POUDRE SCHOOL DISTRICT

SOLAR AND STORAGE FEASIBILITY STUDY

FINAL REPORT

FORT COLLINS, CO

JULY 2023

Together, Building a Thriving Planet

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Section

1

Executive Summary

1. Executive Summary

In February 2023, Poudre School District (PSD) contracted with McKinstry to perform a feasibility study for solar photovoltaic (PV) and battery energy storage systems (BESS) across 62 different sites throughout the district. The goal of the feasibility study is to investigate opportunities to deploy ground, carport canopy, and roof-mounted solar arrays and BESS to progress PSD's renewable energy goals. McKinstry's feasibility assessment incorporates technical, financial, sustainability, and many other considerations, as detailed in McKinstry's High Performance Buildings Bond Planning Proposal.

As a result of the feasibility study and in consideration of all PSD's priorities, McKinstry has engineered a series of PV arrays and BESS which were designed to meet the goals above and assembled these into two portfolios (Financially Feasible and Technically Feasible, but Not Financially Feasible), along with four BESS sites. In general, the solar PV sites which are supplied electrical service by City of Fort Collins Utilities (FCU), as well as all BESS sites were found to have challenging financial outcomes.

Solar Photovoltaic – Financially Feasible Portfolio

Site	PV System Type	DC Capacity (kWDC)	Year 1 Production (kWh)	GHG Reduction (MTCO2)	Building Consumption Offset
Bamford ES	Roof	202.0	302,000	124.7	73.8%
Bethke ES	Fixed Tilt Ground Mount	137.7	220,900	91.3	76.9%
Eyestone ES South	Fixed Tilt Ground Mount	110.2	189,400	78.2	100.9%
Rice ES	Fixed Tilt Ground Mount	142.6	241,700	99.8	77.2%
Timnath MS/HS	Roof	679.3	1,003,200	414.3	99.0%
Wellington MS/HS	Roof	679.3	1,003,200	414.3	94.3%
Totals		**1,951.0**	**2,960,400**	**1,222.7**	**90.4%**

**GHG Reduction based on Xcel Energy guidelines of 1kWh=0.000413MTCO2*

1. Executive Summary

Solar Photovoltaic – Technically Feasible, But Not Financially Feasible Portfolio

Site	PV System Type	DC Capacity (kWDC)	Year 1 Production (kWh)	GHG Reduction* (MTCO2)	Building Consumption Offset
Beattie ES	Fixed Tilt Ground Mount	202.0	327,300	135.2	97.4%
Blevins MS	Carport	248.4	363,100	150.0	93.1%
Boltz MS	Carport	197.1	295,400	122.0	56.3%
Fort Collins HS	Carport	1222.6	1,715,800	708.6	91.4%
Fossil Ridge HS GM	Fixed Tilt Ground Mount	679.3	1,126,300	465.2	55.5%
Johannsen Support Services Center	Carport	151.2	216,800	89.6	90.1%
Kinard Core Knowledge MS	Carport	268.9	388,700	160.5	60.5%
Preston MS	Fixed Tilt Ground Mount	388.8	626,800	258.9	75.6%
Poudre HS	Carport	871.6	1,301,400	537.5	82.1%
Rocky Mountain HS	Carport	1164.2	1,761,400	727.5	95.1%
South Bus Terminal	Flush Mount	101.0	136,800	56.5	79.3%
Traut Core Knowledge ES	Carport	156.6	234,400	96.8	87.5%
Warehouse 5	Roof	110.2	151,800	62.7	29.2%
Werner ES	Fixed Tilt Ground Mount	128.5	213,800	88.3	96.9%
Totals		**5,789.4**	**8,723,000**	**3,602.6**	**77.1%**

**GHG Reduction based on Xcel Energy guidelines of 1kWh=0.000413MTCO2*

1. Executive Summary

The Financially Feasible portfolio includes sites where Xcel Energy, Poudre Valley REA (PVREA), and The City of Loveland Water and Power supply electricity to the facilities. These sites were found to have a value of solar energy (VOSE) that leads to financially feasible projects.

Financial Summary – Direct Ownership, Financially Feasible

Site	PV System Type	Estimated System Cost*	Estimated System Cost with 30% IRA Contribution*	Year 1 Utility Savings	Estimated Simple Payback with 30% IRA and Applicable Incentives**
Bamford ES	Roof	$750,300	$525,210	$23,300	22.5
Bethke ES	Fixed Tilt Ground Mount	$579,800	$405,860	$22,400	18.0
Eyestone ES South	Fixed Tilt Ground Mount	$497,600	$348,320	$19,800	17.6
Rice ES	Fixed Tilt Ground Mount	$592,500	$414,750	$33,300	12.5
Timnath MS/HS	Roof	$1,992,200	$1,394,540	$98,300	14.2
Wellington MS/HS	Roof	$2,001,900	$1,478,500	$69,800	20.00
Totals		**$6,414,300**	**$4,567,180**	**$266,900**	**16.8**

**Costs and savings are estimated to be +/- 20% and reflect conditions at Q2, 2023. Savings include utility bill savings and incentives. Financial summary above assumes projects are contracted as a portfolio.*

***Simple payback does not include O&M, decommissioning, inverter replacement, and utility rate escalation.*

McKinstry has determined a very low VOSE for the sites within the FCU service area. These low VOSE sites lead to many system paybacks longer than the expected life of the PV systems. Because of these long paybacks, we have estimated pricing based on a per-project basis and would look to PSD for guidance on which sites to move forward to an implementation phase.

1. Executive Summary

Financial Summary – Direct Ownership Technically Feasible, but Not Financially Feasible

Site	PV System Type	Estimated System Cost*	Estimated System Cost with 30% IRA Contribution*	Year 1 Utility Savings	Estimated Simple Payback with 30% IRA and Applicable Incentives**
Beattie ES	Fixed Tilt Ground Mount	$816,500	$571,500	$17,250	30.2
Blevins MS	Carport	$1,348,100	$943,700	$20,500	43.4
Boltz MS	Carport	$1,111,300	$778,900	$17,200	42.4
Fort Collins HS	Carport	$5,140,500	$3,598,400	$95,800	37.0
Fossil Ridge HS GM	Fixed Tilt Ground Mount	$2,174,200	$1,521,900	$63,300	23.2
Johannsen Support Services Center	Carport	$895,300	$626,700	$12,800	45.1
Kinard Core Knowledge MS	Carport	$1,443,100	$1,010,200	$19,700	48.7
Preston MS	Fixed Tilt Ground Mount	$1,381,100	$966,800	$34,900	26.3
Poudre HS	Carport	$3,858,500	$2,700,900	$72,800	36.4
Rocky Mountain HS	Carport	$4,930,000	$3,451,000	$97,400	34.9
South Bus Terminal	Flush Mount	$403,500	$282,500	$10,700	21.8
Traut Core Knowledge ES	Carport	$925,700	$648,000	$13,200	45.2
Warehouse 5	Roof	$404,900	$283,400	$9,300	25.2
Werner ES	Fixed Tilt Ground Mount	$599,800	$419,900	$11,700	31.70
Totals		**$25,432,500**	**$17,803,800**	**$496,550**	**34.3**

**Costs and savings are estimated to be +/- 20% and reflect conditions at Q2, 2023. Savings include utility bill savings and incentives. Financial summary above assumes projects are contracted as a portfolio.*

***Simple payback does not include O&M, decommissioning, inverter replacement, and utility rate escalation.*

1. Executive Summary

BESS Portfolio – (Battery Energy Storage System)

The BESS sites were chosen with guidance from PSD and the analysis focused on determining the potential demand saving values and resiliency functionality. These systems were integrated with the solar PV where applicable, but cost/savings analyses are separate from the PV systems. As the table below shows, the demand management system paybacks far exceed the expected 10-year lifespan of the BESS. While the economics are poor, additional value can be derived from resiliency functionality at Cache la Poudre and the Warehouse 5. BESS details can be found in Section 3 for the following sites:

- Bamford Elementary School
- Cache la Poudre Middle School
- Warehouse 5
- Wellington Middle / High School

BESS – Portfolio Details

Site	Use Case	BESS Size	Total Project Cost*	Total Project Cost with 30% IRA Contribution*	Simple Payback (years)**
Bamford ES	Utility Bill Optimization	125kW/250kWh	$516,200	$361,300	42.6
Cache la Poudre MS	Backup Power	125kW/250kWh	$529,400	N/A	N/A
Warehouse 5	Utility Bill Optimization & Backup Power	125kW/250kWh	$529,400	$370,600	57.8
Wellington MS/HS	Utility Bill Optimization	250kW/500kWh	$753,600	$527,500	20.6

**The financial results above are in addition to PV systems, where applicable, and are priced on an individual project basis.*

***Simple payback does not include O&M, decommissioning, inverter replacement, and utility rate escalation.*

1. Executive Summary

Funding Opportunities

Several funding options have been identified to support project implementation. To get the Financially Not Feasible Solar PV Portfolio payback below 20 years, PSD would need to make a capital contribution through allocated stimulus funding or bundle additional measures with a payback shorter than the overall recommended portfolio through an Energy Savings Performance Contract. The following are opportunities for PSD to consider for funding the Financially Feasible solar PV project portfolio option above and are further described in Section 6:

- **Energy Savings Performance Contracting (ESPC)**
- **Tax Exempt Lease Purchase (TELP)**
- **Certificates of Participation (COP)**
- **Bonds**
- **Debt-free Mill Levy**
- **Power Purchase Agreement (PPA)**
- **Grant funding**
- **Xcel Renewable Energy Credits (RECs) and SPVTOU rate**
- **Combination of above funding options**

Section

2

Methodology

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2. Analysis Methodology

2.1 General Approach

The portfolio described in this section is the result of our data collection, analysis, and costing activities, as well as ongoing discussions with PSD personnel. The evaluation utilized the approach outlined in McKinstry's RFP response and included the following key steps.

