Modifications

The proposed modifications include the following:

Replacement of existing flushometers with new hardware, including the following features and benefits:

1. New diaphragm valve X-body and diaphragm kit
2. Spud replacement
3. Flush tube replacement
4. New vacuum breaker and O-ring
5. Fixture reengineering and tuning
6. Variable flow technology

Installation of new or replacement of existing vandal-resistant flow control devices (aerators) at all lavatory and general-use sinks.

Please refer to **Appendix F** for detailed fixture audit and new equipment specifications.

1. Non-residential shower use averages 8 minutes per shower; residential shower use averages 10 minutes per shower.

4.3.3 Savings Methodology

Domestic plumbing fixture water usage is based primarily on facility occupancy. Detailed savings calculations can be found in **Appendix F1**. In general, domestic plumbing fixtures savings can be calculated as follows:

$$[\, Sw = d \times n \times F \times \Delta q \,]$$

where:

Sw	Water savings (gal/y)
n	Number of occupants
F	Fixture usage per day (FUPD, flush/d/occupant)
Δq	Baseline flush rate – proposed flush rate (gal/flush)
D	Days in use per year (d/y)

Industry-standard assumptions[1] of use are utilized to determine fixture usage per day (FUPD) as follows:

1. Occupant and time-of-occupancy information is collected through IGA.
2. A split of 50% male and 50% female occupants is assumed.
3. Occupants will use restrooms once per two hours (0.5 uses per hour).
4. Males will use urinals 75% of the time.
5. New ADA handle
6. Non-residential lavatory usage is tied to the number of flushes and averages 6 seconds (0.1 minutes) per flush.
7. Residential lavatory usage averages 5 minutes per person per day.
8. Non-residential kitchenette, or general-purpose, faucets are used an average of 2 minutes per person per day.
9. Residential kitchen faucets are used an average of 3 minutes per person per day.
10. Usage factors are applied to each calculation in order to scale usage up or down depending on special conditions. Typically, these usage factors remain at 100% unless there is an indication of a modified usage pattern (e.g., it is known that a shower is used by only one person, once per week.)

[1]References: Building Science Corporation, “Setting Up Performance and Prescriptive Criteria for Domestic Water Use and Construction Waste Generation”, 1996; U.S. Department of Defense, “Military Handbook: Water Conservation”, 1997; Pacific Institute, “Waste Not, Want Not: The Potential for Urban Water Conservation in California”, 2003; Report sponsored by FEMP and conducted by Urban Systems Engineering, “WATERGY: A Water and Energy Conservation Model for Federal Facilities”, 1996.

Thermal energy and cost savings are calculated as follows:

$$[\ Se = Sw \times \rho \times Cp \times \Delta T\ ]$$

$$[\ Sc = Se / \varepsilon * f\ ]$$

where:

Sw	Water savings (gal/y)
Se	Thermal energy savings (BTU/y)
Sc	Thermal energy cost savings ($/y)
ρ	Water density = 8.34 lb./gal
Cp	Specific heat of water = 0.999 BTU/lb.-°F
ΔT	Hot water design temperature – mean inlet water temperature (°F)
f	Fuel unit cost ($/BTU)
ε	Efficiency (dimensionless)

4.3.4 Guaranteed Year 1 Utility Savings

Table 91: COSF Facilities – Water Conservation FIM Guaranteed Year 1 Utility Savings

FIM No.	Facility	Electricity				Natural Gas	Water
		kW	On-Peak kWh	Off-Peak kWh	kWh	therm	kgal
3.01	Bicentennial / Alto Park Complex	0	0	0	0	62	76
3.03	Fire Station #8	0	0	0	0	10	12
3.04	Fort Marcy Recreation Complex	0	0	0	0	92	83
3.05	Genoveva Chavez Community Center	0	0	0	0	4,341	1,001
3.06	La Familia Medical Center	0	0	0	0	157	89
3.08	Police Dept – Admin	0	0	0	0	149	69
3.09	Public Library – Main	0	0	0	0	119	72

FIM No.	Facility	Electricity				Natural Gas	Water
		kW	On-Peak kWh	Off-Peak kWh	kWh	therm	kgal
3.10	Public Library – Southside	0	0	0	0	59	71
3.11	Salvador Perez Swimming Pool	0	0	0	0	65	50
3.12	Sandoval Parking Garage Lot B	0	0	0	0	0	25
3.13	Santa Fe Convention Center	0	0	0	0	347	181
3.15	Siler Complex	0	0	0	0	316	171
3.16	Siringo Complex	0	0	0	0	74	74
3.18	Transit Administration	0	0	0	0	35	16
Total		0	0	0	0	5,825	1,988

Table 92: Public Utility Facilities – Water Conservation FIM Guaranteed Year 1 Utility Savings

FIM No.	Facility	Electricity				Natural Gas	Water
		kW	On-Peak kWh	Off-Peak kWh	kWh	therm	kgal
3.20	Santa Fe Water Division Office	0	0	0	0	33	19
Total		0	0	0	0	33	19

No scope of work at BDD Facilities.

4.3.5 Financial Summary

Table 93: COSF Facilities – Water Conservation FIM Financial Summary

FIM No.	Facility	Year 1 Annual Utility Savings	Year 1 Annual O&M Savings	Year 1 Total Annual Savings	Labor, Equip & Material Costs	Estimated Utility Rebate	Net Cost
3.01	Bicentennial / Alto Park Complex	$485	$55	$540	$8,314	$880	$7,434
3.03	Fire Station #8	$75	$62	$137	$11,890	$1,650	$10,240
3.04	Fort Marcy Recreation Complex	$540	$46	$586	$7,619	$1,320	$6,299
3.05	Genoveva Chavez Community Center	$7,723	$290	$8,013	$46,677	$7,040	$39,637
3.06	La Familia Medical Center	$599	$76	$675	$9,267	$880	$8,387
3.08	Police Dept – Admin	$472	$43	$515	$7,301	$880	$6,421
3.09	Public Library – Main	$480	$42	$522	$6,228	$440	$5,788
3.10	Public Library – Southside	$451	$44	$495	$5,055	$0	$5,055
3.11	Salvador Perez Swimming Pool	$328	$55	$383	$8,799	$1,320	$7,479
3.12	Sandoval Parking Garage Lot B	$149	$16	$165	$1,837	$0	$1,837
3.13	Santa Fe Convention Center	$1,229	$216	$1,445	$25,074	$0	$25,074
3.15	Siler Complex	$1,160	$50	$1,210	$11,465	$3,080	$8,385
3.16	Siringo Complex	$475	$79	$554	$13,456	$2,200	$11,256
3.18	Transit Administration	$109	$22	$131	$5,257	$1,320	$3,937
Total		$14,276	$1,096	$15,372	$168,239	$21,010	$147,229

Table 94: Public Utility Facilities – Water Conservation FIM Financial Summary

FIM No.	Facility	Year 1 Annual Utility Savings	Year 1 Annual O&M Savings	Year 1 Total Annual Savings	Labor, Equip & Material Costs	Estimated Utility Rebate	Net Cost
3.20	Santa Fe Water Division Office	$128	$39	$165	$5,568	$440	$5,128
Total		$128	$39	$165	$5,568	$440	$5,128

No scope of work at BDD Facilities.

4.3.6 Scope of Work

Please refer **Appendix F** for a detailed baseline and proposed room-by-room water fixture inventory.

Table 95: COSF Facilities – Proposed Water Conservation scope of Work

Facility	Flushometer Fixtures			Tank Toilets		Sinks	New Fixtures
	Valve Replacement	Spud & Flush tube Replacement	Handle-Mount Hands-Free	System Tuning	Retrofit Upgrade	Vandal Resistant Flow Control	Urinal
Bicentennial/ Alto Park Complex	14	13	0	0	0	11	2
Fire Station #8	16	8	0	0	0	12	6
Fort Marcy Recreation Complex	11	6	0	1	0	14	3
Genoveva Chavez Community Center	76	40	0	0	1	44	16
La Familia Medical Center	13	7	0	0	1	58	2
Police Dept- Admin	9	5	0	0	3	13	3
Public Library- Main	10	7	3	0	0	13	1
Public Library- Southside	11	6	0	0	0	10	0

Facility	Flushometer Fixtures			Tank Toilets		Sinks	New Fixtures
	Valve Replacement	Spud & Flush tube Replacement	Handle-Mount Hands-Free	System Tuning	Retrofit Upgrade	Vandal Resistant Flow Control	Urinal
Salvador Perez Swimming Pool	12	6	0	0	4	14	3
Sandoval Parking Garage Lot B	4	2	0	0	0	4	0
Santa Fe Convention Center	55	29	0	0	0	46	0
Siler Complex	7	4	0	0	11	17	7
Siringo Complex	16	8	0	0	10	16	5
Transit Administration	3	3	2	0	3	14	3
Total	257	144	5	1	33	286	51

Table 96: Public Utility Facilities – Proposed Water Conservation Scope of Work

Facility	Flushometer Fixtures			Tank Toilets		Sinks	New Fixtures
	Valve Replacement	Spud & Flush tube Replacement	Handle-Mount Hands-Free	System Tuning	Retrofit Upgrade	Vandal Resistant Flow Control	Urinal
Santa Fe Water Division Office	4	2	0	0	12	13	1

No scope at BDD facilities.

Clarifications

1. Above quantities and sizing are preliminary and will be finalized once final equipment selections are made.
2. Minor repairs to horizontal water supply connections 1" and less in diameter are included where necessary to complete retrofit installation.
3. All piping modifications will be made with material that complies with standard trade practice and similar to existing materials.
4. Prior to construction, Owner will identify isolation valves. Isolation valves are required to be in working order in order for the above scope of work to be performed. Failed isolation valves are the Agency's responsibility to repair or replace.
5. Permit fees are not expected for this scope of work since it is a retrofit scope of work and no major modifications to infrastructure are being made. Yearout Energy has excluded permits from project cost at this time and would pass them through at cost (without markup) should they be required.
6. It is the Agency's responsibility to continue to provide domestic water at 25-85 psi and suitable flowrates to all fixtures. Deviations from this pressure range will require additional retrofits external to this project scope.

Exclusions

1. Control stops and shutoff valves.
2. Special-use sinks, volume-based sinks, and irregular sinks that are incompatible with retrofit scope of work.
3. Sink faucets and peripherals.
4. Shower peripherals.
5. Broken toilet flanges. Flange repairs and/or replacements will incur an additional charge external to this project scope.
6. Broken carriers (for wall-mount toilets and urinals).
7. Painting, extensive tile work, and wall repair outside of footprint-related patching.
8. Pre-existing damage to walls and/or flooring will be brought to the attention of the Agency and the best course of action will be determined. Yearout Energy will repair any damage caused by its installations. Yearout Energy will attempt to match existing conditions, but where unique finishes are present it may require the Agency to supply material.
9. Hazardous material removal or abatement.

4.3.7 Equipment Service Life

The estimated service life for this FIM is as follows:

Table 97: Water Conservation FIM Estimated Service Life

FIM Component	% of FIM Total Cost	Median Service Life
All Domestic Water Fixtures	100%	20 Years
FIM Weighted Average Service Life		20 Years

4.3.8 Preliminary Commissioning Plan

The following preliminary commissioning plan is intended to serve as the outline from which the final commissioning plan will be developed during the pre-construction / design phase. The final commissioning plan will be primarily focused on validating the proposed equipment and strategies are implemented in accordance with the savings methodology associated with each measure.

1. Review equipment submittals to validate the specified performance criteria is in alignment with the proposed savings methodology
2. Perform a random inspection to validate the implemented water fixture improvements align with the proposed scope of work.

4.3.9 Warranty

An industry standard 1-year materials and workmanship warranty is provided by Yearout Energy. Any material warranties that extend beyond this period will be transferred to the Agency upon project closeout. All available warranty information can be found in **Appendix F1**.

The warranty period information for the major pieces of equipment associated with this measure is summarized in the table below.

Table 98: Water Conservation FIM Warranty Information

Equipment Description	OEM Warranty Period	Water Conservation Partner Warranty
Flushometer valve components	3 years	3 years
Diaphragm	3 years	10 years
Hands-free handle mounts	3 years	3 years

Equipment Description	OEM Warranty Period	Water Conservation Partner Warranty
Flapper assembly	N/A	3 years
Flapper and flipper seal	N/A	10 years
Fluidmaster sure-fit tank lever	3 years	3 years
Supply lines	N/A	3 years
Aerators	1 year	3 years
Screen washers	5 years	10 years
Urinals	3 years	3 years

4.3.10 Training

Yearout Energy will co-develop a training plan with the Agency that is tailored to the needs and skill level of the building operators. Training sessions will be conducted during the project implementation phase. These sessions will be recorded and provided in electronic format to the Agency for future reference. Topics commonly covered during these training sessions include:

3. Equipment start-up, proper operation, shutdown, power failure, etc.
4. Sequences of operation
5. Operations and maintenance (O&M) manuals
6. Diagnosing and troubleshooting common equipment issues
7. Preventative maintenance and required documentation
8. Health and safety considerations
9. Warranty information
10. Identified system deficiencies
11. Measurement and Verification (M&V) plan and KPIs which directly impact savings

4.4 FIM 4.00 Building Envelope

4.4.1 Existing Conditions

Significant quantities of air infiltration into the buildings were discovered during the envelope survey period. The facilities were found to be in a mixed set of conditions in regard to infiltration losses, mostly due to age and maintenance issues.

Most buildings are in good condition but could use improvements to stop air infiltration/exfiltration and energy loss. Door systems were found to be the largest areas of air infiltration/exfiltration. Most entrance doors needed one of the following: weather stripping or sweeps. In most buildings of this age the door seals are either original or have been replaced. Often the replacement seals are of poor quality and are degraded by ultraviolet solar rays. Over time they lose their flexibility and ability to function reliably. Care should be taken to replace seals with products having extensive long-term testing (higher cycle count). Sealant is recommended around the perimeter of several windows. Numerous penetrations were observed that need to be sealed.

Recommended improvements are tabulated and available in **Appendix G1**.

Air Leakage – Building Envelope

Air leakage through the building envelope most often occurs where building envelope elements are connected. Leakage is typically a result of either improper design or construction, lack of maintenance, or normal degradation over the life of the building. The audit identified penetrations in the building envelope that consist mainly of cracks or openings at building connection points, holes, and pipe/mechanical penetrations. These openings in the building envelope need to be sealed to stop significant amounts of air leakage and energy loss.

Weather Stripping – Exterior Doors

The weather stripping, door sweeps, vertical sweeps on exterior doors, and overhead doors are damaged and in disrepair allowing air infiltration into the space between the door and the frame. Over time this weather stripping develops gaps due to normal wear and tear. By replacing worn out weather stripping, energy savings can be realized due to reduced infiltration and thus, reduced load on the building HVAC equipment. In some instances, the weather stripping appears to be in good condition, but it is still not preventing air leakage as it is intended.

Air Leakage – Windows

Windows throughout the campus, both single and double paned, both have issues that impact energy efficiency. The window glazing and seals are generally in good condition overall; however, air leakage between the window frames and walls was observed in several locations, as well as failed seals.