1. **Learn**. Data collection, documentation review, and identification of and initial engagement with key PSD staff.
2. **Audit**. Assess data, verify site conditions, review utility usage by site.
3. **Analyze**. Analyze data, produce conceptual designs, solicit PSD feedback, model system outputs, estimate bill savings, and create the preliminary cost estimate.
4. **Finalize Analysis and Cost Estimates**. Finalize designs, savings analyses, cost estimates, portfolio composition and financial assessments.
5. **Report**.

Our approach sought to maximize capacity and offset at each site to realize best installed costs and bill savings. Constraints included physical space available, roof ages, excessive shading, and constructability issues. Each subsection in Section 3 below describes each site in detail.

2.2 Conceptual Design and Energy Modeling

Array layouts at each site were designed using Helioscope, an industry-standard design and energy modeling software package with 3-dimensional modeling capabilities incorporating site-specific characteristics of buildings, ground areas, parking lots, shade producing obstructions, as well as other array locations and their impacts upon system layout and production. McKinstry further applies our knowledge of Codes and regulations, industry best practices, and professional judgment to ensure that designs are Code-compliant, and strike a balance across customer preferences, production, constructability, and installed-cost concerns.

Helioscope also provides robust PV system output modeling capabilities, which we utilize in conjunction with Typical Meteorological Year (TMY) weather datasets, real-world equipment specifications, dust and snow soiling coverage models developed by independent engineers, and professional judgment for critical assumptions and modeling setup.

2.3 Bill Savings Analysis

Our bill savings analyses are based upon output from Energy Toolbase, an industry-standard modeling software package. Energy Toolbase estimates bill savings based upon each site's load characteristics, PV system production (imported from Helioscope or other sources), applicable utility tariffs, and net metering policies. With respect to tariff selection, we evaluate savings under various eligible tariff options to find the best possible savings.

2. Analysis Methodology

2.4 Cost Estimation

Cost estimates for each portfolio are produced using a comprehensive cost model that incorporates estimates for all costs required to bring each portfolio through final development, design, and construction. Detailed costs estimates are developed for cost categories summarized in the following table.

Project Phase	Cost Category	Cost Details
Development	Development Personnel	Development Engineering and Analysis Program Management
	Engineering and Professional Services	Electrical Engineering Civil and Geotechnical Engineering Structural Engineering Surveying Utility Fees
Construction	Capital Equipment	Modules Inverters Mounting Systems Data Acquisition Systems Shipping Costs
	Subcontractors (Labor & Materials)	Electrical Subcontractors Mounting System Subcontractors Civil Subcontractors
	Project Management	Construction Management Project Engineering Site Supervision Travel
	Other Construction Costs	General Conditions Permits and Inspections Bonds
All Phases	Administrative	Contingency Overhead Profit

Cost estimates are informed by a mix of high-level project-specific quotes for equipment and subcontracting, quotes from recent similar projects, and McKinstry internal estimates and experience. Cost assumptions at this stage of analysis are estimated to be +/-20% for each overall portfolio. Total portfolio costs assume that all sites/systems in each portfolio are implemented. Costs may change slightly and would not simply sum should individual projects be removed from each portfolio, as certain fixed costs are redistributed, and scale-driven cost factors will change.

2.5 Financial Modeling

Finally, lifecycle system value is modeled using a 25-year pro forma cash flow. In addition to installed cost and annual bill savings, lifecycle values are impacted by several key assumptions including annual PV system performance degradation, annual utility rate escalation, utility incentives, annual O&M costs, annual cost escalation, and assumed inverter replacement costs and timing. Details of the financial modeling are included in Section 6.

System decommissioning estimates are included as separate costs in Section 3 and were based off input from subcontractors.

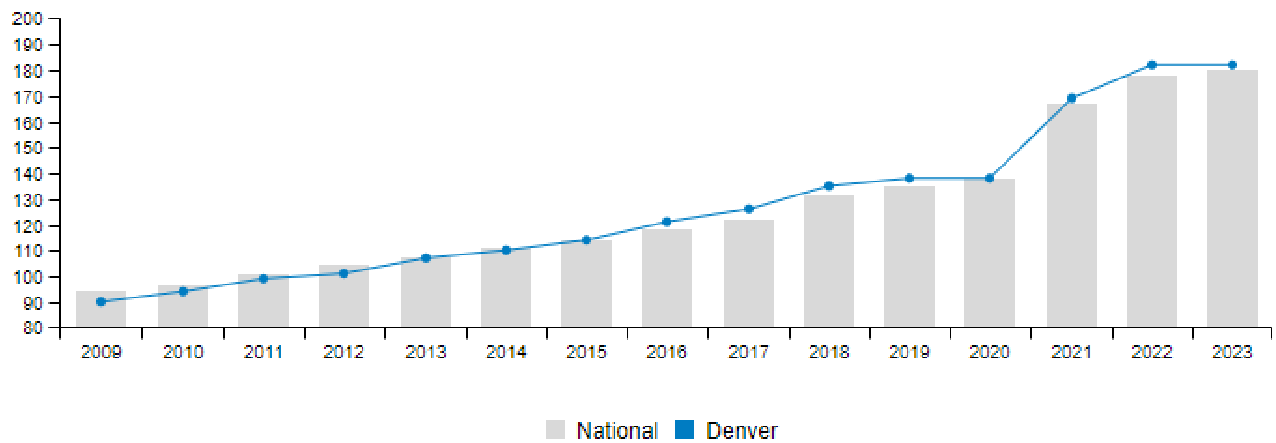
Note that all financial results reflect the outcome of a 25-year cash flow analysis that also incorporates the assumptions outlined in Section 6. The 25-year Lifetime Savings are undiscounted, so do not include a discount rate on future cash flows.

2.6 Construction Service Market Conditions

CONSTRUCTION PRICING TRENDS

Overall construction pricing has risen sharply over the last few years due to supply chain complications caused by the COVID-19 pandemic, but we are seeing increases tapering off. The Producer Price Index (PPI) for nonresidential construction shown in the chart below represents the average change over time in selling prices received by domestic producers of construction services.

Construction Cost Index



Starting in 2020, the PPI has significantly jumped year to year, well above pre-COVID-19 year-on-year increases. We further anecdotally note similar increases in our observed contractor pricing over the past years on active construction projects we have put out to competitive bid. While the 2022-2023 increase has fallen more in line with pre-COVID-19 increases, it is difficult to predict future cost increases.

IMPACTS TO PORTFOLIO ESTIMATES

We recognize PSD is seeking to install PV and storage systems beginning in 2025. Given the volatility and general construction market price inflation we have observed recently, we emphasize that the pricing provided is indicative of market conditions at the time of this report. Further, we present estimated portfolio price sensitivities to module and contractor construction costs to help gauge their relative potential impact given the high degree of recent volatility.

2. Analysis Methodology

2.7 Inflation Reduction Act (IRA) Impacts

With the passing of the IRA in 2022, development and deployment of clean energy projects in the public sector can be incentivized through an Investment Tax Credit (ITC). The base credit is 30% of cost, with additional adders for:

- Domestic Content – 10% adder
  - All steel and 40% of manufactured products must originate from the US.
  - The cost of US manufactured equipment is significantly higher than that out of country manufactured equipment. We expect these increases to be well over the value of the additional incentive and have not included this adder in our cost and financial models.
- Energy Communities (one or more of the following) – 10% adder
  - Brownfield Category
    - Defined as the real property, the expansion, redevelopment, or reuse of which may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant.
    - We have not identified any of the buildings as Brownfield sites.
  - Statistical Area Category
    - Includes a metropolitan statistical area (MSA) or non-metropolitan statistical area ("non-MSA") that (i) has 0.17% or greater direct employment (the "Fossil Fuel Employment Requirement") or 25% or greater local tax revenues related to the extraction, processing, transport or storage of coal, oil or natural gas (the "Fossil Fuel Tax Revenue Requirement"), and (ii) has an unemployment rate at or above the national average unemployment rate for the previous year (the "Unemployment Rate Requirement"). Treasury and the IRS intend to issue, annually each May, listings that identify the MSAs and non-MSAs that qualify in the Statistical Area Category based on the Unemployment Rate Requirement.
    - We did not find that any of these sites would qualify for this adder.
  - Additional Resources Relevant to Identifying Energy Communities
    - The IRS released appendices identifying counties that constitute an MSA or non-MSA, (ii) identifying MSAs and non-MSAs that meet the Fossil Fuel Employment Requirement, and (iii) identifying census tracts and directly adjoining tracts that have ever had a Closed Coal Mine or a Retired Coal-Fired Electric Generating Unit.
    - We did not find that any of these sites would qualify for this adder.
- Low Income or Tribal– 10% adder
  - Poverty rate must be 20% or greater, or site located in/ owned by a Tribe.
    - We did not find that any sites qualify for this adder.