Windows

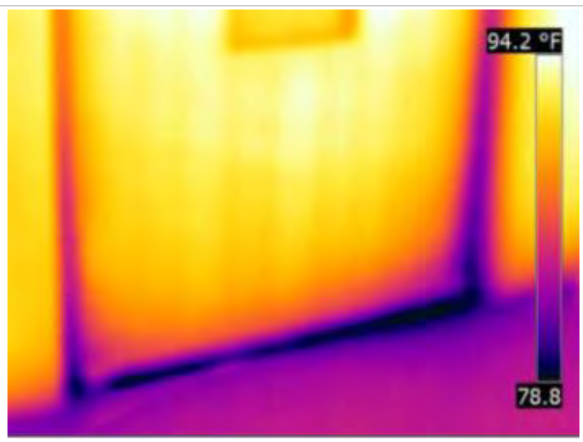
Gaps at window / wall junction should be sealed as shown at the Siler Complex.

Air Leakage

We recommend sealing penetrations and blank openings to reduce air and moisture infiltration and exfiltration leading to energy loss

Exterior Doors

The thermal image at right shows a typical example of failed weather-stripping at exterior doors. Here dark blue at the edges of the doors signify a large temperature differential is apparent, signaling severe leakage.



4.4.2 Proposed Modifications

Recommended improvements are tabulated and available in **Appendix G1**.

Air Leakage – Building Envelope

The proposed modifications include insulating and sealing all identified penetrations and openings with the appropriate polyurethane spray foam product and premium urethanized elastomeric sealants to minimize or eliminate these sources of air leakage.

Weather Stripping – Exterior Doors

This scope will repair or replace the weather stripping, door sweeps, and vertical sweeps as identified in order to minimize the amount of air leakage at identified locations.

Air Leakage – Windows

Interiors of windows and frames where they meet interior finishes will be caulked using premium urethanized elastomeric sealants to mitigate air leakage where necessary.

Implementing the proposed modifications will reduce the heating and cooling loads by reducing the amount of air entering and leaving through the building envelope and will also improve space comfort.

4.4.3 Savings Methodology

Infiltration Reduction (Air Leakage, Weather Stripping, Exterior Doors, and Windows)

Heat loss, q, in BTU/h, is determined by the following equation:

$$[\, q = H_l \times Q \times \Delta T \,]$$

Where:

H_l = Heat Loss Coefficient ($\frac{BTU*Min}{ft^3*°F*Hr}$) is calculated as follows:

$$[H_l = Cp \times \rho \times 60\ (\frac{Min}{Hr})] = 0.864\ \frac{BTU*Min}{ft^3*°F*Hr}$$

Where:

Cp = Specific Heat ($\frac{BTU}{Lb*°F}$)

P = Air density at site elevation ($\frac{lb}{ft^3}$)

Conversion factor = 60 ($\frac{Min}{Hr}$)

where:

Q represents the airflow in cubic feet per minute (CFM) and is calculated in the following manner:

$$[\, Q = A_{crack} \times \sqrt{C_s \Delta T + C_w V^2}\,]$$

where:

A_{crack} = crack area reduction (in²)

C_s = stack coefficient

C_w = wind coefficient

V = wind speed = 8.8 mph
[ΔT = temperature difference = $T_{out} - T_{in}$ (deg F)]

ΔT is calculated by subtracting the average outdoor air temperature per hour from the indoor temperature, using 24 data points per month to accurately account for weather variances, and subsequently calculating airflow and heat loss for each set of data. In total, 288 data points are used, and Δt is the number of hours each data point represents. The total heat loss is calculated as follows:

$$[q = \sum_{x=1}^{288} H_l \times A_{crack} \times \sqrt{C_s(T_{out} - T_{in}) + C_w V^2} \times (T_{out} - T_{in}) \times \Delta t \,]$$

Conduction/Insulation

Steady-state one-dimensional heat loss, q, in BTU/h, is given by Fourier's law:

$$[\, q = -kA\frac{dT}{dx} \times \frac{hrs}{MMBTU} \,]$$

where:

A = cross-sectional area normal to heat flow (ft^2)
K = thermal conductivity of the insulation material (BTU-in/h-ft^2-°F)
dT/dx = temperature gradient (°F/in)

The proposed modifications would provide a reduction in leakage area at the facilities as shown in the following tables.

Table 99: COSF Facilities – Proposed Air Leakage Area Remediation (ft^2)

Facility	Remediated Air Leakage Area (ft^2)
Bicentennial/ Alto Park Complex	8.85
Fire Station #8	2.86
Fort Marcy Recreation Complex	2.75
Genoveva Chavez Community Center	23.51
La Familia Medical Center	4.26
Municipal Recreation Complex	4.04

Facility	Remediated Air Leakage Area (ft^2)
Police Dept- Admin	2.75
Public Library- Main	2.20
Public Library- Southside	3.18
Salvador Perez Swimming Pool	2.14
Santa Fe Convention Center	19.65
Santa Fe Regional Airport	5.23
Siler Complex	15.28
Siringo Complex	10.29
Transit Administration	4.87
Total	111.86

Table 100: Public Utility Facilities – Proposed Air Leakage Area Remediation (ft^2)

Facility	Remediated Air Leakage Area (ft^2)
Canyon Road Water Treatment Plant	4.50
Santa Fe Water Division Office	3.16
Total	7.66

Please refer **Appendix G1** for additional information regarding calculations.

4.4.4 Guaranteed Year 1 Utility Savings

Table 101: COSF Facilities – Building Envelope FIM Guaranteed Year 1 Utility Savings

FIM No.	Facility	Electricity				Natural Gas	Water
		kW	On-Peak kWh	Off-Peak kWh	kWh	therm	kgal
4.01	Bicentennial / Alto Park Complex	0	78	28	106	1,584	0
4.03	Fire Station #8	0	61	0	61	747	0
4.04	Fort Marcy Recreation Complex	0	20	20	41	666	0
4.05	Genoveva Chavez Community Center	0	280	280	560	7,218	0
4.06	La Familia Medical Center	0	26	26	51	765	0
4.07	Municipal Recreation Complex	0	45	23	68	756	0
4.08	Police Dept – Admin	0	29	29	59	720	0
4.09	Public Library – Main	0	19	19	39	522	0
4.10	Public Library – Southside	0	28	28	57	648	0
4.11	Salvador Perez Swimming Pool	0	19	19	38	432	0
4.13	Santa Fe Convention Center	0	119	119	239	4,086	0
4.14	Santa Fe Regional Airport	0	0	0	0	1,485	0
4.15	Siler Complex	0	184	0	184	2,745	0
4.16	Siringo Complex	0	62	62	123	1,845	0
4.18	Transit Administration	0	37	37	75	925	0
Total		0	1,008	690	1,698	25,146	0

Table 102: Public Utility Facilities – Building Envelope FIM Guaranteed Year 1 Utility Savings

FIM No.	Facility	Electricity				Natural Gas	Water
		kW	On-Peak kWh	Off-Peak kWh	kWh	therm	kgal
4.19	Canyon Road Water Treatment Plant	0	55	55	111	1,359	0
4.20	Santa Fe Water Division Office	0	28	17	45	621	0
Total		0	83	72	156	1,980	0

4.4.5 Financial Summary

Table 103: COSF Facilities – Building Envelope FIM Financial Summary

FIM No.	Facility	Year 1 Annual Utility Savings	Year 1 Annual O&M Savings	Year 1 Total Annual Savings	Labor, Equip & Material Costs	Estimated Utility Rebate	Net Cost
4.01	Bicentennial / Alto Park Complex	$614	$92	$706	$9,993	$0	$9,993
4.03	Fire Station #8	$293	$44	$337	$6,868	$0	$6,868
4.04	Fort Marcy Recreation Complex	$256	$38	$295	$3,696	$0	$3,696
4.05	Genoveva Chavez Community Center	$2,784	$418	$3,201	$30,861	$0	$30,861
4.06	La Familia Medical Center	$295	$44	$339	$4,531	$0	$4,531
4.07	Municipal Recreation Complex	$294	$44	$338	$12,146	$0	$12,146
4.08	Police Dept – Admin	$278	$42	$320	$3,077	$0	$3,077
4.09	Public Library – Main	$201	$30	$231	$5,812	$0	$5,812
4.10	Public Library – Southside	$250	$38	$288	$3,710	$0	$3,710

FIM No.	Facility	Year 1 Annual Utility Savings	Year 1 Annual O&M Savings	Year 1 Total Annual Savings	Labor, Equip & Material Costs	Estimated Utility Rebate	Net Cost
4.11	Salvador Perez Swimming Pool	$167	$25	$192	$2,831	$0	$2,831
4.13	Santa Fe Convention Center	$1,573	$236	$1,809	$29,308	$0	$29,308
4.14	Santa Fe Regional Airport	$568	$85	$653	$12,335	$0	$12,335
4.15	Siler Complex	$1,066	$160	$1,225	$29,800	$0	$29,800
4.16	Siringo Complex	$711	$107	$817	$18,337	$0	$18,337
4.18	Transit Administration	$358	$54	$411	$13,552	$0	$13,552
Total		$9,707	$1,456	$11,163	$186,857	$0	$186,857

Table 104: Public Utility Facilities – Building Envelope FIM Financial Summary

FIM No.	Facility	Year 1 Annual Utility Savings	Year 1 Annual O&M Savings	Year 1 Total Annual Savings	Labor, Equip & Material Costs	Estimated Utility Rebate	Net Cost
4.19	Canyon Road Water Treatment Plant	$530	$79	$609	$12,684	$0	$12,684
4.20	Santa Fe Water Division Office	$240	$36	$276	$6,629	$0	$6,629
Total		$770	$116	$886	$19,313	$0	$19,313

4.4.6 Scope of Work

Please refer **Appendix G1** for a detailed baseline and proposed envelope remediation.

Table 105: COSF Facilities – Proposed Air Leakage Remediation Scope of Work

Facility	*Penetrations	*Wall cracks, window/door frames and vents	Sets of Weather-strip DF	Door Sweeps	**Astragals	Sets of weather-strip DF (OH Door)	Door sweeps (OH Door)
	ft^2	Linear Ft	Sets	Qty	Qty	Qty	Qty
Bicentennial/ Alto Park Complex	0.24	20	36	36	4	0	0
Fire Station #8	0.23	0	10	10	1	4	4
Fort Marcy Recreation Complex	0.11	0	11	11	4	0	0
Genoveva Chavez Community Center	0.37	633	59	59	15	3	3
La Familia Medical Center	0.67	155	11	11	1	0	0
Municipal Recreation Complex	0.41	27	21	21	2	6	6
Police Dept- Admin	0.48	0	9	9	0	0	0
Public Library- Main	0.22	0	19	20	4	0	0
Public Library- Southside	0.17	0	12	12	3	0	0
Salvador Perez Swimming Pool	0.26	0	8	8	2	0	0
Santa Fe Convention Center	0.26	0	81	81	36	2	2
Santa Fe Regional Airport	0.12	218	19	19	4	6	6
Siler Complex	0.89	398	39	39	3	17	17
Siringo Complex	1.01	1,044	32	32	8	4	4
Transit Administration	0.35	7	17	17	1	9	9
Total	5.79	2,502	384	385	88	51	51

*sealed w/ polyurethane sealant
**weather-strip for center of double door

Table 106: Public Utility Facilities – Proposed Air Leakage Remediation Scope of Work

Facility	*Penetrations	*Wall cracks, window/door frames and vents	Sets of Weather-strip DF	Door Sweeps	**Astragals	Sets of weather-strip DF (OH Door)	Door sweeps (OH Door)
	ft^2	Linear Ft	Sets	Qty	Qty	Qty	Qty
Canyon Road Water Treatment Plant	0.27	133	16	16	0	8	8
Santa Fe Water Division Office	0.38	250	11	11	1	2	2
Total	0.65	383	27	27	1	10	10

*sealed w/ polyurethane sealant
**weather-strip for center of double door

Clarifications

1. Installation will be executed in accordance with industry-standard safety practices and with the care, skill, and diligence provided by a contractor skilled in building envelope services.
2. Installation of all materials will be executed per manufacturer's recommendations.
3. Any conditions not meeting current codes, and any system deficiencies will be brought to the attention of the Agency. Any work required to remedy these situations is excluded.

Exclusions

1. Removal of asbestos containing materials, lead containing materials or any other hazardous / suspect materials.

2. Removal of caulking, coatings, mastics, flashings, insulation or any other materials unless clearly specified.
3. Repair or installation of brick or other masonry materials or systems.
4. Repair or installation of window or door systems unless clearly identified.
5. Repair or installation of any structural systems.

4.4.7 Equipment Service Life

The estimated service life for this FIM is as follows:

Table 107: Building Envelope FIM Estimated Service Life

FIM Component	% of FIM Total Cost	Median Service Life
Building Envelope Materials	100%	20 Years
FIM Weighted Average Service Life		20 Years

4.4.8 Preliminary Commissioning Plan

The following preliminary commissioning plan is intended to serve as the outline from which the final commissioning plan will be developed during the pre-construction / design phase. The final commissioning plan will be primarily focused on validating the proposed equipment and strategies are implemented in accordance with the savings methodology associated with each measure.

1. Review material submittals to validate the specified performance criteria is in alignment with the proposed savings methodology
2. Perform a random inspection to validate the implemented building envelope improvements align with the proposed scope of work (door sweeps, penetrations, etc.)

4.4.9 Warranty

An industry standard 1-year materials and workmanship warranty is provided by Yearout Energy. Any material warranties that extend beyond this period will be transferred to the Agency upon project closeout. All available warranty information can be found in **Appendix G1**.

The warranty period information for the major pieces of equipment associated with this measure is summarized in the table below.

Table 108: Building Envelope FIM Warranty Information

Equipment Description	Warranty Period
DAP & Dow Corning Sealants	50 years
Other sealants	1 year
Door sweeps and astragals	N/A

4.4.10 Training

Yearout Energy will co-develop a training plan with the Agency that is tailored to the needs and skill level of the building operators. Training sessions will be conducted during the project implementation phase. These sessions will be recorded and provided in electronic format to the Agency for future reference. Topics commonly covered during these training sessions include:

3. Equipment start-up, proper operation, shutdown, power failure, etc.
4. Sequences of operation
5. Operations and maintenance (O&M) manuals
6. Diagnosing and troubleshooting common equipment issues
7. Preventative maintenance and required documentation
8. Health and safety considerations
9. Warranty information
10. Identified system deficiencies
11. Measurement and Verification (M&V) plan and KPIs which directly impact savings

4.5 FIM 5.00 High-Efficiency Transformers

4.5.1 Existing Conditions

Transformers operate continuously and consume energy through there inherent inefficiency. Of the 67 transformers surveyed, 14 transformers have been identified as good candidates for replacement due to their age and inefficiency. This will save energy and improve aging infrastructure.

Transformers step down higher voltages delivered via utility distribution to lower voltages required for most building applications, including HVAC, lighting, and plug loads. Regardless of connected demand, transformers operate 24 hours per day and 365 days per year and experience roughly constant losses. These losses originate from two major transformer components: the core (typically made of steel), and coil windings (made of aluminum or copper). Standards for minimum transformer energy efficiencies were adopted at the discretion of manufacturers until 2007, when minimum efficiency legislation was enacted. An extensive survey of the city's, Water Division's, and BDD's transformers was conducted, and it was found that all transformers are older than 2007. The table below includes appropriate candidates for replacement.

Table 109: COSF Facilities – Existing Transformers

Tag	Facility	Location	KVA	Primary	Secondary
59108	Bicentennial Park	Concession Stand	30	480	208/120
59085	Municipal Recreation Center	Outside near Cart Barn	112.5	480	208/120
59100	Public Library-Southside	Electrical Rm in Community Rm	75	480	208/120
59101	Public Library-Southside	Loading dock Electrical Rm	75	480	208/120
59102	Public Library-Southside	Loading dock Electrical Rm	75	480	208/120
59103	Transit Admin	Outside, Bus Wash	45	480	208/120
59104	Transit Admin	Building by Bus Wash	30	480	208/120
59105	Transit Admin	Garage	75	480	208/120
59106	Transit Admin	Bus Parking Bay 2	30	480	208/120
59107	Transit Admin	Conf Rm	45	480	208/120

Table 110: Public Utility Facilities – Existing Transformers

Tag	Facility	Location	KVA	Primary	Secondary
59087	Canyon Road WTP	Outside chiller	45	480	240 x 120
59088	Canyon Road WTP	Ready Stock Rm	30	480	208/120
59090	Canyon Road WTP	Pipe Gallery Airator Rm	25	480	240 x 120
59091	Canyon Road WTP	Pipe Gallery Airator Rm	25	480	240 x 120
59202	WWTP	Bldg LC	30	480	208/120
59188	WWTP	Grit-GB Bldg	30	480	208/120
59189	WWTP	Head Works (HW) Bldg ER	45	480	208/120
59190	WWTP	Laboratory-Outside Back	45	480	208/120
59191	WWTP	Admin Bldg-Elect Rm Basement	112.5	480	208/120
59193	WWTP	Admin Bldg-Elect Rm 2	15	480	208/120
59198	WWTP	None-Potable (NP) Bldg	30	480	208/120
59197	WWTP	Old Digester Bldg-Elect Rm	45	480	208/120
59194	WWTP	Old DAF Bldg-Elect Rm	40	480	----
59195	WWTP	Old DAF Bldg-Elect Rm	37.5	480	240 x 120
59199	WWTP	Tertiary Treatment Facility	75	480	208/120
59185	WWTP	West Warehouse	75	480	208/120
59186	WWTP	West Warehouse	45	480	----
59187	WWTP	West Warehouse	30	480	208/120

Low-Voltage Transformers

Several transformers like those shown at right are present throughout the electrical rooms in the facilities. Most of these units have been in place since the time of the facility's original construction.

4.5.2 Proposed Modifications

Modifications will include replacement of the existing transformers, shown in Table 109 and Table 110, with new, high-efficiency Powersmiths' model E-Saver-80R transformers. Energy savings are driven by modern, precision-crafted cores and coil windings. Refer to **Appendix H3** for specifications.

4.5.3 Savings Methodology

Transformer losses are comprised of two major energy losses:

12. Core loses, also known as no-load losses or energizing losses, are present continuously, regardless of load.
13. Coil losses, also known as load losses, vary with the square of the load placed upon them.

Total Transformer Losses are calculated as follows:

[Total Transformer Losses = No-load Losses (Core) + Load Losses (Coils)]

The below graph is the summary of a survey by the Northeast Energy Efficiency Partnership that indicates that typical transformer loading typically falls within the range of 7 – 24%.

(SOURCE DATA: INDUSTRIAL AND PUBLIC BUILDINGS, THE CADMUS GROUP INC. 12/7/99, PREPARED FOR NEFP)

Figure 75: Root Mean Square (RMS) Transformer Average Load Factor by Facility Type

The following graph shows the two loss components for a representative 75-kVA transformer. No-load losses represent 80-95% of the total losses, with only a small percentage (depicted in the blue-shaded triangular area between the red and orange lines) associated with load-dependent losses.

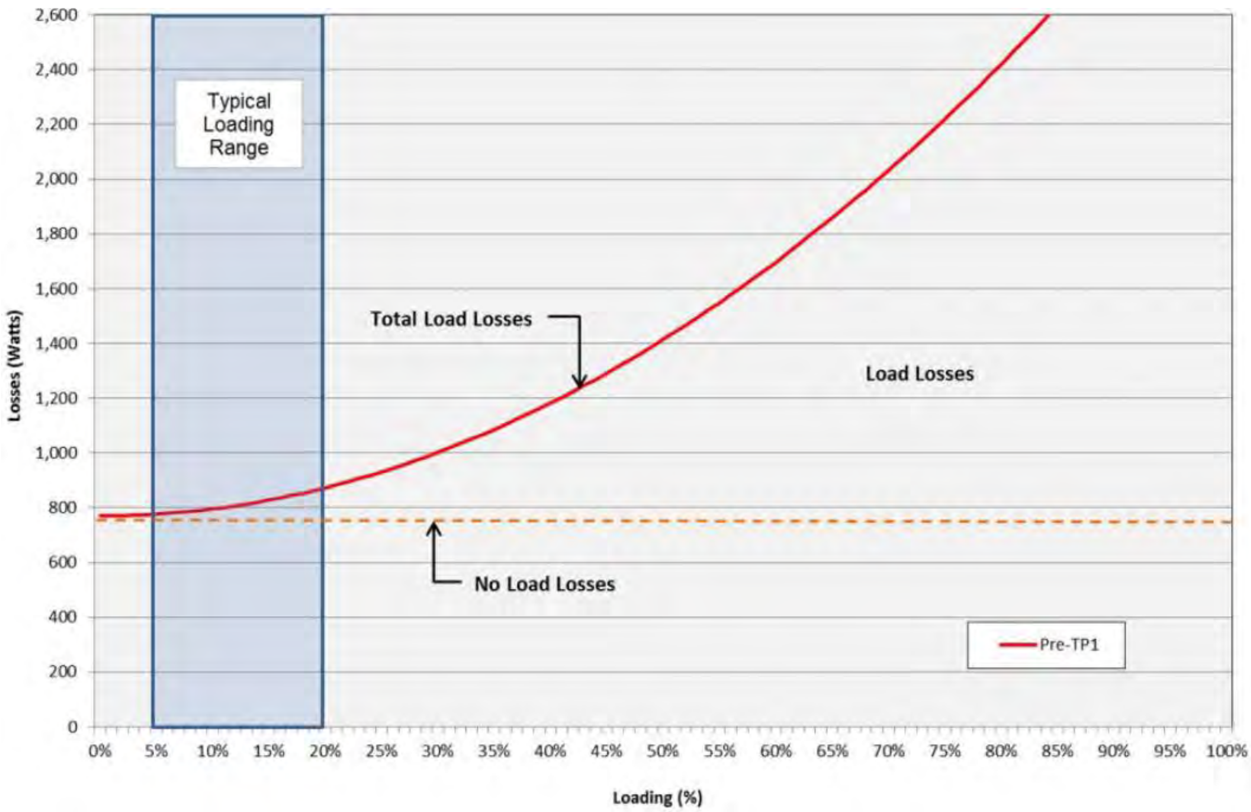


Figure 76: Typical 75 kVA NEMA TP-1 Low-Voltage Dry-Type Transformer Energy Loss Profile

Savings calculations are based on extensive field data collected by Powersmiths over the past decade across the country and COSF facility field measurements of the % loading and kW losses were performed on a number of existing transformers. Most transformers exhibit a very predictable duty-cycle using.

The following equation was used to calculate the on- and Off-Peak power savings:

$$[\, Lp = Ln + I^2 \times (Lf - Ln)\,]$$

where:

Lp	Total transformer power losses (kW)
Ln	No-load losses (kW)
Lf	Full-load losses (kW)
I	Loading during operating hours (%)

The below table shows the load losses for the baseline and new proposed transformer.

Table 111: Transformer Load Losses

Size kVA	Baseline Losses		Proposed Losses (E-Saver-80R)	
	No Load	Full Load	No Load	Full Load
	W	W	W	W
15	311	1,182	35	775
25	282	1,369	57	674
30	412	1,462	57	1,332
45	665	2,202	78	1,725
75	834	3,347	111	2,537
112.5	1,190	4,271	164	3,313

Energy losses were calculated as follows:

[Le = Lp x H]

Savings for power (kW) and energy (kWh) were calculated as follows:

[Savings = Baseline Transformer Losses – Proposed Transformer Losses]

Where:

Lp	Total transformer power losses (kW)
Le	Total transformer energy losses (kWh)
H	Hours of operation (h/y)

See **Appendix H2** for savings calculation.

4.5.4 Guaranteed Year 1 Utility Savings

Table 112: COSF Facilities – High-Efficiency Transformers FIM Guaranteed Year 1 Utility Savings

FIM No.	Facility	Electricity				Natural Gas	Water
		kW	On-Peak kWh	Off-Peak kWh	Total kWh	therm	kgal
5.01	Bicentennial / Alto Park Complex	0	2,792	0	2,792	0	0
5.07	Municipal Recreation Complex	11	2,880	5,207	8,087	0	0
5.10	Public Library – Southside	24	6,147	11,116	17,263	0	0
5.18	Transit Administration	28	7,357	13,314	20,670	0	0
Total		63	19,175	29,637	48,812	0	0

Table 113: Public Utility Facilities – High-Efficiency Transformers FIM Guaranteed Year 1 Utility Savings

FIM No.	Facility	Electricity				Natural Gas	Water
		kW	On-Peak kWh	Off-Peak kWh	kWh	therm	kgal
5.19	Canyon Road Water Treatment Plant	0	3,926	7,076	11,002	0	0
5.21	WWTP	0	21,908	39,624	61,533	0	0
Total		0	25,834	46,700	72,534	0	0

No scope at BDD facilities.

4.5.5 Financial Summary

Table 114: COSF Facilities High-Efficiency Transformers FIM Financial Summary

FIM No.	Facility	Year 1 Annual Utility Savings	Year 1 Annual O&M Savings	Year 1 Total Annual Savings	Labor, Equip & Material Costs	Estimated Utility Rebate	Net Cost
5.01	Bicentennial / Alto Park Complex	$345	$52	$397	$4,237	$179	$4,058
5.07	Municipal Recreation Complex	$596	$89	$686	$15,888	$518	$15,370
5.10	Public Library - Southside	$1,273	$191	$1,464	$31,778	$1,105	$30,673
5.18	Transit Administration	$1,524	$229	$1,753	$31,778	$1,323	$30,455
Total		$3,739	$561	$4,299	$83,681	$3,124	$80,557

Table 115: Public Utility Facilities High-Efficiency Transformers FIM Financial Summary

FIM No.	Facility	Year 1 Annual Utility Savings	Year 1 Annual O&M Savings	Year 1 Total Annual Savings	Labor, Equip & Material Costs	Estimated Utility Rebate	Net Cost
5.19	Canyon Road Water Treatment Plant	$885	$133	$1,017	$17,654	$704	$16,950
5.21	WWTP	$4,943	$742	$5,685	$97,836	$3,938	$93,898
Total		$5,828	$874	$6,702	$115,490	$4,642	$110,848

No scope at BDD facilities.

Scope of Work

The scope shall include the equipment as shown in the below table and work shall be performed as follows:

1. Verify all dimensions in the field.
2. Check for damage and loose connections.
3. Set the transformer plumb and level.
4. Mount transformer on vibration isolation pads suitable for isolating the transformer.

Table 116: High Efficiency Transformer FIM Proposed Scope of Work

Scope Item	Quantity
Demolish transformer	28
Install 15Kva high-efficiency transformer	1
Install 25Kva high-efficiency transformer	2
Install 30Kva high-efficiency transformer	8
Install 37.5kva high-efficiency transformer	1
Install 40Kva high-efficiency transformer	1
Install 45Kva high-efficiency transformer	7
Install 75Kva high-efficiency transformer	6
Install 112.5Kva high-efficiency transformer	2

Please refer **Appendix H** for a detailed baseline and proposed transformers.

Clarifications

1. Work will require system shutdowns. All work shall be coordinated with the Agency in order to minimize the effect on day-to-day operations. Work shall be conducted during normal work hours when utility interruptions are approved; otherwise, work will be conducted outside of normal work hours when utility interruptions are not approved. All preparation work shall be done prior to shut down so as to minimize the time the system is down.
2. Installation will be executed in accordance with industry-standard safety practices and with the care, skill, and diligence provided by a contractor skilled in building envelope services.
3. Installation of all materials will be executed per manufacturer's recommendations.
4. Any conditions not meeting current codes, and any system deficiencies will be brought to the attention of the Agency. Any work required to remedy these situations is excluded.

Exclusions

1. Removal of asbestos containing materials, lead containing materials or any other hazardous / suspect materials.

2. New vibration isolation pads suitable for isolating
3. Repair or installation of any structural systems and/or installation of seismic restraints where required.
4. Repair or installation of brick or other masonry materials or systems.

4.5.6 Equipment Service Life

The estimated service life for this FIM is as follows:

Table 117: High Efficiency Transformer FIM Estimated Service Life

FIM Component	% of FIM Total Cost	Median Service Life
HE Transformers	100%	32 Years
FIM Weighted Average Service Life		32 Years

4.5.7 Preliminary Commissioning Plan

The following preliminary commissioning plan is intended to serve as the outline from which the final commissioning plan will be developed during the pre-construction / design phase. The final commissioning plan will be primarily focused on validating the proposed equipment and strategies are implemented in accordance with the savings methodology associated with each measure.

1. Develop and issue construction phase commissioning plan
2. Review equipment submittals to validate the specified performance criteria is in alignment with the proposed savings methodology
3. Review sequences of operation and controls strategies to validate alignment with proposed savings methodology
4. Review manufacturer's startup documentation
5. Develop equipment Pre-Functional Checklists (PFCs)
6. Develop and conduct Functional Performance Testing (FPT) procedures on equipment and sequences of operation to ensure proper operation
7. Create and maintain a commissioning issues log
8. Establish trends as required to validate system operation
9. Coordinate Owner participation as required during commissioning and equipment startup efforts

10. Participate in staff training activities

4.5.8 Warranty

An industry standard 1-year materials and workmanship warranty is provided by Yearout Energy. Any material warranties that extend beyond this period will be transferred to the Agency upon project closeout. All available warranty information can be found in **Appendix H3**.

The warranty period information for the major pieces of equipment associated with this measure is summarized in the table below.