2. Analysis Methodology

2.8 Pricing Assumptions, Inclusions, and Exclusions

All cost and savings were based off the following:

- Codes and Utility Standards:
  - NEC 2020
  - IBC 2021
  - IFC 2021
- City of Fort Collins Light & Power Interconnection Standards for Distributed Energy Resources
- Tax-exempt
- 10% mechanical attachment count for the rooftop
- No structural upgrades required of the roofs
- Sites where the remaining roof life is not compatible with the PV system lifespan have been dropped from the study (see “Physically Not Feasible Portfolio” in section 3.1)
- Scope from AC combiner to interconnection is included in the electrical scope and pricing
- Pricing assumes a portfolio approach
- Pricing includes payment & performance bond
- Terms & Conditions listed in the City of Fort Collins Light & Power Interconnection Agreement and REC Contract
- Current labor rates
- Modeling:
  - TMY, GREELEY/WELD (AWOS), NSRDB (tmy3, II) weather data file
  - 1.5% production gain for ground mounts with bifacial modules
  - Soiling data from DNV Solar Resource Compass
- Design Loads
  - Category III: 1.15 importance factor
  - Ground snow load: 35 psf
  - Wind speed: 114 mph
- No interconnection upgrade costs
- Project payback is, in part, contingent on renewable energy credits (RECs), incentives from Xcel Energy. McKinstry would make best efforts to capture solar incentives from the utility on the PSD’s behalf. In the event the incentives are not available the payback is subject to increase for the applicable sites.
- No grounding transformers
- Major equipment warranties:
  - Modules – 12 years
  - Inverters – 10 years
  - DAS – 5 years
  - AC Combiners – 5 years
  - LEDs (carport canopies only) – 5 years
- No extended warranties
- No ongoing DAS Costs
- Any ongoing fees beyond year 5 are excluded (both Cell Service and Data Subscription Monitoring fees).
- No reroofing or roofing repairs
- No backup generation
- 4’ perimeter setback for rooftops
- Favorable soil conditions. No hard drilling or special footers/foundations required.
- No hazardous soils or materials (asbestos, PFAS, etc.). Should monitoring, mitigation, abatement, and/or disposal be required, Louisville would be responsible for this additional scope.
- City of Fort Collins Utility Solar REC Incentives:
  - Onetime payment of $0.50/ watt of generating capacity up to $50,000
  - Maximum of 2 PV projects can be incentivized per calendar year

Section

3

Portfolio Details

3. Portfolio Details

3.1 Portfolios

This section provides consolidated portfolio-level performance and financial results, as well as detailed descriptions of each site within the portfolios, including site and system descriptions, modeled system outputs, site usage offsets, costs/ savings, and financial performance. Also included are a breakdown of sites that are technically, but not economically feasible, and a breakdown of sites that are not feasible with associated reasoning.

FINANCIALLY FEASIBLE PV PORTFOLIO

The Financially Feasible Portfolio consists of 6 sites. The portfolio is a combined 1.95 MWdc and will reduce consumption across the sites by 90.4%. System details and direct ownership models are provided below.

FINANCIALLY NOT FEASIBLE PV PORTFOLIO

This portfolio includes the 14 sites which are provided electricity by Fort Colins Utility, and where paybacks were found to be greater than the expected life of the PV systems. System details, direct ownership models, and additional funding figures to make these projects economically feasible are provided below.

PV SYSTEM TYPE DETERMINATION

The table below shows all the sites in the scope of the study with reasoning for the proposed PV system type, or lack thereof.

McKinstry, along with PSD's guidance, reviewed all the available land area for PV ground mount systems. Sites where there was not enough land for an economically feasible system were dropped from the study.

Carport feasibility was based off available double-row parking, and a total system capacity of 200kWdc. Single-row parking and systems smaller than 200kWdc would not be economically feasible.

Roof ages along with feasible PV system layouts were the determining factors for going forward with roof-based systems. All sites below would need a roof replacement within the lifespan of the PV system, the cost of a deinstall-reinstall of the system would not lead to an economically feasible project. On a positive note, there are several roofs where PV system layouts would be technically feasible. When these roofs are replaced, they would be great candidates for rooftop PV systems.

For the roof systems where roof life aligns with PV system life, structural capacity assessments were performed to ensure feasibility. It was found that the North Transportation Center lacks sufficient structural capacity to support the added weight of a PV system.

On sites where multiple PV system types were technically feasible, system economics determined the recommended modality for the site. Roof top systems are typically the most economical, therefore roof mount systems were the first choice, followed by ground mount, and finally carports, which are typically the most expensive to implement.

3. Portfolio Details

Site Feasibility Breakdown

**Rooftop PV array too small, heavily shaded, roof layout not feasible*

***F = Feasible; NF = Not Feasible, TFNFF = Technically Feasible Not Financially Feasible*

Site	Ground Mount PV Not Feasible	Carport PV Not Feasible	Roof PV Not Feasible - Roof Age Not In Alignment With PV System Life	Roof PV Not Feasible - PV System Layout Is Not Economically Feasible*	Roof PV Not Feasible - Structural Capacity of Roof Does Not Support PV	PV Feasibility**	System Selection Narrative
Assessment & Research Offices BLDG C	x	x	x	x		NF	Since there is no current opportunity for a PV system, this site was dropped from the study. The rooftop area is small and would not be conducive to an economic project.
Bacon ES	x	x	x			NF	Since there is no current opportunity for a PV system, this site was dropped from the study. When the roof is replaced, this site should be considered for rooftop PV.
Bamford ES	x	x				F	With guidance from PSD, a roof top PV system was proposed for this site due to its new roof.
Bauder ES	x	x	x			NF	Since there is no current opportunity for a PV system, this site was dropped from the study. When the roof is replaced, this site should be considered for rooftop PV.
Beattie ES		x	x			TFNFF	With the remaining roof life just outside of the PV system life and a small carport area, a ground mount option was selected along with PSD input.
Bennett ES	x	x	x			NF	Since there is no current opportunity for a PV system, this site was dropped from the study. When the roof is replaced, this site should be considered for rooftop PV.
Bethke ES		x	x			F	While the roof age is out of alignment with a rooftop PV system, a ground mount system is appropriate for this site. The array location was decided on with input from PSD.
Blevins MS	x		x			TFNFF	Since there the roof is too old, and there not land available for a ground mount, a carport PV system has been proposed at this site.
Boltz MS	x		x			TFNFF	Since there the roof is too old, and there not land available for a ground mount, a carport PV system has been proposed at this site.
Cache La Poudre ES	x	x	x			NF	Since there is no current opportunity for a PV system, this site was dropped from the study. When the roof is replaced, this site should be considered for rooftop PV.
Centennial HS	x	x	x	x		NF	Since there is no current opportunity for a PV system, this site was dropped from the study. The rooftop area is small and would not be conducive to an economic project.
Customer Support Center - OPS	x	x	x	x		NF	Since there is no current opportunity for a PV system, this site was dropped from the study. The rooftop area is small and would not be conducive to an economic project.
Dunn ES	x	x	x			NF	Since there is no current opportunity for a PV system, this site was dropped from the study.

3. Portfolio Details

Site	Ground Mount PV Not Feasible	Carport PV Not Feasible	Roof PV Not Feasible - Roof Age Not In Alignment With PV System Life	Roof PV Not Feasible - PV System Layout Is Not Economically Feasible*	Roof PV Not Feasible - Structural Capacity of Roof Does Not Support PV	PV Feasibility**	System Selection Narrative
							When the roof is replaced, this site should be considered for rooftop PV.
Eyestone ES North	x	x	x			NF	Since there is no current opportunity for a PV system, this site was dropped from the study. When the roof is replaced, this site should be considered for rooftop PV.
Eyestone ES South		x	x			F	With no roof replacement planned, a ground mount system is the best option at this time. if the roof were to be replaced, it is likely that a rooftop system would be more economical than the proposed ground mount system.
Fort Collins HS	x		x			TFNFF	Since there the roof is too old, and there is not land available for a ground mount, a carport PV system has been proposed at this site.
Fossil Ridge HS			x			TFNFF	Since there the roof is too old, and there is available land area, a ground mount PV system has been proposed at this site. The array location was decided on with input from PSD.
Fullana Learning Center-Headstart	x	x	x	x		NF	Since there is no current opportunity for a PV system, this site was dropped from the study. When the roof is replaced, this site should be considered for rooftop PV.
Grounds Office BLDG I	x	x	x	x		NF	Since there is no current opportunity for a PV system, this site was dropped from the study. When the roof is replaced, this site should be considered for rooftop PV.
Harris Billingual ES	x	x	x	x		NF	Since there is no current opportunity for a PV system, this site was dropped from the study. The rooftop area is small and heavily shaded, which would not be conducive to an economic project.
Irish ES	x	x	x			NF	Since there is no current opportunity for a PV system, this site was dropped from the study. When the roof is replaced, this site should be considered for rooftop PV.
ITC	x	x	x	x		NF	Since there is no current opportunity for a PV system, this site was dropped from the study. When the roof is replaced, this site should be considered for rooftop PV.
Johannsen Support Services Center	x		x	x		TFNFF	With the roof being so small, and no available land area, a carport PV system was proposed for this site.
Johnson ES	x	x	x	x		NF	Since there is no current opportunity for a PV system, this site was dropped from the study. The rooftop area heavily shaded by dormers, severely hampering PV system capacity which would not be conducive to an economic project.
Kinard Core Knowledge MS	x		x			TFNFF	With the roof being too old, and no available land area, a carport PV system was proposed for this site.