Table 118: HE Transformer FIM Warranty Information

Equipment Description	Warranty Period
Powersmiths Opal Transformers	32 years

4.5.9 Training

Yearout Energy will co-develop a training plan with the Agency that is tailored to the needs and skill level of the building operators. Training sessions will be conducted during the project implementation phase. These sessions will be recorded and provided in electronic format to the Agency for future reference. Topics commonly covered during these training sessions include:

11. Equipment start-up, proper operation, shutdown, power failure, etc.
12. Sequences of operation
13. Operations and maintenance (O&M) manuals
14. Diagnosing and troubleshooting common equipment issues
15. Preventative maintenance and required documentation
16. Health and safety considerations
17. Warranty information
18. Identified system deficiencies
19. Measurement and Verification (M&V) plan and KPIs which directly impact savings

4.6 FIM 6.00 Utility Management

4.6.1 Existing Conditions

4.6.1.1 MRC Pump Station Hill Soccer Pond

During the IGA, it was observed that the electric meter serving the MRC Pump Station Hill Soccer Pond was on a demand-based rate structure, PNM Rate 3E Pilot Municipalities and Counties Low Load Factor General Power Service Time-of-Use (TOU). Yearout Energy identified that this meter was eligible to switch to PNM 2A Small Power Service, which would be financially advantageous for the COSF. Eligibility for PNM 2A is defined as having a load factor that does not exceed 35% and one of the two following conditions: 1) a minimum monthly On-Peak demand of 50 kW, 2) consumption must be an actual 15,000kWh; both for three of the last twelve month.

4.6.1.2 Genoveva Chavez Community Center

Due to loss of production from the existing carport solar PV system as described in Section 2.5.8.3, the rate had been changed by PNM in early 2019 from rate 2A Small Power Service to rate 3B General Power Time-of-Use (TOU), which is less advantageous for solar. Yearout Energy identified this rate change during the IGA and brought it to the COSF's attention.

4.6.2 Proposed Modifications

4.6.2.1 MRC Pump Station Hill Soccer Pond

As a result of the utility analysis performed during the IGA, it was found that the PNM 2A Small Power Service was more appropriate for the MRC Pump Station Hill Soccer Pond. The rate has a higher Off-Peak Summer, On-Peak Winter, and Off-Peak Winter Consumption rate, but this is offset by no demand charge and lower monthly flat service charge. On November 8, 2019, the rate change was approved and applied by PNM immediately reducing utility costs at this site.

Table 119: MRC Pump Station Utility Management Proposed Modifications

Facility	Electric Provider	Account Number	Meter Serial No.	Current Rate	Proposed Rate
MRC Pump Station Hill Pond Soccer	PNM	43554000-0472017-2	947578	3E	2A

4.6.2.2 Genoveva Chavez Community Center

Yearout Energy requested on behalf of the COSF that PNM return the rate back to 2A and described the reasoning for the increase in consumption at this site. In December 2019, PNM approved and applied the rate change along with crediting the COSF back the utility cost increases experienced during the rate change period.

Table 120: GCCC Utility Management Proposed Modifications

Facility	Electric Provider	Account Number	Meter Serial No.	Current Rate	Proposed Rate
Genoveva Chavez Community Center	PNM	115447884-1174415-5	740514	3B	2A

4.6.3 Savings Methodology

4.6.3.1 MRC Pump Station Hill Soccer Pond

Savings for this measure were calculated by utilizing actual utility consumption data for the meter and simulating the monthly cost difference between the currently assigned electric rate and the proposed electric rate. Detailed calculations are provided in **Appendix I1**.

Table 121: MRC Pump Station Utility Management Savings

Facility	Electric Provider	Account Number	Baseline Annual Cost	Proposed Annual Cost	Annual Savings
MRC Pump station Hill Pond Soccer	PNM	43554000-0472017-2	$9,468	$7,647	$1,821

4.6.3.2 Genoveva Chavez Community Center

In December 2019, PNM approved and credited the COSF with the rate difference for the period it had changed. This was considered for project as a one-time credit (rebate).

Table 122: GCCC Utility Management Savings

Facility	Electric Provider	Account Number	Credit Amount
Genoveva Chavez Community Center	PNM	115447884-1174415-5	$1,516

4.6.4 Guaranteed Year 1 Utility Savings

Table 123: Utility Management FIM Guaranteed Year 1 Utility Savings

FIM No.	Facility	Electricity				Natural Gas	Water
		kW	On-Peak kWh	Off-Peak kWh	kWh	therm	kgal
6.05	Genoveva Chavez Community Center	0	0	0	0	0	0
6.07	Municipal Recreation Complex	0	0	0	0	0	0
Total		0	0	0	0	0	0

4.6.5 Financial Summary

Table 124: Utility Management FIM Financial Summary

FIM No.	Facility	Year 1 Annual Utility Savings	Year 1 Annual O&M Savings	Year 1 Total Annual Savings	Labor, Equip & Material Costs	Estimated Utility Rebate	Net Cost
6.05	Genoveva Chavez Community Center	$0	$0	$0	$0	$1,516	($1,516)
6.07	Municipal Recreation Complex	$1,821	$0	$1,821	$0	$0	$0
Total		$1,821	$0	$1,821	$0	$1,516	($1,516)

4.6.6 Scope of Work

Yearout Energy has coordinated with the COSF and PNM to have the proposed rate changes reviewed. PNM has confirmed the proposed changes are acceptable and have applied the requested changes to all future billings.

4.6.7 Equipment Service Life

No new equipment proposed for this measure.

4.6.8 Preliminary Commissioning Plan

There are no components requiring commissioning for this FIM.

4.6.9 Warranty

No new equipment proposed for this measure.

4.6.10 Training

No training required for this measure.

4.7 FIM 7.00 GCCC Solar PV Carport Repairs

4.7.1 Existing Conditions

As described in Section 2.5.8.3, a solar carport system operates on the two electric utility accounts serving this site. This includes a 528kW DC system connected to the larger account and 96kW DC system to the smaller account. The system had a decline in production by 74% at the end of 2016 when production went from 57,109 kWh in November to 14,852 kWh the following month. The average monthly production thereafter was 14,756 kWh per month for the following year of 2017 and even lower in 2018.

A report provided by the original installer, is available in **Appendix J**. YE reviewed this report and system independently. The main causes of the reduction in PV system production are the electric panel breakers tripping and inverter failures. Recently, the system production has been limited so not to trip the breakers. This has increased the production from the prior breaker tripping, but the system is far below full production capacity, and this is not a desirable long-term solution. The solar production is recorded by REC meters; one for each of the two systems that serve the facility. The reduced solar production caused an increase in grid provided consumption. PNM, the utility company, in early 2019 PNM changed the rate for account 115447884-1174415-5 from 2A to 3B, a less advantageous rate for solar production. Design drawings are from 2013 and the system was installed shortly after. Typical inverter warranty is for ten years which means the warranty is ending soon and this is important since there have been inverter failures recently.

GCCC Solar Carport

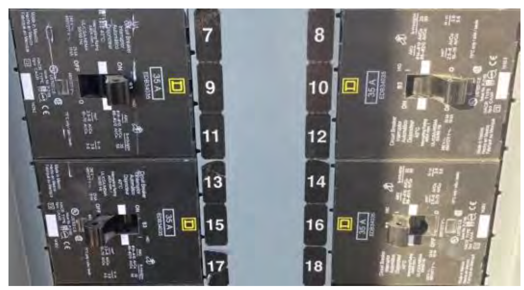
This system provides shade for the parked cars along with a roof mounted solar PV system.

Inverter Errors

Besides invertor failures, multiple inverters are showing error messages that are limiting the system potential production.

Tripped Breakers

Multiple breakers are tripped, and these have been reset and not able to stay on during higher system production times, reducing the overall system production.



4.7.2 Proposed Modifications

The proposed modifications would repair the system to its original design production and include replacing the existing breaker panels, invertors, and install a remote monitoring system that would allow to validate production.

4.7.3 Saving Methodology

Savings for this measure were calculated by utilizing actual utility consumption data for the meter and simulating the monthly production difference between the current baseline and the systems original design output. Detailed calculations are provided in **Appendix J**.

4.7.4 FIM Guaranteed Year 1 Utility Savings

Table 125: GCCC Solar PV Carport Repairs FIM Year 1 Utility Savings

FIM No.	Facility	Electricity				Natural Gas	Water
		kW	On-Peak kWh	Off-Peak kWh	kWh	therm	kgal
7.05	Genoveva Chavez Community Center	0	351,158	125,605	476,763	0	0
Total		0	351,158	125,605	476,763	0	0

4.7.5 FIM Financial Summary

Table 126: GCCC Solar PV Carport Repairs FIM Financial Summary

FIM No.	Facility	Year 1 Annual Utility Savings	Year 1 Annual O&M Savings	Year 1 Total Annual Savings	Labor, Equip & Material Costs	Estimated Utility Rebate	Net Cost
7.05	Genoveva Chavez Community Center	$25,204	$0	$25,204	$155,730	$7,628	$148,102
Total		$25,204	$0	$25,204	$155,730	$7,628	$148,102

4.7.6 Scope of Work

The solar carport repairs will include the following:

1. Replace all 26 existing inverters with 26 Chint Power Systems 23kW AC inverters with Standard 10-Year Warranty.
2. Replace existing 600V wiring with 1000V rated wiring.
3. Install appropriately sized back feed breakers where applicable.
4. Install remote monitoring systems for both PV systems.
5. Existing solar PV modules and carport racking equipment to remain.
6. Perform system commissioning and system optimization tests to ensure the solar system will produce energy as intended as follows:

   a. IV curve trace test of each string to confirm actual production matches nameplate power production.
   b. Confirm invertor AC output matches string power production.
   c. Monitor system production vs production estimates.
7. Provide all materials and labor for design and installation of entire scope of work.

New equipment specifications are provided in **Appendix J.**

Clarifications

1. Installation of all materials will be executed per manufacturer's recommendations.
2. Any conditions not meeting current codes, and any system deficiencies will be brought to the attention of the Agency. Any work required to remedy these situations is excluded.
3. The renovation will not require coordination or authorization from the electrical utility.
4. For carport systems, the associated parking areas will be closed during installation. Closures will be coordinated with the Agency.

Exclusions

1. Surveying
2. Replacement of any defective or underperforming solar panels.
3. Penetrations and sealing of roofing, under buildings and roof membranes.
4. Installation of snow guards.
5. Reassembly of solar panel arrays.
6. Cathodic protection, snow melt and heat trace equipment.
7. Temporary facilities such as water, sanitary and first aid facilities.
8. Independent testing laboratory services including soils and compaction/density testing.
9. Removal of asbestos containing materials, lead containing materials or any other hazardous / suspect materials.
10. Saw cutting, removal, patching, and replacement of landscaping, gravel ground cover, concrete, and asphalt.
11. Formed concrete, including equipment pads, leveling channels, conduit curbs, and pole bases other than defined for racking structures.
12. Cutting, patching and painting and all other miscellaneous coatings.

13. Fire sealing, fireproof patching, damp proofing, and water stops at conduit entrances/penetrations.
14. Tree removal and trimming.
15. Penetrations and sealing of roofing, under buildings and roof membranes.
16. Repair or installation of any structural systems.
17. Cellular monitoring or infrastructure upgrades to support remote monitoring.

4.7.7 Equipment Service Life

The estimated service life for this FIM is as follows:

Table 127: GCCC PV System Repairs FIM Estimated Service Life

FIM Component	% of FIM Total Cost	Median Service Life
Inverters	100%	20 years
FIM Weighted Average Service Life	100%	20 years

4.7.8 Preliminary Commissioning Plan

The following preliminary commissioning plan is intended to serve as the outline from which the final commissioning plan will be developed during the pre-construction / design phase. The final commissioning plan will be primarily focused on validating the proposed equipment and strategies are implemented in accordance with the savings methodology associated with each measure.

1. Develop and issue construction phase commissioning plan.
2. Review equipment submittals to validate the specified performance criteria is in alignment with the proposed savings methodology.
3. Review sequences of operation and controls strategies to validate alignment with proposed savings methodology.
4. Review manufacturer's startup documentation.
5. Develop equipment Pre-Functional Checklists (PFCs).
6. Develop and conduct Functional Performance Testing (FPT) procedures on equipment and sequences of operation to ensure proper operation.
7. Create and maintain a commissioning issues log.
8. Establish trends as required to validate system operation.

9. Coordinate Owner participation as required during commissioning and equipment startup efforts.

10. Participate in staff training activities.

4.7.9 Warranty

An industry standard 1-year materials and workmanship warranty is provided by Yearout Energy. Any material warranties that extend beyond this period will be transferred to the Agency upon project closeout. All available warranty information can be found in **Appendix J3**.

The warranty period information for the major pieces of equipment associated with this measure is summarized in the table below.

Table 128: GCCC Solar PV Carport Repairs FIM Warranty Information

Equipment Description	Warranty Period
String Inverters	10 years

4.7.10 Training

Yearout Energy will co-develop a training plan with the Agency that is tailored to the needs and skill level of the building operators. Training sessions will be conducted during the project implementation phase. These sessions will be recorded and provided in electronic format to the Agency for future reference. Topics commonly covered during these training sessions include:

1. Equipment start-up, proper operation, shutdown, power failure, etc.
2. Sequences of operation
3. Operations and maintenance (O&M) manuals
4. Diagnosing and troubleshooting common equipment issues
5. Preventative maintenance and required documentation
6. Health and safety considerations
7. Warranty information
8. Identified system deficiencies
9. Measurement and Verification (M&V) plan and KPIs which directly impact savings

4.8 FIM 8.00 Roof Replacement

4.8.1 Existing Conditions

The main building at the Canyon Road Water Treatment Plant's (WTP) age is unknown but appears to be 15-25 years of age. The roof survey can be found in **Appendix K1**.The facility has a built-up roof system over a concrete deck. Visual inspection and core samples revealed that the existing built up roof system is different for the upper and lower roofs and composed of the following layers:

Upper Roof

1. 1 ½" polyisocyanurate (Polyiso) closed-cell, rigid foam board roof insulation
2. ½" perlite
3. 3-ply BUR
4. 90# cap sheet
5. Mopped to concrete deck with asphalt

Lower Roof

1. 2" polyiso roof insulation
2. 3-ply BUR
3. 90# cap sheet
4. Mopped to concrete deck with asphalt

Figure 77: Canyon Road Water Treatment Plant Roof Levels and Aeras

South Low Roof

The photo at right shows evidence of severe weathering on the roof material.

Low Roof Core Drill

Roof core, low roof section, showing 2” Polyiso, 3ply BUR, Cap sheet, hot asphalt.

4.8.2 Proposed Modifications

Replacement of the entire Canyon Road WTP Main Building roof surface is recommended due to age-related deterioration noted above. No HVAC equipment or systems are included in the work scope. Should the COSF decide to replace the HFAC equipment at this facility in the future, YE recommends that the engineer of record perform the load calculations to properly size the equipment based on conditions at that time.

4.8.3 Saving Methodology

No utility savings are proposed for this measure.