3. Portfolio Details

Site	Ground Mount PV Not Feasible	Carport PV Not Feasible	Roof PV Not Feasible - Roof Age Not In Alignment With PV System Life	Roof PV Not Feasible - PV System Layout Is Not Economically Feasible*	Roof PV Not Feasible - Structural Capacity of Roof Does Not Support PV	PV Feasibility**	System Selection Narrative
Kruse ES	x	x	x	x		NF	Since there is no current opportunity for a PV system, this site was dropped from the study. The rooftop area heavily shaded by dormers, severely hampering PV system capacity which would not be conducive to an economic project.
Laurel School of Arts & Tech ES	x	x	x	x		NF	Since there is no current opportunity for a PV system, this site was dropped from the study. The rooftop area heavily shaded by dormers, severely hampering PV system capacity which would not be conducive to an economic project.
Lesher, IB World School	x	x	x			NF	Since there is no current opportunity for a PV system, this site was dropped from the study. When the roof is replaced, this site should be considered for rooftop PV.
Lincoln, IB World School	x	x	x			NF	Since there is no current opportunity for a PV system, this site was dropped from the study. When the roof is replaced, this site should be considered for rooftop PV.
Linton ES	x	x	x	x		NF	Since there is no current opportunity for a PV system, this site was dropped from the study. The rooftop area heavily shaded by dormers, severely hampering PV system capacity which would not be conducive to an economic project.
Livermore ES	x	x	x	x		NF	Since there is no current opportunity for a PV system, this site was dropped from the study. When the roof is replaced, this site should be considered for rooftop PV.
Lopez ES	x	x	x			NF	Since there is no current opportunity for a PV system, this site was dropped from the study. When the roof is replaced, this site should be considered for rooftop PV.
McGraw, IB World School ES	x	x	x	x		NF	Since there is no current opportunity for a PV system, this site was dropped from the study. The rooftop area heavily shaded by dormers, severely hampering PV system capacity which would not be conducive to an economic project.
North Transportation Center	x	x			x	NF	The roof capacity assessment shows that there is not enough structural loading capacity to support the additional weight of a PV system.
O'Dea Core Knowledge ES	x	x	x	x		NF	Since there is no current opportunity for a PV system, this site was dropped from the study. When the roof is replaced, this site should be considered for rooftop PV.
Olander School for Project Based Learning ES	x	x	x	x		NF	Since there is no current opportunity for a PV system, this site was dropped from the study. The rooftop area heavily shaded by dormers, severely hampering PV system capacity which would not be conducive to an economic project.

3. Portfolio Details

Site	Ground Mount PV Not Feasible	Carport PV Not Feasible	Roof PV Not Feasible - Roof Age Not In Alignment With PV System Life	Roof PV Not Feasible - PV System Layout Is Not Economically Feasible*	Roof PV Not Feasible - Structural Capacity of Roof Does Not Support PV	PV Feasibility**	System Selection Narrative
Old warehouse BLGD E	x	x	x			NF	Since there is no current opportunity for a PV system, this site was dropped from the study. When the roof is replaced, this site should be considered for rooftop PV.
Partnership & Volunteer Center	x	x	x	x		NF	Since there is no current opportunity for a PV system, this site was dropped from the study. The rooftop area is small and heavily shaded, which would not be conducive to an economic project.
Polaris Expeditionary Learning K-12	x	x	x			NF	Since there is no current opportunity for a PV system, this site was dropped from the study. When the roof is replaced, this site should be considered for rooftop PV.
Preston MS		x	x	x		TFNFF	Due to an old, complicated roof layout, and a small parking area, a ground mount system was proposed for this site.
Poudre Community Academy	x	x	x	x		NF	Since there is no current opportunity for a PV system, this site was dropped from the study. The rooftop area is small and heavily shaded, which would not be conducive to an economic project.
Poudre HS	x		x			TFNFF	With an old roof and no ground mount area, a carport PV system was proposed at this site.
Poudre High School Laundry Building	x	x	x	x		NF	Since there is no current opportunity for a PV system, this site was dropped from the study. The rooftop area is small which would not be conducive to an economic project.
PSD Global Academy Charter School	x	x	x	x		NF	Since there is no current opportunity for a PV system, this site was dropped from the study. When the roof is replaced, this site should be considered for rooftop PV.
Putnam ES	x	x	x			NF	Since there is no current opportunity for a PV system, this site was dropped from the study. When the roof is replaced, this site should be considered for rooftop PV.
Records Warehouse BLDG G	x	x	x			NF	Since there is no current opportunity for a PV system, this site was dropped from the study. When the roof is replaced, this site should be considered for rooftop PV.
Red Feather ES	x	x	x	x		NF	Since there is no current opportunity for a PV system, this site was dropped from the study. The rooftop area is small and heavily shaded, which would not be conducive to an economic project.
Rice ES		x	x			F	With the remaining roof life just outside of the PV system life, a ground mount option was selected along with PSD input.
Riffenburgh, IB World School ES	x	x	x			NF	Since there is no current opportunity for a PV system, this site was dropped from the study. When the roof is replaced, this site should be considered for rooftop PV.
Rocky Mountain HS	x		x			TFNFF	With an old roof and no ground mount area, a carport PV system was proposed at this site.

3. Portfolio Details

Site	Ground Mount PV Not Feasible	Carport PV Not Feasible	Roof PV Not Feasible - Roof Age Not In Alignment With PV System Life	Roof PV Not Feasible - PV System Layout Is Not Economically Feasible*	Roof PV Not Feasible - Structural Capacity of Roof Does Not Support PV	PV Feasibility**	System Selection Narrative
Shepardson STEM ES	x	x	x			NF	Since there is no current opportunity for a PV system, this site was dropped from the study. When the roof is replaced, this site should be considered for rooftop PV.
South Bus Terminal	x	x				TFNFF	With no ground mount area, and a small parking area, the bus parking structure would provide a flush mount PV system.
Stove Prairie ES	x	x	x	x		NF	Since there is no current opportunity for a PV system, this site was dropped from the study. The rooftop area is small which would not be conducive to an economic project.
Tavelli ES	x	x	x			NF	Since there is no current opportunity for a PV system, this site was dropped from the study. When the roof is replaced, this site should be considered for rooftop PV.
Tinmath ES	x	x	x			NF	Since there is no current opportunity for a PV system, this site was dropped from the study. When the roof is replaced, this site should be considered for rooftop PV.
Tinmath MS/HS						F	Since this is a new building and roof, a rooftop system was proposed in lieu of a ground mount or carport system.
Traut	x		x			TFNFF	Since there the roof is too old, and there is not land available for a ground mount, a carport PV system has been proposed at this site.
Warehouse 5	x	x				TFNFF	With no available land, and small parking areas, a flush mount roof system has been proposed at this site.
Webber MS	x	x	x			NF	Since there is no current opportunity for a PV system, this site was dropped from the study. When the roof is replaced, this site should be considered for rooftop PV.
Wellington MS/HS						F	Since this is a new building and roof, a rooftop system was proposed in lieu of a ground mount or carport system.
Werner ES		x	x	x		TFNFF	Since the roof is old and heavily shaded, and carport areas are small, a ground mount system has been proposed for this site.
Zach ES	x	x	x			NF	Since there is no current opportunity for a PV system, this site was dropped from the study. When the roof is replaced, this site should be considered for rooftop PV.

3. Portfolio Details

3.2 Financially Feasible Portfolio Details

The sections below give details for the Financially Feasible PV Portfolio along with any BESS systems, which are priced out separately from the PV systems. The direct ownership models included in this section assume the following:

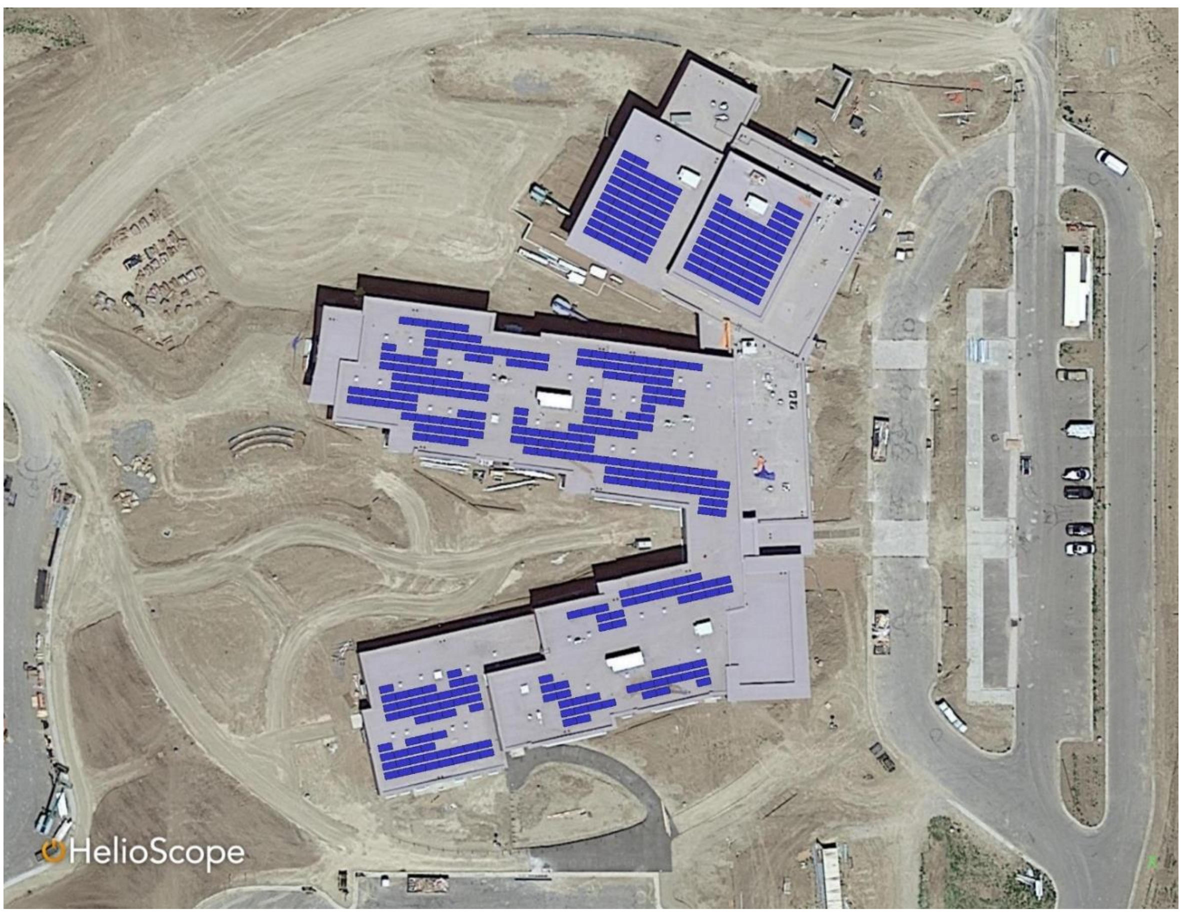
- 25-year cashflow model
- 3% utility escalator
- Inverter replacement at year 15
- 0.6% annual module degradation
- 3% inflation rate
- 30% IRA contribution

3.2.1 Bamford Elementary School

SITE DESCRIPTION

This ballasted flat roof system was designed as an array on multiple sections of the roof where an economic system layout and azimuth were taken into consideration.

Bamford Elementary School



3. Portfolio Details

PV SYSTEM DETAILS

System technical and performance details are outlined in the table below.

Bamford Elementary	Roof System
Utility and Current Rate	Loveland Water and Power; LG
Annual Usage	408,960
System Size (kWDC/kWAC)	202.0/ 172.0
Production, Year 1 (kWh-AC)	302,000
Solar Offset, Year 1	73.8%
GHG Reduction, Year 1 (MT CO2e)	124.8

PV FINANCIAL DIRECT OWNERSHIP DETAILS

Financial performance details are provided in the table below. See Section 6 for PPA/ Funding details.

Bamford Elementary – PV Direct Ownership	
Total Project Cost*	$670,000
Total Project Cost with 30% IRA Contribution	$469,000
Bill Savings, Year 1	$23,300
REC/ Incentive, Year 1	N/A
Payback (years)	17.6
25-year Total Lifetime Savings	$799,980
End of Life Decommissioning Cost	$35,300

**Financial summary above assumes projects are contracted as a portfolio.*

MAJOR PV EQUIPMENT INCLUDED IN PERFORMANCE MODELING AND COST ESTIMATES

Our technical modeling and cost estimates incorporate the specifications and expected performance of the equipment outlined below. For the products listed, there are fungible alternatives with similar cost and performance characteristics available, and thus the exact specification of equipment is not expected to materially impact our estimates of capacity possible, costs, or system performance at the sites analyzed.

Equipment Type	QTY		Equipment Description	
PV Modules	374		JA Solar 540-Watt Bifacial Module	
Inverter	2	2	CPS 50kW-AC	CPS 36kW-AC
Data Acquisition System	1		AlsoEnergy Data Acquisition System	
Module Shutdown Unit	216		Tigo TS4-A-2F – Tigo PV Module Rapid Shutdown Unit	

3. Portfolio Details

BESS DETAILS

The BESS system at Bamford is intended to be implemented along with the PV system. This system would be charged from the solar PV and generate savings by lowering the building's electrical demand.

Bamford Elementary	BESS System
BESS Use Case	Demand Management
Manufacturer	SYL/ STEM
System Size (kWAC)	125
System Size (kWh)	250

BESS FINANCIAL DIRECT OWNERSHIP DETAILS

Financial performance details are provided in the table below. This system would be a capital improvement measure as the system payback far exceeds the expected system life of 10 years.

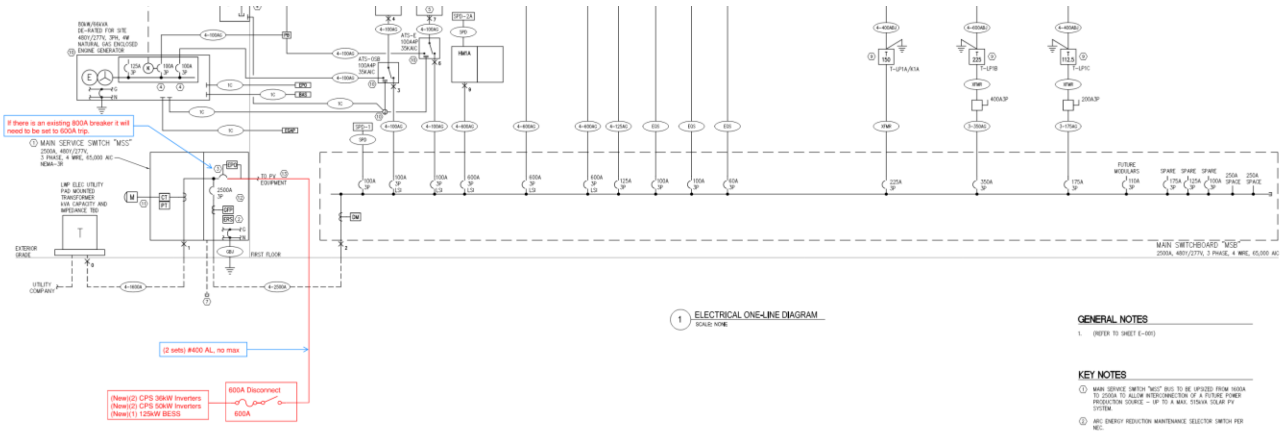
Bamford Elementary – BESS Direct Ownership	
Total Project Cost	$516,200
Total Project Cost with 30% IRA Contribution	$361,300
Bill Savings, Year 1	$8,500
Payback (years)	42.6
10-year Total Lifetime Savings	$85,000
Additional Funding Needed for 10 Year Payback	$267,600

3. Portfolio Details

PV AND BESS INTERCONNECTION

The single line diagram (SLD) below illustrates the way that the BESS and PV system would be interconnected to the existing electrical infostructure. These systems would interconnect to the dedicated PV breaker. See Appendix B for full SLD mark-ups.

Bamford ES BESS and PV System Proposed Interconnection Method



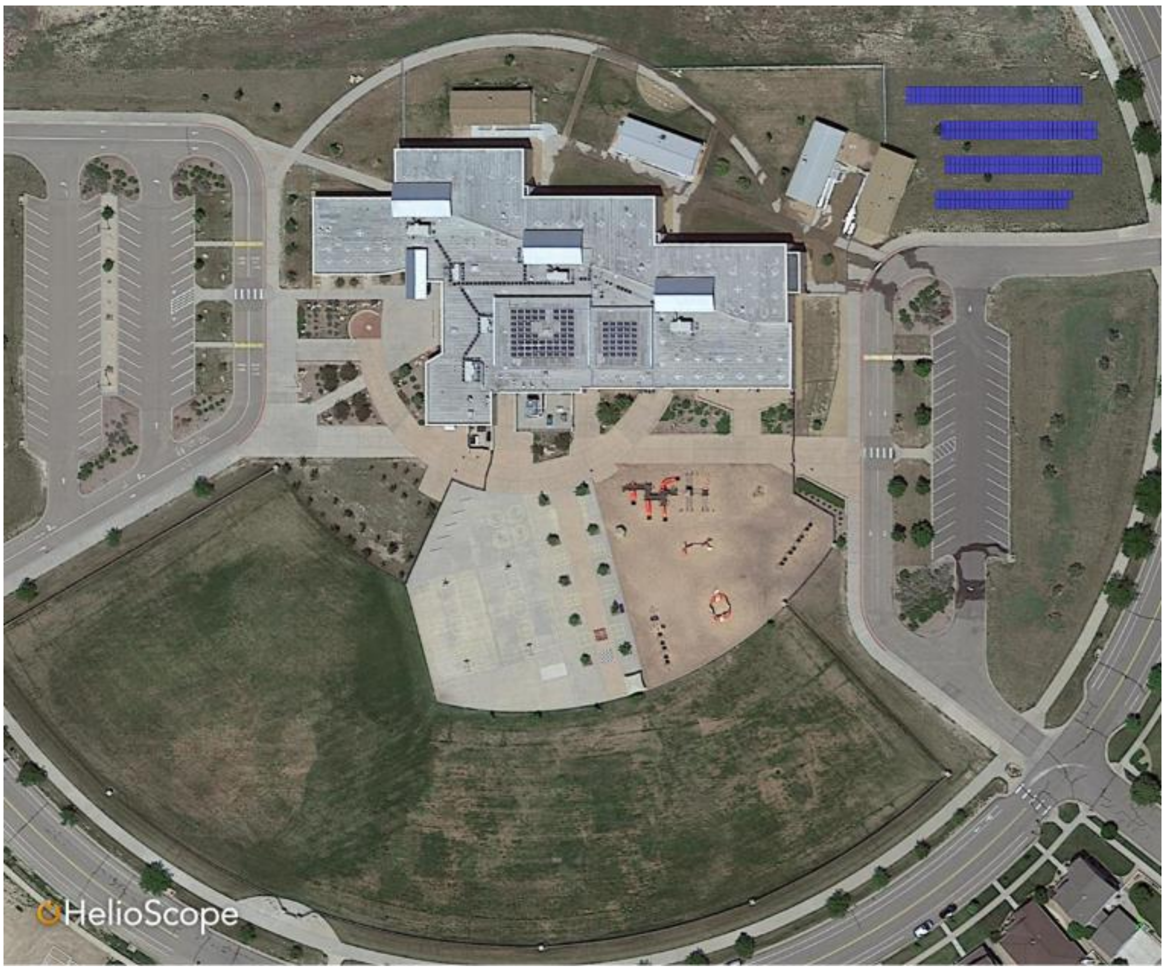
3.2.2 Bethke Elementary School

SITE DESCRIPTION

The recommended ground mount system at Bethke Elementary totals 137.7 kWDC.