4.8.4 FIM Guaranteed Year 1 Utility Savings

Table 129: Canyon Road WTP Roof Replacement FIM Year 1 Utility Savings

FIM No.	Facility	Electricity				Natural Gas	Water
		kW	On-Peak kWh	Off-Peak kWh	kWh	therm	kgal
8.19	Canyon Road Water Treatment Plant	0	0	0	0	0	0
Total		0	0	0	0	0	0

4.8.5 FIM Financial Summary

Table 130: Canyon Road WTP Roof Replacement FIM Financial Summary

FIM No.	Facility	Year 1 Annual Utility Savings	Year 1 Annual O&M Savings	Year 1 Total Annual Savings	Labor, Equip & Material Costs	Estimated Utility Rebate	Net Cost
8.19	Canyon Road Water Treatment Plant	$0	$1,740	$1,740	$199,918	$0	$199,918
Total		$0	$1,740	$1,740	$199,918	$0	$199,918

4.8.6 Scope of Work

The modifications are as follows:

1. Provide architect stamped drawings for permit as required by the City of Santa Fe
2. Remove all roofing, insulation, base flashings, misc. flashings and related metal components
3. Install two layers 3.2” poly-iso and 1/4” Invinsa Board in 2-part poly-urethane adhesive – The total R-Value of the new insulation and cover board is approximately 38.62 which exceeds the City of Santa Fe requirements
4. Install new adhered 80 mil PVC membrane
5. Install adhered 60 mil PVC base flashings at walls, parapets and curbs
6. Install new PVC clad gutter liner and scuppers

7. Install new prefinished coping at divider parapet and counter flashings
8. Install miscellaneous flashings and accessories
9. Provide 20-year NDL labor and materials warranty.

Please refer **Appendix K** for a detailed baseline and proposed envelope remediation.

Clarifications

1. Installation will be executed in accordance with industry-standard safety practices and with the care, skill, and diligences provided by a contractor skilled in roofing services.
2. Installation of all materials will be executed per manufacturer's recommendations.

Exclusions

1. Removal and abatement of asbestos-containing materials.
2. Structural and seismic upgrades associated with the replacement of the roof.
3. Temporary heating and cooling.
4. All wood nailers, curbs & blocking.
5. All other sheet metal; Air/Water Barrier; Expansion Joints; Installation of deck flute filler insulation strips.
6. All roof and wall sheathing; fire retardant plywood; hat channels and furring; structural members; caulking sealants & backer rod.
7. Any roof hatches and access ladders; skylights and curbs; concrete splash blocks; mechanical equipment, curbs, plumbing and pipe supports
8. All electrical; painting; testing services; a.

4.8.7 Equipment Service Life

The estimated service life for this FIM is as follows:

Table 131: Roofing Repair FIM Estimated Service Life

FIM Component	% of FIM Total Cost	Median Service Life
Roof	100%	20 Years
FIM Weighted Average Service Life		20 Years

4.8.8 Preliminary Commissioning Plan

The following preliminary commissioning plan is intended to serve as the outline from which the final commissioning plan will be developed during the pre-construction / design phase. The final commissioning plan will be primarily focused on validating the proposed equipment and strategies are implemented in accordance with the savings methodology associated with each measure.

1. Develop and issue construction phase commissioning plan.
2. Review equipment submittals to validate the specified performance criteria is in alignment with the proposed savings methodology.
3. Review sequences of operation and controls strategies to validate alignment with proposed savings methodology.
4. Review manufacturer's startup documentation.
5. Develop equipment Pre-Functional Checklists (PFCs).
6. Develop and conduct Functional Performance Testing (FPT) procedures on equipment and sequences of operation to ensure proper operation.
7. Create and maintain a commissioning issues log.
8. Establish trends as required to validate system operation.
9. Coordinate Agency participation as required during commissioning and equipment startup efforts.
10. Participate in staff training activities.

4.8.9 Warranty

An industry-standard 1-year materials and workmanship warranty is provided by Yearout Energy. Any material warranties that extend beyond this period will be transferred to the Agency upon project closeout. The roofing subcontractor provides a 20-year warranty per Section 4.8.6.

The warranty period information for the major pieces of equipment associated with this measure is summarized in the table below.

Table 132: CRWTP Roof Replacement FIM Warranty Information

Equipment Description	Warranty Period
Roof Labor and Materials	20 years

4.8.10 Training

Yearout Energy will co-develop a training plan with the Agency that is tailored to the needs and skill level of the building operators. Training sessions are recorded and provided in electronic format to the Agency for future reference. Topics commonly covered during these training sessions include:

1. Equipment start-up, proper operation, shutdown, power failure, etc.
2. Sequences of operation
3. Operations and maintenance (O&M) manuals
4. Diagnosing and troubleshooting common equipment issues
5. Preventative maintenance and required documentation
6. Health & safety considerations
7. Warranty information
8. Identified system deficiencies

4.9 Measures Not Recommended

4.9.1 Solar Thermal Pool Heating

Yearout Energy evaluated opportunities for solar thermal pool heating at each of the pools included in the IGA. Preliminary calculations proved this measure to not be financially viable.

4.9.2 LED Ball Park Lighting at Fort Marcy Recreational Center

This measure was evaluated but found not to be financially viable due to high initial costs and low operating hours.

4.9.3 Solar PV

Solar PV systems were evaluated at all IGA sites, but several were found not to be financially viable for a variety of reasons including: poor site conditions, existing solar PV systems, unattractive utility rates and historic district limitations.

Buckman Direct Diversion (BDD) Main was analyzed for potential solar PV system. This would be in addition to the existing solar system provided through a PPA. The current PV system is producing more On-Peak energy than the facility is using during a number of month therefore the installation of solar for this facility is not recommended until the current REC contract runs out and additional information is available in **Appendix E**.

Fire Station #2 was evaluated for a solar PV system and YE recommended and proposed a system. The COSF elected not to include this in the scope of work due to the construction of this site being put on hold.

4.9.4 Utility Meter/Account Consolidation

This is often an opportunity to reduce fixed customer charges at sites where multiple meters that could be consolidated to a single point of service. However, consolidation of meters to eliminate fixed customer charges does not always provide a better financial outcome should the consolidation push the meter/account into a different rate class.

YE performed a high-level preliminary assessment for meter consolidation and found that the existing infrastructure, meter quantities and geographic layout make it non-feasible to recommend a meter consolidation at any IGA sites.

4.10 General Clarifications and Exclusions

4.10.1 General Clarifications

1. Yearout Energy shall provide the necessary scheduling and coordination of its own forces and of subcontractors sufficient to operate the orderly and efficient completion of Yearout Energy's work without delay, interference, or interruption. Yearout Energy will make all efforts to meet schedules agreed to in advance. Yearout Energy's work shall be performed during five-day, forty-hour work weeks. If extended hours are required due to circumstances beyond the control of Yearout Energy, Yearout Energy shall be compensated for additional overhead, premium time costs, and lost productivity. Yearout Energy will substantiate circumstances beyond control in writing to the COSF prior to incurring any additional costs for overhead, premium time and lost productivity.

2. The project will be invoiced monthly, projecting the work through the end of the month. Invoices will include pay requests and schedule of values. Our proposal may involve a significant amount of off-site prefabrication. Yearout Energy anticipates invoicing for materials stored and work performed off-site at our fabrication facility.

3. Payment and performance bond are included.

4. Assumes reasonable access to the work areas.

5. Upgrades and modifications are to match existing material types in like-kind unless specifically noted otherwise in the scope of work.

6. COSF should anticipate limited planned outages and service interruptions as necessary to complete the scope of work. Yearout Energy will work diligently with COSF to determine the best plan for work.

7. Assumes that existing building electrical service and infrastructure is adequate to power new equipment.

8. We anticipate temporary power for tools and welding equipment will be available within 75' of work areas.

9. Our proposal anticipates operating under the guidelines of Yearout's Safety Program. We reserve the right to review requirements of any other safety program that will be in force on the project to determine if additional costs will apply.

10. We anticipate parking for craft and supervisory personnel will be on the job site. Any necessary permits will be issued by COSF for craft personnel. Transportation of our employees from an off-site location is not included.

11. Assumes adequate lay-down areas and storage facilities will be available in order to facilitate the execution of our work.

12. Yearout Energy has included separate trash dumpster for disposal of construction waste.

13. Permits and inspections by the AHJ are included.

4.10.2 General Exclusions

1. Removal of any hazardous materials. Should any hazardous materials be encountered, we will immediately notify COSF to determine a mutually agreeable course of action. We reserve the right to be compensated for cost related to the discovery of any hazardous material. No work will be performed in areas containing hazardous materials.
2. Provisions for seismic calculations
3. The requirement to provide additional insured status on the employer's worker's compensation insurance.
4. Repair or correction of pre-existing code violations.
5. Temporary heating and cooling.
6. Existing ductwork cleaning or sealing.

5.0 Measurement and Verification (M&V)

During the Investment Grade Audit (IGA), Yearout Energy follows industry best practices and governing agency requirements to identify and develop the most appropriate M&V plan per project and individual measure. Procedures for M&V vary based on complexity, risk, cost, the magnitude of savings and level of assurance required by project stakeholders. Our approach aligns with guidelines established by IPMVP. Yearout Energy develops the M&V plan and provided an opportunity to the project stakeholders for review and comment to ensure methodologies are clearly understood and project risks and responsibilities are properly allocated between Yearout Energy and the Agency.

Following the installation and commissioning of the project scope, Yearout Energy shall execute the post-construction Measurement and Verification plan to confirm the expected guaranteed savings are achievable based on as-built conditions. As with all construction projects, unforeseen conditions may lead to a change in the scope of work. YE will address these conditions as they arise and will ensure that the final scope of work will meet or exceed the guaranteed savings proposed. Yearout Energy shall author, distributes and reviews the findings of this report with the Agency for complete transparency.

The project is then transitioned into the performance assurance phase, where Yearout Energy shall perform the co-developed annual M&V plan outlined herein for ongoing validation of guaranteed savings.

The proposed preliminary Measurement and Verification plan have been developed to comply with the State of New Mexico "Public Facility Energy Efficiency and Water Conservation Act" [Chapter 6, Article 23, Section 8 NMSA 1978]. The determination of verified savings will follow current best practices as defined in the 2014 IPMVP Core Concepts June 2014, EVO 10000-1:2014.

5.1 M&V Reporting

Yearout Energy will prepare an annual M&V Report which will detail the following items for the reporting period:

- Date and time of site visits
- Areas assessed with a summary of findings
- Evaluation of system and overall performance
- Changes to facility operation along with identified impacts to the guarantee
- Verified utility consumption and cost savings
- Comparison of verified versus guaranteed savings
- Description of any required adjustments to the baseline or guaranteed savings

- Description of any shortfalls in guaranteed savings and plan for reimbursement

Yearout Energy will require ongoing access to all utility information throughout the duration of the performance period. This information will be tracked monthly and summarized in the annual M&V Report.

5.2 Adjustments to the Baseline

For the full duration of the performance period, COSF will be responsible for reporting the following items to Yearout Energy:

- Changes in the facility area
- Changes in space type or use
- Changes in operating hours
- Changes in occupancy
- Changes in set points, schedules, and sequences of operation
- Changes in equipment
- Changes to maintenance procedures
- Issues with installed equipment

Adjustments to the baseline or guarantee may be necessary when significant changes to any of the above-noted items occur. Additional adjustments for changes in weather will be accounted for on applicable measures. According to the IPMVP, baseline adjustments come in two forms:

- Routine Adjustments
    - Factors that expected to change routinely during the reporting period. An example is weather.
- Non-Routine Adjustments
    - Factors not usually expected to change. Examples include adjustments include facility size, space types, occupancy, and internal loads.

5.3 M&V Option per FIM

The proposed M&V option per FIM is depicted in the following table.

Table 133: M&V Option per FIM

FIM No.	FIM Name	M&V Option
1.00	LED Lighting	Option A – Retrofit Isolation
2.00	Renewable Energy	Option B – Retrofit Isolation
3.00	Water Conservation	Option A – Retrofit Isolation
4.00	Building Envelope	Option A – Retrofit Isolation
5.00	High Efficiency Transformers	Option A – Retrofit Isolation
6.00	Utility Measurement	Non-Measured
7.00	GCCC Solar Carport Repairs	Option B – Retrofit Isolation
8.00	Roof Replacement	Non-Measured

5.4 Annual M&V Fee

The Year-1 M&V Fee is $68,632 The M&V Fee will escalate at a rate of 2.500% annually for the duration of the project as depicted in the table below. The Agency will be responsible for payment of the annual M&V Fee, as these ongoing costs are considered annual fees, and cannot be financed up front.

Table 134: Annual M&V Fee

Year	M&V Fee	Year	M&V Fee
1	$68,632	10	$85,712
2	$70,348	11	$87,855
3	$72,106	12	$90,051
4	$73,909	13	$92,302
5	$75,757	14	$94,610
6	$77,651	15	$96,975
7	$79,592	16	$99,400
8	$81,582	17	$101,885
9	$83,621	18	$104,432

5.5 Preliminary M&V Plan

Table 135: Preliminary M&V Plan

FIM	Facility	IPMVP Option	Guarantee Factor	KPI No.	Key Performance Indicator	Baseline Value	Proposed Value	Baseline Audit Task	Post-Retrofit M&V Task	Annual M&V Task	Ongoing Owner Responsibilities	Stipulated Factors
1.00 LED Lighting	1. Bicentennial/Alto Park Complex 2. BDD Main 3. Fire Station #8 4. Fort Marcy Recreation Complex 5. Genoveva Chavez Community Center 6. La Familia Medical Center 7. Municipal Recreation Center 8. Police Dept – Admin 9. Public Library – Main 10. Public Library – Southside 11. Salvador Perez Swimming Pool 12. Santa Fe Convention Center 13. Santa Fe Regional Airport 14. Santa Fe Water Division Office 15. Siler Complex 16. Siringo Complex 17. Transit Administration 18. WWTP 19. Camino La Canada 20. Cristo Rey Church Pump 21. Dempsey Booster Station 22. Well Los Montoyas 23. BDD Booster Station #2A 24. BDD Lift Station 25. BDD Booster Station #1A 26. Buckman Well #10 27. Buckman Booster Station #1 28. Buckman Well #1	A	90%	1	Fixture Input Power	Refer to Appendix D1 (Room-by-Room)	Refer to Appendix D1 (Room-by-Room)	1. Detailed lighting survey 2. Reviewed as built and Mfr. documentation	1. Review and update as-built documentation based on final commissioned and verified equipment installed 2. Revise calculations based on as-built conditions. 3. Post-retrofit testing on a sample of fixtures.	1. Perform visual inspection of approximately 10% of the installed lighting equipment to validate proper operation	1. Maintain equipment per Mfr's and Yearout Energy's recommendations 2. Immediately notify Yearout Energy of any changes made to equipment or operation 3. Replacement equipment shall meet or exceed proposed equipment performance	1. Input power per Mfr data and original construction drawings and specifications.
				2	Fixture Quantities	Refer to Appendix D1 (Room-by-Room)	Refer to Appendix D1 (Room-by-Room)	1. Detailed lighting survey	1. Review as-built documentation based on final commissioned and verified equipment installed 2. Revise calculations based on as-built conditions	None	1. Immediately notify Yearout Energy of any changes to fixture quantities	None
				3	Burn Hours	Refer to Appendix D6	Refer to Appendix D6	1. Detailed lighting survey 2. Owner interviews 3. Applied industry standards / best practices 4. Occupancy/lighting logging	None	None	1. Immediately notify Yearout Energy of any changes to facility operation	1. Baseline and Proposed Burn Hours