The ground mount system is comprised of 4 rows of 2 PV modules high at a 25° tilt. The location has been designed based off input from PSD. This array would need to be fenced in and would require the removal of 3 small trees.

Bethke Elementary



3. Portfolio Details

SYSTEM DETAILS

System technical and performance details are outlined in the table below.

Bethke Elementary	Ground Mount System
Utility and Current Rate	Xcel; SG
Annual Usage	287,200
System Size (kWDC/kWAC)	137.7/100.0
Production, Year 1 (kWh-AC)	220,900
Solar Offset, Year 1	76.9%
GHG Reduction, Year 1 (MT CO2e)	91.3

FINANCIAL DIRECT OWNERSHIP DETAILS

Financial performance details are provided in the table below. See Section 6 for PPA/ Funding details.

Bethke Elementary	
Total Project Cost**	$568,400
Total Project Cost with 30% IRA Contribution	$397,900
Bill Savings, Year 1	$13,800
REC/ Incentive, Year 1*	$8,600
Payback (years)	14.0
25-year Total Lifetime Savings	$670,400
End of Life Decommissioning Cost	$28,200

**Xcel Energy Solar Rewards Commercial/Industrial pay credits at $0.04/kWh of PV generation for systems smaller than 250kW, for a period of 20 years.*

***Financial summary above assumes projects are contracted as a portfolio.*

MAJOR EQUIPMENT INCLUDED IN PERFORMANCE MODELING AND COST ESTIMATES

Our technical modeling and cost estimates incorporate the specifications and expected performance of the equipment outlined below. For the products listed, there are fungible alternatives with similar cost and performance characteristics available, and thus the exact specification of equipment is not expected to materially impact our estimates of capacity possible, costs, or system performance at the sites analyzed.

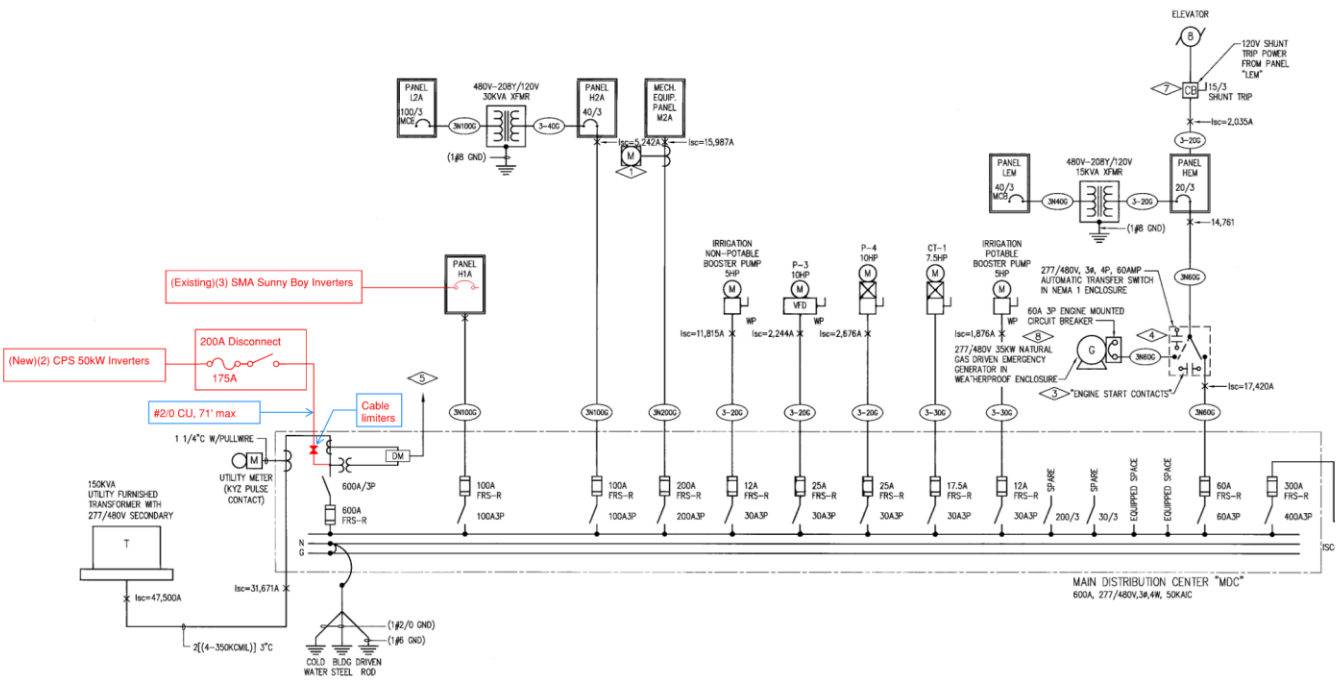
Equipment Type	QTY	Equipment Description
PV Modules	255	JA Solar 540-Watt Bifacial Module
Inverter	2	CPS 50kW-AC
Data Acquisition System	1	AlsoEnergy Data Acquisition System

INTERCONNECTION

The SLD below illustrates the way the proposed PV system would be interconnected to the site's electrical infostructure. Bethke's proposed PV system would be interconnected via a line side tap on the Main Distribution Center. See Appendix B for full SLD mark-ups.

3. Portfolio Details

Bethke Elementary PV System Proposed Interconnection Method



3.2.3 Eyestone South Elementary School

SITE DESCRIPTION

The recommended ground mount system at Eyestone South totals 110.2 kWDC.

The ground mount system is comprised of 2 rows of 2 PV modules high at a 25° tilt. The location has been designed based off input from PSD. This array would need to be fenced in and would require the removal of 2 trees and shrubbery on the north side of the array. The concrete circle on the south-west corner of the array has been removed.

Eyestone Elementary South

3. Portfolio Details

SYSTEM DETAILS

System technical and performance details are outlined in the table below.

Eyestone South	Ground Mount System
Utility and Current Rate	Xcel; SG
Annual Usage	187,700
System Size (kWDC/kWAC)	110.2/100.0
Production, Year 1 (kWh-AC)	189,400
Solar Offset, Year 1	100%
GHG Reduction, Year 1 (MT CO2e)	78.2

FINANCIAL DIRECT OWNERSHIP DETAILS

Financial performance details are provided in the table below. See Section 6 for PPA / Funding details.

Eyestone South – Direct Ownership	
Total Project Cost**	$487,900
Total Project Cost with 30% IRA Contribution	$341,500
Bill Savings, Year 1	$12,400
REC/ Incentive, Year 1*	$7,400
Payback (years)	11.9
25-year Total Lifetime Savings	$681,700
End of Life Decommissioning Cost	$22,600

**Xcel Energy Solar Rewards Commercial/Industrial pay credits at $0.04/kWh of PV generation for systems smaller than 250kW, for a period of 20 years.*
***Financial summary above assumes projects are contracted as a portfolio.*

MAJOR EQUIPMENT INCLUDED IN PERFORMANCE MODELING AND COST ESTIMATES

Our technical modeling and cost estimates incorporate the specifications and expected performance of the equipment outlined below. For the products listed, there are fungible alternatives with similar cost and performance characteristics available, and thus the exact specification of equipment is not expected to materially impact our estimates of capacity possible, costs, or system performance at the sites analyzed.

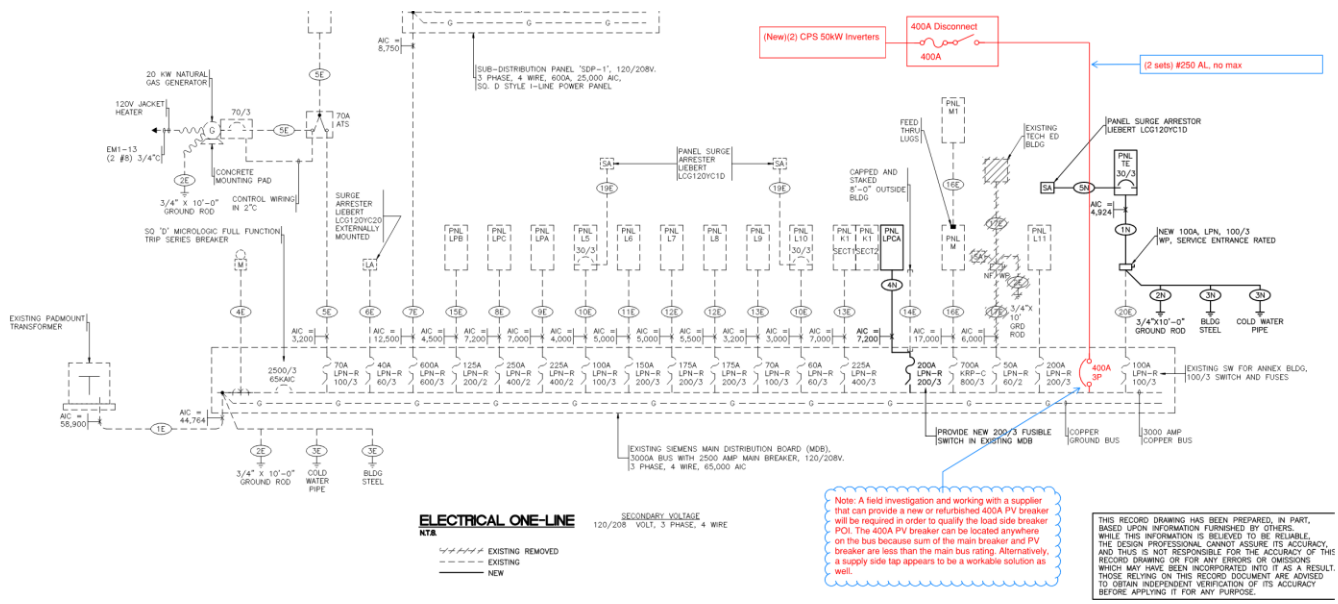
Equipment Type	QTY	Equipment Description
PV Modules	204	JA Solar 540-Watt Bifacial Module
Inverter	2	CPS 50kW-AC
Data Acquisition System	1	AlsoEnergy Data Acquisition System

3. Portfolio Details

INTERCONNECTION

An electrical field investigation and working with a supplier who can provide a refurbished 400-amp breaker will be needed to verify the load side breaker can be used as the interconnection method. An electrical field investigation would require an electrician to don arc flash gear and remove the dead fronts of the switchboard to assess the available space, take pictures, and notes of the existing infrastructure. These findings would then be relayed to the electrical engineers for a final interconnection method determination. Alternatively, a supply side tap could be utilized if needed. See Appendix B for full SLD mark-ups.

Eyestone South Elementary PV System Proposed Interconnection Method



3. Portfolio Details

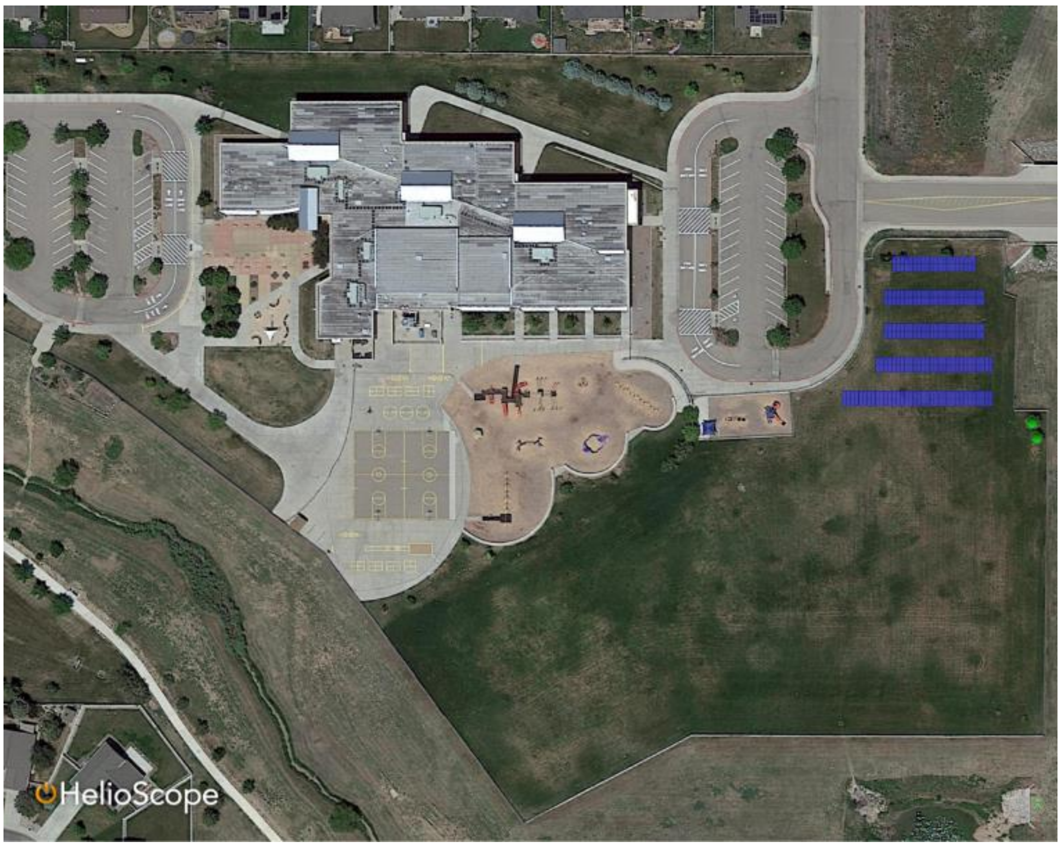
3.2.4 Rice Elementary School

SITE DESCRIPTION

The recommended ground mount system at Rice Elementary totals 142.6 kWDC.

The ground mount system is comprised of 5 rows of 2 PV modules high at a 25° tilt. The location has been designed based off input from PSD. This array would need to be fenced in and would require the removal of 3 trees.

Rice Elementary School



SYSTEM DETAILS

System technical and performance details are outlined in the table below.

Rice Elementary	Roof System
Utility and Current Rate	Xcel; SG
Annual Usage	313,000
System Size (kWDC/kWAC)	142.6/120.0
Production, Year 1 (kWh-AC)	241,700
Solar Offset, Year 1	77.2%
GHG Reduction, Year 1 (MT CO2e)	99.8

3. Portfolio Details

FINANCIAL DIRECT OWNERSHIP DETAILS

Financial performance details are provided in the table below. See Section 6 for PPA/ Funding details.

Rice Elementary – Direct Ownership	
Total Project Cost***	$580,800
Total Project Cost with 30% IRA Contribution	$406,600
Bill Savings, Year 1*	$23,800
REC/ Incentive, Year 1**	$9,500
Payback (years)	9.1
25-year Total Lifetime Savings	$1,142,400
End of Life Decommissioning Cost	$29,200

**Savings assume a rate switch to SPVTOU.*
***Xcel Energy Solar Rewards Commercial/Industrial pay credits at $0.04/kWh of PV generation for systems smaller than 250kW, for a period of 20 years.*
****Financial summary above assumes projects are contracted as a portfolio.*

MAJOR EQUIPMENT INCLUDED IN PERFORMANCE MODELING AND COST ESTIMATES

Our technical modeling and cost estimates incorporate the specifications and expected performance of the equipment outlined below. For the products listed, there are fungible alternatives with similar cost and performance characteristics available, and thus the exact specification of equipment is not expected to materially impact our estimates of capacity possible, costs, or system performance at the sites analyzed.

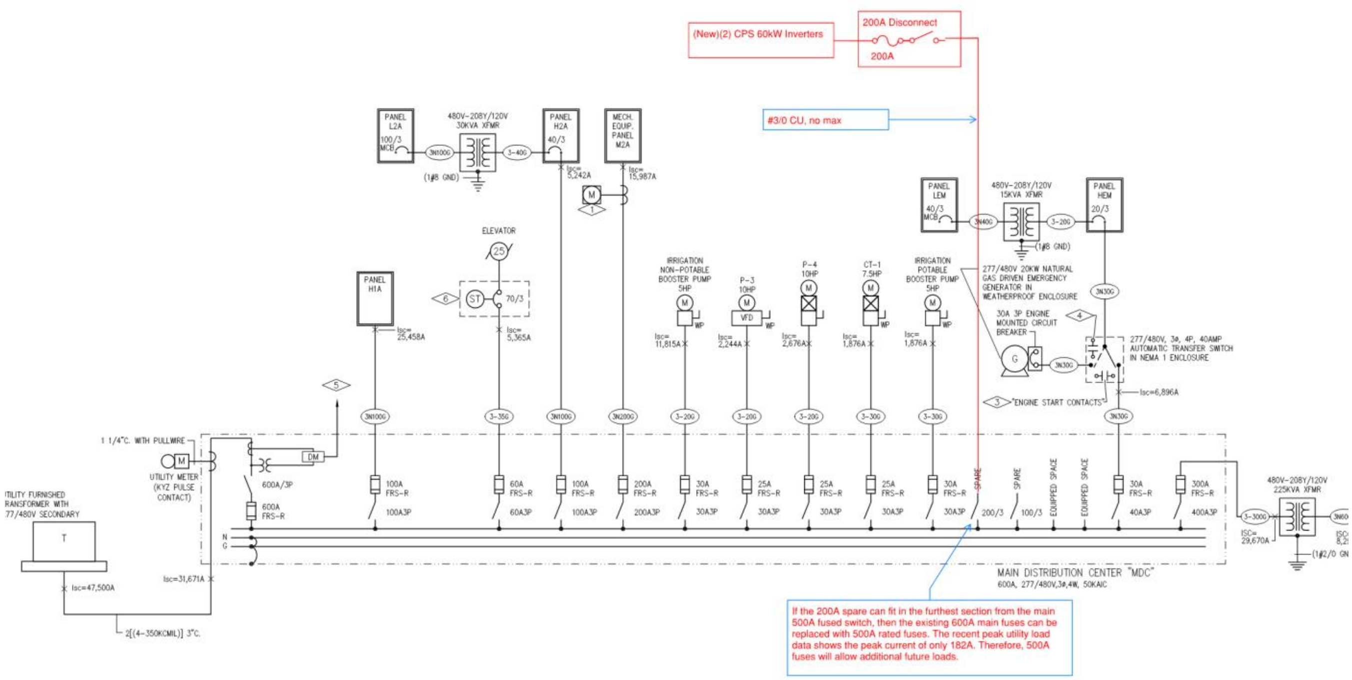
Equipment Type	QTY	Equipment Description
PV Modules	264	JA Solar 540-Watt Bifacial Module
Inverter	2	CPS 60kW-AC
Data Acquisition System	1	AlsoEnergy Data Acquisition System

3. Portfolio Details

INTERCONNECTION

The proposed PV system at Rice Elementary can be interconnected by a 200 amp back feed breaker in one of the spare breaker locations on the Main Distribution Center (MDC). The existing 600-amp main fuses would need to be replaced with 500-amp fuses. See appendix B for full SLD mark-ups.

Rice ES PV System Proposed Interconnection Method



3. Portfolio Details

3.2.5 Timnath Middle / High School

SITE DESCRIPTION

This ballasted flat roof system was designed as an array on multiple sections of the roof where an economic system layout was taken into consideration. Since the school is so new, there is not imagery of it in Helioscope's satellite view. This design is based off Wellington Middle/ High School, a sister building to Timnath. PSD has confirmed the design differences in these buildings are negligible.