FIM	Facility	IPMVP Option	Guarantee Factor	KPI No.	Key Performance Indicator	Baseline Value	Proposed Value	Baseline Audit Task	Post-Retrofit M&V Task	Annual M&V Task	Ongoing Owner Responsibilities	Stipulated Factors
2.00 Renewable Energy	1. Bicentennial/Alto Park Complex 2. Canyon Road Water Treatment Plant 3. Fire Station #8 4. Municipal Recreation Center 5. Police Dept – Admin 6. Public Library – Southside 7. Santa Fe Regional Airport 8. Southside Transit Center 9. 10M Gallon Tank 10. WWTP 11. Camino La Canada 12. Well Los Montoyas 13. BDD Lift Station 14. BDD Booster Station #1A 15. Buckman Well #10 16. Buckman Booster Station #1 17. Buckman Booster Station #4 18. Buckman Booster Station #3 & Well #13	B	90%	1	Production	Refer to FIM Savings Methodology in IGA Report	Refer to FIM Savings Methodology in IGA Report	1. Review baseline utility information and electric rate structure 2. Site survey to confirm array orientation, available space and means of interconnection	1. Review as-built documentation to validate installed equipment meets minimum performance criteria. 2. Functional performance test to validate proper operation per the IGA.	1. Continuously review system production via remote monitoring to ensure proper operation.	1. Refrain from introducing any obstructions that would shade the PV system and negatively impact system performance 2. Maintain equipment free of debris 3. Maintain equipment per manufacturer's and Yearout Energy's recommendations 4. Immediately notify Yearout Energy of any changes made to equipment operation 5. Any replacement equipment shall meet or exceed the proposed performance criteria. 6. Provide Yearout Energy remote access for monitoring PV system operation	1. Weather / Solar Insolation 2. Solar Access / Shading 3. Proposed equipment efficiencies per Mfr's data. 4. Utility Net Metering Program 5. Utility Avoided Cost Rates
3.00 Water Conservation	1. Bicentennial/Alto Park Complex 2. Fire Station #8 3. Fort Marcy Recreation Complex 4. Genoveva Chavez Community Center 5. La Familia Medical Center 6. Police Dept – Admin 7. Public Library – Main 8. Public Library – Southside 9. Salvador Perez Swimming Pool 10. Sandoval Parking Garage Lot B 11. Santa Fe Convention Center 12. Santa Fe Water Division Office 13. Siler Complex 14. Siringo Complex 15. Transit Administration	A	90%	1	Fixture Utilization	Refer to FIM Savings Methodology in IGA Report	Refer to FIM Savings Methodology in IGA Report	1. Occupancy information provided by owner 2. Site survey of fixture types and quantities	None	None	1. Immediately notify Yearout Energy of any major changes to buildings' occupancy or operation.	1. Occupancy / Enrollment 2. Building Operation Schedule
				2	Volume Flow Rate / Flush Volume	Refer to FIM Savings Methodology in IGA Report	Refer to FIM Savings Methodology in IGA Report	1. Pre-retrofit testing on a sample of fixtures with a calibrated water measuring device to validate proper operation	1. Post-retrofit testing on a sample of fixtures with a calibrated water measuring device to validate proper operation 2. Revise calculations based on as-built conditions	1. Visually inspect a sample of fixtures in Year 1 only to validate proper operation	1. Maintain equipment per Mfr's and Yearout Energy's recommendations 2. Immediately notify Yearout Energy of any changes made to equipment or operation 3. Replacement equipment shall meet or exceed proposed equipment performance	1. DHW Temperature 2. Percent hot water 3. Water Pressure

FIM	Facility	IPMVP Option	Guarantee Factor	KPI No.	Key Performance Indicator	Baseline Value	Proposed Value	Baseline Audit Task	Post-Retrofit M&V Task	Annual M&V Task	Ongoing Owner Responsibilities	Stipulated Factors
4.00 Building Envelope	1. Bicentennial/Alto Park Complex 2. BDD Main 3. Canyon Road Water Treatment Plant 4. Fire Station #8 5. Fort Marcy Recreation Complex 6. Genoveva Chavez Community Center 7. La Familia Medical Center 8. Municipal Recreation Center 9. Police Dept – Admin 10. Public Library – Main 11. Public Library – Southside 12. Salvador Perez Swimming Pool 13. Santa Fe Convention Center 14. Santa Fe Regional Airport 15. Santa Fe Water Division Office 16. Siler Complex 17. Siringo Complex 18. Transit Administration	A	90%	1	Leakage Area	Refer to FIM Savings Methodology in IGA Report	Refer to FIM Savings Methodology in IGA Report	1. Detailed site survey to identify existing leakage area	1. Review as-built documentation to validate materials installed and leakage area addressed meet minimum performance criteria.	1. Visually inspect a sample of areas in Year 1 and Year 3 only to validate materials installed are performing as intended.	1. Maintain materials per mfr's and Yearout Energy's recommendations 2. Immediately notify Yearout Energy of any changes made to materials. 3. Any replacement materials shall meet or exceed the proposed performance criteria.	1. Weather 2. Heating and Cooling Equipment Efficiencies 3. Operating Schedules
5.00 High Efficiency Transformers	1. Bicentennial/Alto Park Complex 2. Canyon Road Water Treatment Plant 3. Municipal Recreation Complex 4. Public Library – Southside 5. Transit Administration 6. WWTP	A	90%	1	Transformer Losses	Refer to FIM Savings Methodology in IGA Report	Refer to FIM Savings Methodology in IGA Report	1. Site survey of existing equipment 2. Applied industry standards / best practices"	1. ISO 17025 Certified Test Lab measurements of replacement transformers to validate performance.	None	1. Maintain equipment per Mfr's and Yearout Energy's recommendations 2. Immediately notify Yearout Energy of any changes made to equipment or operation 3. Replacement equipment shall meet or exceed proposed equipment performance criteria. 4. Provide Yearout Energy remote access for monitoring equipment operation.	1. Equipment Operating Hours 2. Equipment Percent Loads 3. Heating and Cooling System Efficiencies
6.00 Utility Management	1. Genoveva Chavez Community Center 2. Municipal Recreation Complex	Non-Measured	100%	----- -----	----------	----------	----------	----------	----------	----------	----------	----------

FIM	Facility	IPMVP Option	Guarantee Factor	KPI No.	Key Performance Indicator	Baseline Value	Proposed Value	Baseline Audit Task	Post-Retrofit M&V Task	Annual M&V Task	Ongoing Owner Responsibilities	Stipulated Factors
7.00 Renewable Energy – GCCC Solar PV Repairs	1. Genoveva Chavez Community Center	B	90%	1	Production	Refer to FIM Savings Methodology in IGA Report	Refer to FIM Savings Methodology in IGA Report	1. Review baseline utility information and electric rate structure 2. Site survey to confirm array orientation, available space and means of interconnection	1. Review as-built documentation to validate installed equipment meets minimum performance criteria. 2. Functional performance test to validate proper operation per the IGA.	1. Continuously review system production via remote monitoring to ensure proper operation.	1. Refrain from introducing any obstructions that would shade the PV system and negatively impact system performance 2. Maintain equipment free of debris 3. Maintain equipment per manufacturer's and Yearout Energy's recommendations 4. Immediately notify Yearout Energy of any changes made to equipment operation 5. Any replacement equipment shall meet or exceed the proposed performance criteria. 6. Provide Yearout Energy remote access for monitoring PV system operation	1. Weather / Solar Insolation 2. Solar Access / Shading 3. Proposed equipment efficiencies per Mfr's data. 4. Utility Net Metering Program 5. Utility Avoided Cost Rates
8.00 Roof Replacement	1. Canyon Road Water Treatment Plant	Non-Measured	No Savings	1	Roof Condition	Failing/Leaking	Replace and/or Repair Roof	1. Site Survey 2. Reviewed as-built documentation for existing roof 3. Staff interviews	1. Review as-built documentation to validate installed materials meet minimum performance criteria	None	1. Maintain roofing materials per Mfr's and Yearout Energy's recommendations. 2. Immediately notify Yearout Energy of any changes made to roofing materials. 3. Any replacement materials shall meet or exceed the proposed performance criteria.	None

6.0 Economic Analysis

6.1 Guaranteed Annual Utility Savings

The following table depicts the Year 1 guaranteed utility consumption savings per FIM. The savings presented in this report are guaranteed each year for the duration of the project term.

Table 136: Year 1 Guaranteed Utility Consumption Savings per FIM

FIM No.	FIM Name	Electricity				Natural Gas	Water
		kW	On-Peak kWh	Off-Peak kWh	kWh	therm	kgal
1.00	LED Lighting	3,203	1,244,780	1,075,544	2,320,324	(4,498)	0
2.00	Renewable Energy	0	3,199,669	1,135,582	4,335,251	0	0
3.00	Water Conservation	0	0	0	0	5,858	2,007
4.00	Building Envelope	0	1,091	763	1,854	27,126	0
5.00	HE Transformers	63	45,009	76,337	121,347	0	0
6.00	Utility Management	0	0	0	0	0	0
7.00	GCCC Solar Carport Repairs	0	351,158	125,605	476,763	0	0
8.00	Roof Replacement	0	0	0	0	0	0
Total		3,266	4,841,707	2,413,831	7,255,538	28,486	2,007

A FIM specific guarantee factor (GF) is applied to the estimated savings to determine the guaranteed savings for each FIM. The guarantee factors can be found in Table 135: Preliminary M&V Plan. The applied guarantee factor is dependent on the FIM type, a methodology for calculating savings, understanding of the facility, experience implementing similar measures, and the level of risk acceptable to meet the Agency's financial objectives for the project.

Where the estimated savings are positive, the guarantee factor is applied as follows:

*[Guaranteed Savings = Estimated Savings * Guarantee Factor]*

Where the Estimated Savings are a negative value, the Guarantee Factor is applied as follows:

*[Guaranteed Savings = Estimated Savings * (1 + (1 – Guarantee Factor))]*

The following table depicts the Year 1 utility cost savings per FIM.

Table 137: Year 1 Utility Cost Savings per FIM

FIM No.	FIM Name	Electricity	Natural Gas	Water	All Utilities
		$	$	$	$
1.00	LED Lighting	$218,775	($1,719)	$0	$217,056
2.00	Renewable Energy	$473,609	$0	$0	$473,609
3.00	Water Conservation	$0	$2,239	$12,165	$14,404
4.00	Building Envelope	$110	$10,367	$0	$10,477
5.00	HE Transformers	$9,567	$0	$0	$9,567
6.00	Utility Management	$1,821	$0	$0	$1,821
7.00	GCCC Solar Carport Repairs	$25,204	$0	$0	$25,204
8.00	Roof Replacement	$0	$0	$0	$0
Total		$729,086	$10,887	$12,165	$752,137

As required by State statute, Yearout Energy must provide a performance guarantee in the form of a performance bond, cash bond, letter of credit or other surety each year in the amount equal to the annual guarantee. Yearout Energy intends to secure an energy savings guarantee bond renewed annually for the full Measurement and Verification term.

6.2 Operations & Maintenance (O&M) Savings

Historic operations and maintenance (O&M) costs were not available for evaluation during the IGA. Therefore, Yearout Energy has applied a conservative O&M savings estimate, below 5% of total annual utility savings, for applicable measures as depicted in the following table. To determine the average annual O&M savings, the identified reduction to baseline O&M expenditures was multiplied by the ratio of the service life of each specific FIM over the finance term. If the service life exceeds the finance term, the ratio is fixed at 1.

*[Average Annual O&M Savings = Est. Annual O&M Savings * (FIM Service Life / Finance Term)]*

For FIM 8.00 Roof Replacement, a conservative $\$0.15/ft^2$ of annual O&M savings was estimated.

Based on this analysis, the Year 1 O&M saving established for this project is depicted in the table below. O&M savings were carried for the anticipated average service life of each individual. FIM.

Table 138: Year 1 Operations & Maintenance (O&M) Savings

FIM No.	FIM Name	Avg Service Life	Annual Utility Savings	Average Annual O&M Savings	% of Annual Utility Savings
1.00	LED Lighting	15.0 Years	$217,056	$21,761	10.03%
2.00	Renewable Energy	37.0 Years	$473,609	$0	0.00%
3.00	Water Conservation	20.0 Years	$14,404	$1,135	7.88%
4.00	Building Envelope	20.0 Years	$10,477	$1,572	15.00%
5.00	HE Transformers	32.0 Years	$9,567	$1,435	15.00%
6.00	Utility Management	0.0 Years	$1,821	$0	0.00%
7.00	GCCC Solar Carport Repairs	20.0 Years	$25,204	$0	0.00%
8.00	Roof Replacement	20.0 Years	$0	$1,740	-----
Total	----------		$752,137	$27,643	3.68%

6.3 Capital Contribution by Agency

The following table depicts the anticipated capital contribution amounts by the Agency per FIM.

Table 139: Capital Contribution by Agency per FIM

FIM No.	FIM Name	Capital Contribution
1.00	LED Lighting	$0
2.00	Renewable Energy	$925,000
3.00	Water Conservation	$0
4.00	Building Envelope	$0
5.00	HE Transformers	$0
6.00	Utility Management	$0
7.00	GCCC Solar Carport Repairs	$0
8.00	Roof Replacement	$200,000
Total		$1,125,000

6.4 Estimated Incentives | Rebates

Utility providers often provide incentives to customers who implement select efficiency improvements to their facilities. Yearout Energy will coordinate with utility providers and submit required documentation during the implementation period. Utility rebates are estimated and subject to availability and final award by the utility provider. Rebates are not guaranteed by Yearout Energy, as these programs are at the discretion of the utility company. All awarded rebates will be paid directly to the Agency by the utility provider.

The proposed scope of work for this project is anticipated to provide the Agency the following estimated rebates per FIM.

Table 140: Estimated Utility Rebates

FIM No.	FIM Name	Estimated Utility Rebate
1.00	LED Lighting	$192,032
2.00	Renewable Energy	$0
3.00	Water Conservation	$21,450
4.00	Building Envelope	$0
5.00	HE Transformers	$7,766
6.00	Utility Management	$1,516
7.00	GCCC Solar Carport Repairs	$7,628
8.00	Roof Replacement	$0
Total		$230,392

6.5 Escalation Rates

The proposed utility escalation rates were determined using the Energy Escalation Rate Calculator (EERC), a tool developed by the National Institute for Standards and Technology (NIST), which computes an average rate of escalation for a specified time period, which can be used as an escalation rate for contract payments in Guaranteed Energy Savings Performance Contracts (GESPC). The calculator prompts the user for information on project location, fuel usage, industry sector, and the beginning and end dates of the performance period. A description of these inputs is provided below.

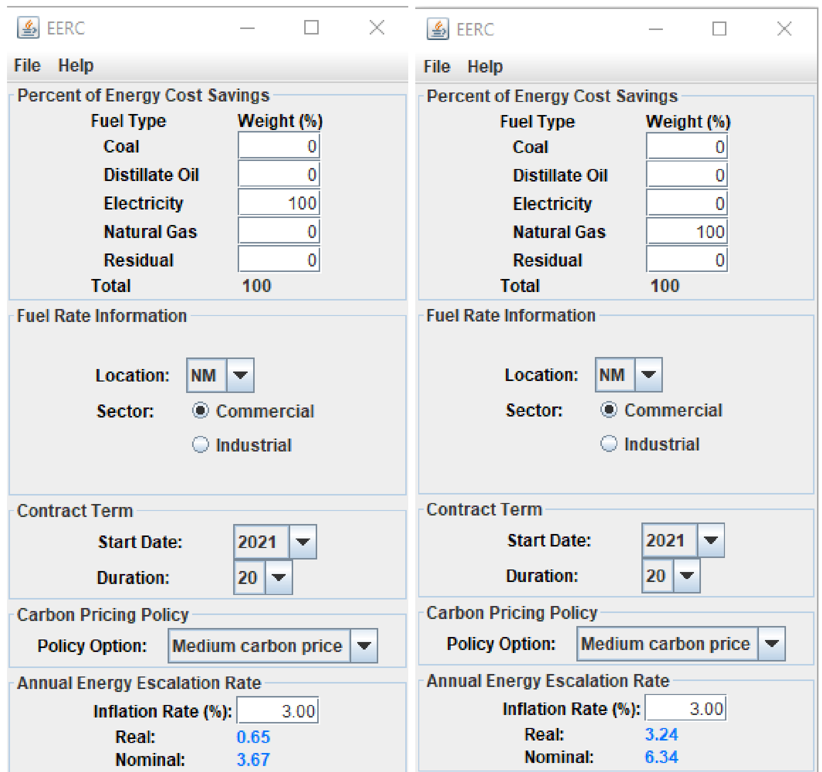


Figure 78: Energy Escalation Rate Calculator

The results of this EERC analysis generated a nominal annual escalation rate of 3.67% for electricity and 6.34% for natural gas, both of which are higher than the escalation rates applied in the project financial analysis. The annual escalation rates applied to this project are 3.60% for electricity and 4.00% for natural gas as depicted in the preliminary project financial analysis herein.

Percent of Energy Cost Savings: Percentage of energy cost savings in dollars that is attributable to one or more of the fuel types used in the project. This input is used to weight the escalation rate.

Location: Selection of the state in which the project is located allows the program to select the energy price escalation rates for the corresponding Census Region.

Sector: Selection of commercial or industrial sector determines the type of utility rate schedule applied to the energy cost calculation.

Performance Period Start Date: Date when energy savings start to accrue, which is usually after project acceptance at the beginning of the performance period.

Performance Period Duration: Number of years of the performance period for which the average escalation rate will be calculated.

Carbon Pricing Policy: Medium Carbon Price. Assumes the most recent climate change bill (American Clean Energy and Security Act of 2009: H.R. 2454) is enacted as is with no restrictions on offsets or generating capacity installation. Assumes that all states decrease electricity emissions at the national average rate for this policy option

Inflation Rate: The sustained increase in the general price level of goods and services in an economy over a period of time.

Real and Nominal Escalation Rates: The output of the program is the calculated average escalation rate, stated both in real terms (excluding the rate of inflation) and in nominal terms (including the rate of inflation).

The following annual escalation rates have been factored into the project's economic analysis.

Table 141: Annual Escalation Rates

Category	Escalation Rate
Electricity	3.600% / Year
Natural Gas	4.000% / Year
Water & Sewer	3.000% / Year
Operations & Maintenance	3.000% / Year

6.6 GESPC Project Budget Summary

The table below depicts the proposed GESPC Project open-book budget summary.

Table 142: GESPC Project Budget Summary

Investment Grade Audit (IGA)	Area	$/SF	$
Investment Grade Audit (IGA) Cost	598,000 SF	$0.175/SF	$104,650
		IGA Subtotal	$104,650
Implementation Cost		% of Implem. Cost	$
Pre-Construction Costs			
Design and Other Engineering		2.25%	$279,734
Pre-Construction Services		2.65%	$329,737
Other Pre-Construction Costs		1.54%	$191,405
		Pre-Construction Subtotal	$800,876
Construction Costs			
Trade Subcontracts		2.35%	$292,819
Design/Build Subcontracts		79.37%	$9,886,777
Direct Purchase Equipment		1.17%	$145,270
Construction Management		2.78%	$346,196
Project Engineering		0.75%	$93,582
General Conditions		1.91%	$238,266
Construction Completion		1.41%	$175,283
Other Construction Costs		3.83%	$477,690
		Construction Subtotal	$11,655,884
		Implementation Subtotal	$12,456,760
Profit | Contingency		%	$
Profit		10.00%	$1,256,141
Contingency		2.25%	$282,632
		Profit | Contingency Subtotal	$1,538,773
Total Funded Amount (Before Taxes and State Fees)			$14,100,183
Other Project Cost		%	$
State Review Fees		1.00%	$141,002
Gross Receipts Tax		8.4375%	$1,201,600
		Other Project Cost Subtotal	$1,342,602
Total Funded Amount			$15,442,785

The following table provides a description of each cost category from the Budget Summary above:

Table 143: Description of Project Cost Categories

Investment Grade Audit	Description
Investment Grade Audit Fee	The IGA fee is based on the number of facilities and gross square footage included in the project.
Pre-Construction Costs	**Description**
Design and Other Engineering	All professional architectural and engineering costs required to design and specify the project scope of work, including engineering design, architectural design, additional energy engineering not included in IGA, engineering oversight and direction, code review.
Pre-Construction Services	Activities required prior to commencing construction, including safety planning, additional bid solicitation, design review, submittal review, construction management planning, constructability reviews, coordination of utility incentives, scheduling, procurement planning and other direct costs associated with presenting the best information to the Agency.
Other Pre-Construction Costs	Site visits and Owner meetings are necessary before construction to ensure designs and equipment meet customer needs and align with project objectives. Other Pre-construction Costs may include but are not limited to administrative support, legal review, accounting services, printing, copying, binding, office supplies, business travel, business meals and supervision of project development staff.
Construction Fees	**Description**
Trade Subcontractors	Subcontractors mutually selected by Yearout Energy and the Agency as the result of a competitive RFP process. Such subcontractors may include lighting contractors, sheet metal contractors, piping contractors, electricians, plumbers, carpenters, controls contractors, and other trade contractors as necessary to complete the project scope of work.
Design-Build Subcontractors	Design-Build subcontractors are design and construction contractors that are engaged during the Investment Grade Audit to assist in the development and design of the project scope of work. Design-Build subcontractors act as their own design agent and finalize the design of the work product to be installed with oversight and direction provided by Yearout Energy. Such subcontractors include lighting contractors that perform the audit and design; mechanical contractors that coordinate all of their own electrical, sheet metal work, piping, and other support work; specialty contractors like pool cover vendors, and other specialty contractors necessary to complete the Work, are included in this category.
Direct Purchase Equipment	Direct purchases for equipment, materials, and supplies made by Yearout Energy.

Construction Management	Oversight and coordination of all work (direct and subcontractors) including construction management, site supervision, safety, quality control, scheduling, budget management, contract administration, submittals, and other construction-related items).
Project Engineering	Engineering & design support during the project implementation phase. Periodic inspections of work and supporting the construction manager with an engineering analysis of required field modifications.
General Conditions	Miscellaneous project implementation costs, including job trailer, trailer office equipment, temporary utilities, permanent utility connection fees, barriers/security fencing, scaffolding, equipment rental, site guards, cleaning and trash and recycling dumpsters, lifts, and other direct project costs.

Construction Completion	Description
Commissioning	At the completion of the construction, Yearout Energy shall perform pre-functional and post-functional tests of all installed measures to ensure proper operation. This intensive quality assurance process ensures all systems and components installed as part of the GESPC project are operating as intended to achieve the desired performance and guaranteed savings.
Construction Measurement & Verification (M&V)	At the completion of construction, Yearout Energy shall perform the measurement and verification (M&V) of installed equipment to verify post-retrofit energy efficiency and operation. These activities include: establishing trends and deploying long-term data loggers, reviewing as-built documentation and updating savings calculations, accordingly, performing post-installation M&V activities defined in performance assurance plan, generating and delivering the post-installation M&V report, and other M&V activities. This effort is necessary to ensure systems will meet the guaranteed energy savings and commence the performance assurance phase.
O&M Manuals	At the completion of construction, Yearout Energy shall provide complete Operation and Maintenance (O&M) Manuals to the Agency for reference.
Training	The process of ensuring that facility staff have been properly trained to operate and maintain the new systems and components installed as part of the GESPC project.

Other Construction Costs	Description
Permits	Construction is performed in various jurisdictions requiring compliance with jurisdictional codes. Yearout Energy must pay each jurisdiction to review design drawings and render decisions on designs meeting code. In addition, Yearout Energy must apply for and receive any necessary construction permits based on designs and/or code review. This line item includes all costs associated with paying code reviewers, application fees and inspections fees for such permits.
Insurance	Yearout Energy is required to possess various levels of Builder's Risk Insurance, Automobile Liability Insurance, Professional Liability Insurance, and other General Liability Umbrella policies. This line item shall include an average amount of insurance that would be attributed to the project scope of work.
Performance & Payment Bonds	A surety bond issued to guarantee satisfactory completion of the project delivered by Yearout Energy to the Agency. The P&P Bond cost ranges from 0.8% to 1.2% based on the total project amount and construction period duration. A premium is often applied if the construction period extends beyond 24 months.
Warranty Labor	The costs associated with supporting and coordinating equipment warranties during the first year following substantial completion.
Profit | Contingency	**Description**
Profit	The compensation to Yearout Energy for the assumption of the risk and delivery of the GESPC Project.
Contingency	A special monetary provision used to cover uncertainties or unforeseeable elements of cost during project implementation. Any unused contingency will be applied towards additional scope as approved by the customer.

Annual Costs	Description
Measurement & Verification (M&V)	The process for quantifying the savings delivered by the various measures included in the GESPC project following IPMVP guidelines. Actual costs for this item are highly dependent upon the final measures installed and M&V options selected.
Maintenance	This is an optional item that is at the Agency's discretion to include. The inclusion of this item is encouraged for Owners that do not have the in-house capabilities to maintain the equipment after installation.

6.7 FIM Summary

The determination of appropriate FIM's for implementation is the result of an iterative process with input from the Agency, engineering best practices, and economic analysis. Infrastructure capital improvement measures are not driven simply by utility savings or return on investment, but rather by the necessity to keep the facility operational. This project includes both capital improvement and energy conservation type measures which are blended into a bundled solution that achieves the Agency's operational and financial objectives.

Table 144: Recommended FIMs Summary

FIM No.	FIM Name	Year 1 Annual Utility Savings	Year 1 Annual O&M Savings	Year 1 Total Annual Savings	Labor, Equip & Material Costs	Estimated Utility Rebate	Net Cost
1.00	LED Lighting	$217,056	$21,761	$238,818	$2,222,158	$192,032	$2,030,126
2.00	Renewable Energy	$473,609	$0	$473,609	$7,167,913	$0	$7,167,913
3.00	Water Conservation	$14,404	$1,135	$15,539	$173,807	$21,450	$152,357
4.00	Building Envelope	$10,477	$1,572	$12,048	$206,170	$0	$206,170
5.00	HE Transformers	$9,567	$1,435	$11,002	$199,171	$7,766	$191,405
6.00	Utility Management	$1,821	$0	$1,821	$0	$1,516	($1,516)
7.00	GCCC Solar Carport Repairs	$25,204	$0	$25,204	$155,730	$7,628	$148,102
8.00	Roof Replacement	$0	$1,740	$1,740	$199,918	$0	$199,918
Total		$752,137	$27,643	$779,780	$10,324,867	$230,392	$10,094,474

Investment Grade Audit	$104,650
Pre-Construction Cost	$800,876
Construction Cost (Includes FIM Labor, Equipment and Materials Cost)	$11,655,884
Profit	$1,256,141
Contingency	$282,632
Total Funded Amount (Before Taxes and State Fees)	$14,100,183
State Review Fee	$141,002
Gross Receipts Tax	$1,201,600
Total Funded Amount	$15,442,785

*Simple Payback Years = Net (Hard) Cost / Year 1 Total Annual Savings
Net Cost = Labor, Equip & Material Costs (Hard Cost) - Estimated Utility Rebate
Year 1 Total Annual Savings = Year 1 Annual Utility Savings + Year 1 Annual O&M Savings

6.8 Preliminary Project Financial Analysis

General Inputs	
Length of Analysis	25 Years
Turn-Key Project Cost	$15,442,785
Up-Front Capital Contribution	$1,125,000
Other Grants & Incentives	$0
Utility Rebate	$230,392
Capitalized Interest (16 Month Construction Period)	$3,340
Cost of Issuance	$189,614
Net Financed Amount	$14,280,347
Type of Amortization	Savings
Finance Term	18 Years
Annual Interest Rate	2.250%

Measurement & Verification	
Year 1 M&V Fee	$68,632
M&V Duration	3 Years

Annual Maintenance	
Year 1 Maintenance Fee	$16,571
On-Going Maintenance Duration	25 Years

Inverter Equipment Replacement (Appears in Maintenance Column)	
Estimated Cost to Replace Solar PV Inverters	$416,700
Anticipated Year of Replacement	Year 15
Annual Amount Set Aside for Equip Replacement	$27,780

	Annual Savings				Annual Costs				Amortization Schedule				
Annual Escalation -->	Electricity	Natural Gas	Water & Sewer	O&M	M&V	Maintenance	Equipment Replacement	Total Annual Savings Less Costs	Interest	Principal	Total Payment	Ending Balance	Annual Cash Flow
	3.600%	4.000%	3.000%	3.000%	2.500%	3.000%							
Year 1	$729,086	$10,887	$12,165	$27,643	($68,632)	($16,571)	($27,780)	$666,797	($321,308)	($345,490)	($666,796)	$13,934,857	$1
Year 2	$755,333	$11,322	$12,530	$28,472	($70,348)	($17,068)	($27,780)	$692,461	($313,534)	($378,927)	($692,460)	$13,555,930	$1
Year 3	$782,525	$11,775	$12,906	$29,326	($72,106)	($17,580)	($27,780)	$719,065	($305,008)	($414,057)	($719,064)	$13,141,873	$1
Year 4	$810,696	$12,246	$13,293	$30,206	$0	($18,107)	($27,780)	$820,553	($295,692)	($524,861)	($820,552)	$12,617,012	$1
Year 5	$839,881	$12,736	$13,692	$31,112	$0	($18,650)	($27,780)	$850,990	($283,883)	($567,107)	($850,989)	$12,049,905	$1
Year 6	$870,116	$13,245	$14,102	$32,046	$0	($19,210)	($27,780)	$882,520	($271,123)	($611,397)	($882,519)	$11,438,508	$1
Year 7	$901,441	$13,775	$14,525	$33,007	$0	($19,786)	($27,780)	$915,182	($257,366)	($657,816)	($915,181)	$10,780,692	$1
Year 8	$933,892	$14,326	$14,961	$33,997	$0	($20,380)	($27,780)	$949,017	($242,566)	($706,452)	($949,016)	$10,074,240	$1
Year 9	$967,513	$14,899	$15,410	$35,017	$0	($20,991)	($27,780)	$984,068	($226,670)	($757,397)	($984,067)	$9,316,843	$1
Year 10	$1,002,343	$15,495	$15,872	$36,068	$0	($21,621)	($27,780)	$1,020,377	($209,629)	($810,748)	($1,020,376)	$8,506,095	$1
Year 11	$1,038,427	$16,115	$16,348	$37,150	$0	($22,269)	($27,780)	$1,057,991	($191,387)	($866,604)	($1,057,990)	$7,639,491	$1
Year 12	$1,075,811	$16,760	$16,839	$38,264	$0	($22,938)	($27,780)	$1,096,956	($171,889)	($925,067)	($1,096,955)	$6,714,424	$1
Year 13	$1,114,540	$17,430	$17,344	$39,412	$0	($23,626)	($27,780)	$1,137,320	($151,075)	($986,246)	($1,137,319)	$5,728,178	$1
Year 14	$1,154,663	$18,127	$17,864	$40,594	$0	($24,334)	($27,780)	$1,179,135	($128,884)	($1,050,251)	($1,179,134)	$4,677,927	$1
Year 15	$1,196,231	$18,852	$18,400	$41,812	$0	($25,065)	($27,780)	$1,222,452	($105,253)	($1,117,198)	($1,222,451)	$3,560,729	$1
Year 16	$1,239,296	$19,606	$18,952	$43,067	$0	($25,816)	($27,780)	$1,267,324	($80,116)	($1,187,208)	($1,267,323)	$2,373,520	$1
Year 17	$1,283,910	$20,391	$19,521	$44,359	$0	($26,591)	($27,780)	$1,313,809	($53,404)	($1,260,405)	($1,313,808)	$1,113,115	$1
Year 18	$1,330,131	$21,206	$20,106	$45,689	$0	($27,389)	($27,780)	$1,361,965	($25,045)	($1,113,115)	($1,138,159)	$0	$223,805
Year 19	$1,378,016	$22,055	$20,710	$47,060	$0	($28,210)	($27,780)	$1,411,850	$0	$0	$0	$0	$1,411,850
Year 20	$1,427,624	$22,937	$21,331	$48,472	$0	($29,057)	($27,780)	$1,463,527	$0	$0	$0	$0	$1,463,527
Year 21	$1,479,019	$23,854	$21,971	$49,926	$0	($29,928)	($27,780)	$1,517,062	$0	$0	$0	$0	$1,517,062
Year 22	$1,532,263	$24,808	$22,630	$51,424	$0	($30,826)	($27,780)	$1,572,519	$0	$0	$0	$0	$1,572,519
Year 23	$1,587,425	$25,801	$23,309	$52,966	$0	($31,751)	($27,780)	$1,629,970	$0	$0	$0	$0	$1,629,970
Year 24	$1,644,572	$26,833	$24,008	$54,555	$0	($32,703)	($27,780)	$1,689,485	$0	$0	$0	$0	$1,689,485
Year 25	$1,703,777	$27,906	$24,728	$56,192	$0	($33,685)	($27,780)	$1,751,139	$0	$0	$0	$0	$1,751,139
Total	$28,778,531	$453,390	$443,517	$1,007,836	($211,086)	($604,151)	($694,500)	$29,173,536	($3,633,833)	($14,280,347)	($17,914,162)	----------	$11,259,374

7.0 Environmental Impact

More efficient use of resources at your facility can result in both direct and indirect reductions in Greenhouse Gas (GHG) emissions and water consumption due to a concept known as the Water-Energy Nexus.

With the scope and conservation measures previously detailed in this report, COSF will reduce their direct energy (electricity and natural gas) and water consumption by 7,255,538 kWh/year, 28,486 therms/year and 2,007 kgal/year, respectively. Table 145 demonstrates the annual reduction in GHG emissions directly linked to these savings.

Table 145: GHG emissions reduction and equivalents

Utility Type	Annual Savings	lbs. CO_2	Metric Tonnes CO_2
Electricity	7,255,538 kWh	6,383,945	2,895.71
Natural Gas	28,486 Therm	333,486	151.27
Water	2,007,380 gal	24,851	11.27
Total	----------	6,742,281	3,058

In order to better understand the reduction in emissions, Table 146 presents the equivalencies.

Table 146: Emissions Reduction and Equivalencies, Annual

588	Number of Vehicles Removed from Roads (Avg Size); or
3,977,946	Number of Miles Not Driven (Avg Size); or
84,279	Number of 75-Watt Light bulbs Not Energized; or
295	Number of Avg Sized Houses Removed from Power Grid; or
836	Acres of Trees Planted; or
3,150,599	Pounds of Coal Not Burned

In addition, because water is used in electricity generation, there are significant indirect water savings from the reduced energy demand.

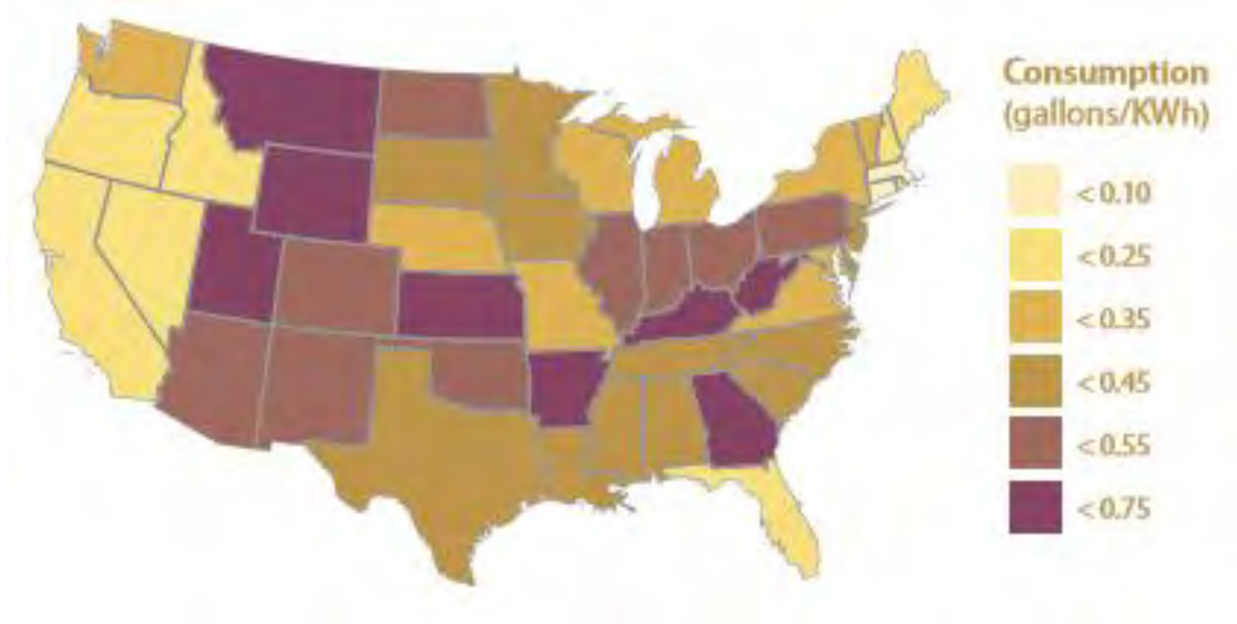


Figure 79: Freshwater use for Electricity Generation[2]

Figure 79 shows that the New Mexico electricity production is more water intensive than a majority of states in the U.S. Based on the value of 0.45 gallons/kWh, the COSF will save an additional 3,264,992 gallons of water indirectly, annually, on top of the direct water savings from the implementation of the water conservation measures.

Table 147: Water Reduction and Equivalencies, Annual

3,264,992	Indirect Gallons Saved from reduced energy consumption
2,007,380	Direct Gallons Saved from implementation of water conservation measures
5,272,372	Total Gallons saved, Annual; or
8.0	Olympic Swimming Pools; or
53.1	Average NM Households' Consumption

2 Source: Avery, K., J. Fisher, A. Huber-Lee, A. Lewis, J. Macknick, N. Madden, J. Rogers, and S. Tellinghuisen. 2011. Freshwater use by U.S. power plants: Electricity's thirst for a precious resource. A report of the energy and Water in a Warming World initiative. Cambridge, MA: Union of Concerned Scientists. November.

8.0 Customer Awareness

It is essential that the City of Santa Fe (COSF) is fully informed and engaged in the GESPC process to ensure a successful project outcome. The table below outlines the key elements from past experience and the proposed project scope that the COSF should carefully review and understand.

Table 148: Customer Awareness

The IGA Report should be distributed to all staff and other stakeholders that may be responsible for implementing and/or maintaining the key elements of the project scope of work and associated utility and operational savings.
Proposed utility baselines detailed herein.
Proposed escalation rates detailed herein.
Existing operating hours, set points, sequences of operation, and other inputs outlined throughout this report used to establish the baseline operation of each facility are accurate.
Agency understands how the proposed scope of work may impact building occupants.
Agency's responsibility to properly maintain the equipment installed per the manufacturer's and Yearout Energy's recommendations.
Agency's responsibility for ongoing maintenance and commissioning of systems to ensure savings are sustained throughout the performance period.
A full-building interruption to electrical service may be required at a select building undergoing electrical service upgrades and solar interconnection.
Agency will provide Yearout Energy with wired and wireless network connections were required to implement the proposed scope of work including at solar PV sites.
The solar PV carport system designed for the airport was based on initial drawings by Molzen-Corbin. Any changes to these drawings may impact the design of the Solar Carport.

Carefully review the proposed M&V Plan and approach for how guaranteed savings will be evaluated.
Utility rebates are estimated, and the final awarded incentive amount is not guaranteed by Yearout Energy, as these programs are at the discretion of the utility company. All incentives will be paid directly to the Agency from the utility provider.
The electric utility provider, PNM, must review and approve all solar PV interconnection applications prior to Yearout Energy executing the proposed scope of work. The duration and result of this approval process from the utility provider may have an impact on the project schedule, scope, cost, and savings. Yearout Energy will coordinate any required changed with the COSF to amend the project scope and contract where necessary following this pre-construction phase activity.
Land acquisition must be approved where solar PV systems are proposed and the COSF is not the current landowner. The duration and result of this approval process from the current landowners may have an impact on the project schedule, scope, cost, and savings. Yearout Energy will coordinate any required changed with the COSF to amend the project scope and contract where necessary following this pre-construction phase activity.
The Federal Aviation Administration (FAA) must review and approve the solar PV systems proposed at the Santa Fe Regional Airport. The duration and result of this approval process may have an impact on the project schedule, scope, cost, and savings. Yearout Energy will coordinate any required changed with the COSF to amend the project scope and contract where necessary following this pre-construction phase activity.
Pricing provided is based on conditions at time of document release and does not account for any additional tariffs or increases in material costs which may occur prior to implementation.
Agency will provide Yearout Energy with the following information for the duration of the performance period: • Grant access to utility information directly from providers • Grant access to utility provider web portals where available • Copies of monthly utility bills (Provided to Yearout Energy electronically) • Completed Maintenance Checklists (Provided to Yearout Energy electronically)

Agency agrees to immediately notify Yearout Energy of any of the following:

- Changes to the facility or individual space operating hours,
- Additions / Remodels to the facility,
- Changes to how individual spaces are utilized,
- Changes to facility equipment,
- Changes to set points, schedules, and sequence of operation,
- Issues with facility equipment; and
- All other items that may affect the energy performance of the facility.

The Agency will remedy any existing code violations that are outside the project scope discovered during the project implementation phase.

Throughout the IGA process, Yearout Energy has been unable to verify if any hazardous materials are present in the areas affected by the proposed scope of work. The Agency accepts responsibility for identifying and removing any hazardous material within the affected areas prior to the installation of the project scope.

Appendices

A Facility Worksheet

B Utility Baseline

B1 Baseline Utility Analysis

- Detailed summary of consumption and cost data that establishes the baseline for each facility

B2 Utility Rate Analysis

B3 Tariffs

B4 PNM Service Entrance Agreements

B5 Solar PPA Contract with Amendments

B6 Solar REC Agreements

C Existing Equipment and Plug Loads

C1 HVAC and DHW Inventory

C2 Pump House Inventory

C3 Plug Load Inventory

D FIM 1:00 Lighting System

D1 Baseline and Proposed Room-by-room Lighting Inventory

Provides a detailed room-by-room description of pre-retrofit and post-retrofit lighting information, including location, fixture type, fixture quantity, burn hours, and electric demand and energy

D2 Preliminary Lighting Product Data

D3 Lighting Power Density

D4 Lighting Interaction with HVAC System Calculation

D5 Lighting Data Logging

D6 Standard Burn Hours

D7 Diversity Factors and Foot-candle Levels

D8 Lighting Savings Calculation Methodology

E FIM 2.00 Renewable Energy

E1 Solar PV Production Summaries

E2 Detailed Equipment Specifications

E3 Solar PV Savings Calculations

E4 Renderings

E5 BDD Main Recommendations

E6 Existing Agreements

F FIM 3.00 Water Conservation

F1 Water Savings Calculations

F2 Water Fixture Cut-sheets

G FIM 4.00 Building Envelope

G1 Building Envelope Assessment

G2 Roofing Surveys

H FIM 5.00 High Efficiency Transformers

H1 Existing Transformer Inventory

- Detailed inventory of the existing electrical transformers, including unit description, manufacturer, model, and available performance data

H2 Transformer Energy Savings Calculation

H3 Proposed Transformer Product Data

I FIM 6.00 Utility Management

I1 Calculations

I2 Correspondence

J FIM 7.00 GCCC Solar Carport PV Repairs

J1 Solar PV Production Calculations

J2 GCCC - Recovered Solar Production Analysis

J3 Proposed Inverter Product Data

K FIM 8.00 Canyon Road WTP Roof

K1 Roofing Survey

L Utility Incentives

L1 PNM LED Lighting Incentives

- LED lighting rebate calculation
- LED lighting rebate prescriptive rebate program (Excel file attachment)

L2 Water Conservation Department (City of Santa Fe)

- Pint-flush urinal rebate calculation
- Urinal prescriptive rebate program

L3 PNM High Efficiency Transformer Incentives

N Bi-weekly Progress Reports, Presentations, and Meeting Minutes

N1 Bi-weekly IGA Progress Reports

- Bi-weekly reports submitted to COSF documenting recent progress, updates, two-week lookaheads, and help needed over the course of IGA development

N2 Meeting Minutes

N3 50% IGA Presentation

N4 90% IGA Presentation

O 3rd Party Review Comments

O1 3rd-party Reviewer Comments

O2 Comments Tracking Log

- Summary of all comments received and tracking log of comment closure