Since the school is new, we do not have a full year of representative utility data. As of now the school does not qualify for a rate switch from SG to SPVTOU due to a single month having a load factor below 20%. Based on the data that is available, we see the likelihood that this school would qualify for the rate switch. The SPVTOU rate adds a significant amount of savings and would greatly improve project economics. The financial details below illustrate the economics of both rate structures.

Timnath Middle/ High School

3. Portfolio Details

SYSTEM DETAILS

System technical and performance details are outlined in the table below.

Timnath Middle / High School	Roof System
Utility and Current Rate	Xcel; SG
Annual Usage	1,013,200*
System Size (kWDC/kWAC)	679.3/ 540.0
Production, Year 1 (kWh-AC)	1,003,200
Solar Offset, Year 1	99.0%
GHG Reduction, Year 1 (MT CO2e)	**414.3**

**Since the school opened in August 2023, there is not a full year's worth of representative utility data. Usage and associated savings are based on monthly bills from 5/22-5/23.*

FINANCIAL DIRECT OWNERSHIP DETAILS

Financial performance details are provided in the table below. See Section 6 for PPA/ Funding details.

Timnath Middle / High School – Direct Ownership	SG Rate	SPVTOU Rate
Total Project Cost**	$1,857,600	Same as SG Rate
Total Project Cost with 30% IRA Contribution	$1,300,300	Same as SG Rate
Bill Savings, Year 1	$61,500	$104,260
REC/ Incentive, Year 1*	$36,800	Same as SG Rate
Payback (years)	9.5	7.1
25-year Total Lifetime Savings	$3,292,200	$4,809,100
End of Life Decommissioning Cost	$118,900	Same as SG Rate

**Xcel Energy Solar Rewards Commercial/Industrial pay credits at $0.0375/kWh of PV generation for systems larger than 250kW, and small than 500kW, for a period of 20 years.*
***Financial summary above assumes projects are contracted as a portfolio.*

MAJOR EQUIPMENT INCLUDED IN PERFORMANCE MODELING AND COST ESTIMATES

Our technical modeling and cost estimates incorporate the specifications and expected performance of the equipment outlined below. For the products listed, there are fungible alternatives with similar cost and performance characteristics available, and thus the exact specification of equipment is not expected to materially impact our estimates of capacity possible, costs, or system performance at the sites analyzed.

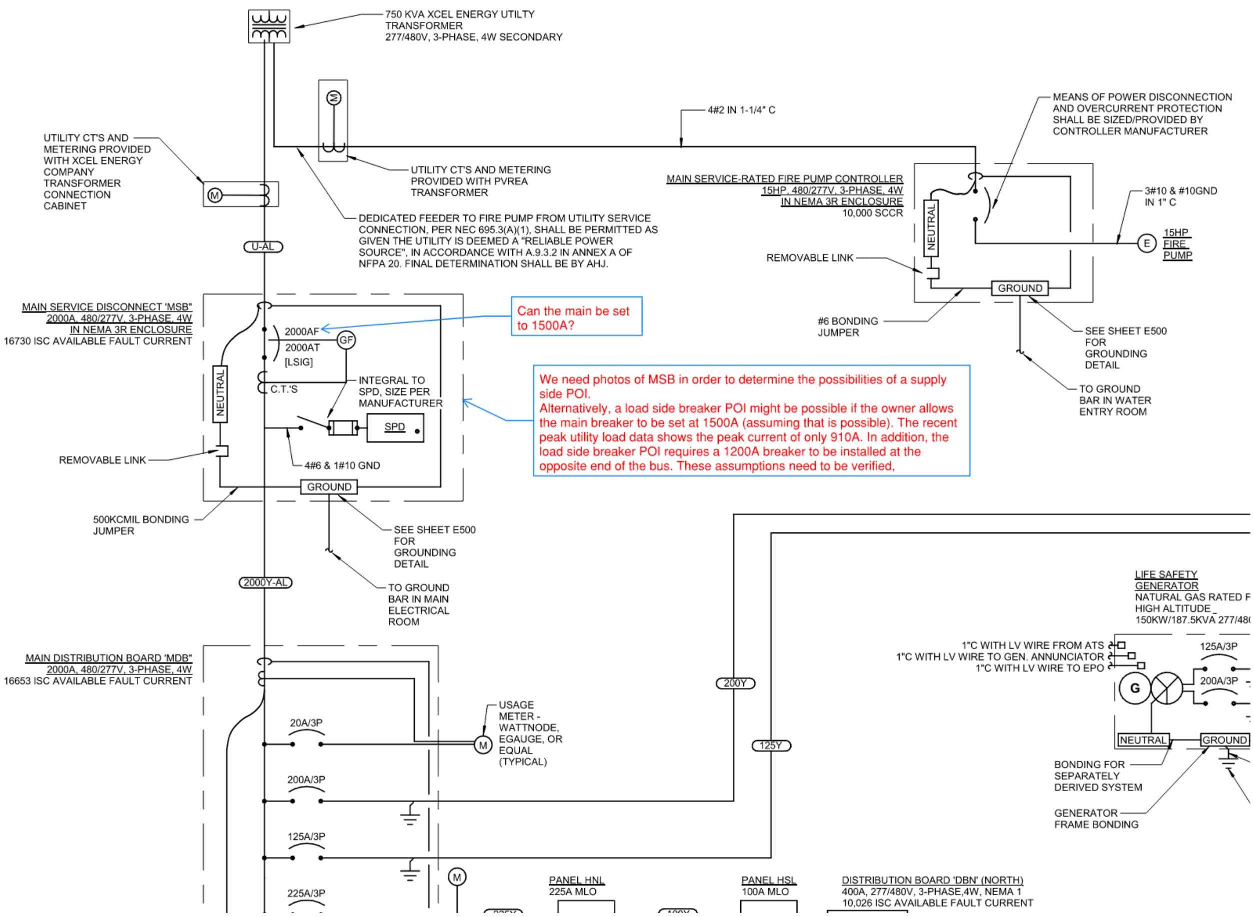
Equipment Type	QTY	Equipment Description
PV Modules	1,258	JA Solar 540-Watt Bifacial Module
Inverter	9	CPS 60kW-AC
Data Acquisition System	1	AlsoEnergy Data Acquisition System
Module Shutdown Unit	666	Tigo TS4-A-2F – Tigo PV Module Rapid Shutdown Unit

3. Portfolio Details

INTERCONNECTION

The proposed PV system could be interconnected by either a supply side tap or a load side breaker. An electrical field investigation would determine if there is space for a supply side tap, if not a load side breaker could be implemented if PSD were onboard with lowering the main breaker setting from 2000 amps to 1500 amps. See Appendix B for full SLD mark-ups.

Timnath MS/HS PV System Proposed Interconnection Method



3. Portfolio Details

3.2.6 Wellington Middle / High School

SITE DESCRIPTION

This ballasted flat roof system was designed as an array on multiple sections of the roof where an economic system layout was taken into consideration.

Wellington Middle/ High School

PV SYSTEM DETAILS

System technical and performance details are outlined in the table below.

Wellington Middle / High School	Roof System
Utility and Current Rate	PVREA; LP
Annual Usage	1,013,200*
System Size (kWDC/kWAC)	679.3/ 540.0
Production, Year 1 (kWh-AC)	1,003,200
Solar Offset, Year 1	94.3%
GHG Reduction, Year 1 (MT CO2e)	**414.3**

3. Portfolio Details

**Since the school opened in August 2023, there is not a full year's worth of representative utility data. Usage and associated savings are based on 15-minute interval data from 5/22-5/23.*

PV FINANCIAL DIRECT OWNERSHIP DETAILS

Financial performance details are provided in the table below. See Section 6 for PPA/ Funding details.

Wellington Middle / High School – Direct Ownership	
Total Project Cost**	$1,867,100
Total Project Cost with 30% IRA Contribution	$1,307,000
Bill Savings, Year 1	$69,800
REC/ Incentive, Onetime Payment*	N/A
Simple Payback (years)	16.2
Additional Funding Needed to Reach 20 Year Simple Payback*	$271,100
25-year Total Lifetime Savings	$2,637,800
End of Life Decommissioning Cost	$118,900

**Amount excludes any FCU Incentive. Additional funding could be derived from additional IRA contributions, DOLA grant awards, donations, etc.*
***Financial summary above assumes projects are contracted as a portfolio.*

MAJOR PV EQUIPMENT INCLUDED IN PERFORMANCE MODELING AND COST ESTIMATES

Our technical modeling and cost estimates incorporate the specifications and expected performance of the equipment outlined below. For the products listed, there are fungible alternatives with similar cost and performance characteristics available, and thus the exact specification of equipment is not expected to materially impact our estimates of capacity possible, costs, or system performance at the sites analyzed.

Equipment Type	QTY	Equipment Description
PV Modules	1,258	JA Solar 540-Watt Bifacial Module
Inverter	9	CPS 60kW-AC
Data Acquisition System	1	AlsoEnergy Data Acquisition System
Module Shutdown Unit	666	Tigo TS4-A-2F – Tigo PV Module Rapid Shutdown Unit

3. Portfolio Details

BESS DETAILS

The BESS system at Bamford is intended to be implemented along with the PV system. This system would be charged from PV and generate savings by lowering the demand from the utility.

Wellington Middle / High School	BESS System
BESS Use Case	Demand Management
Manufacturer	SYL/ STEM
System Size (kWAC)	250
System Size (kWh)	500

BESS FINANCIAL DIRECT OWNERSHIP DETAILS

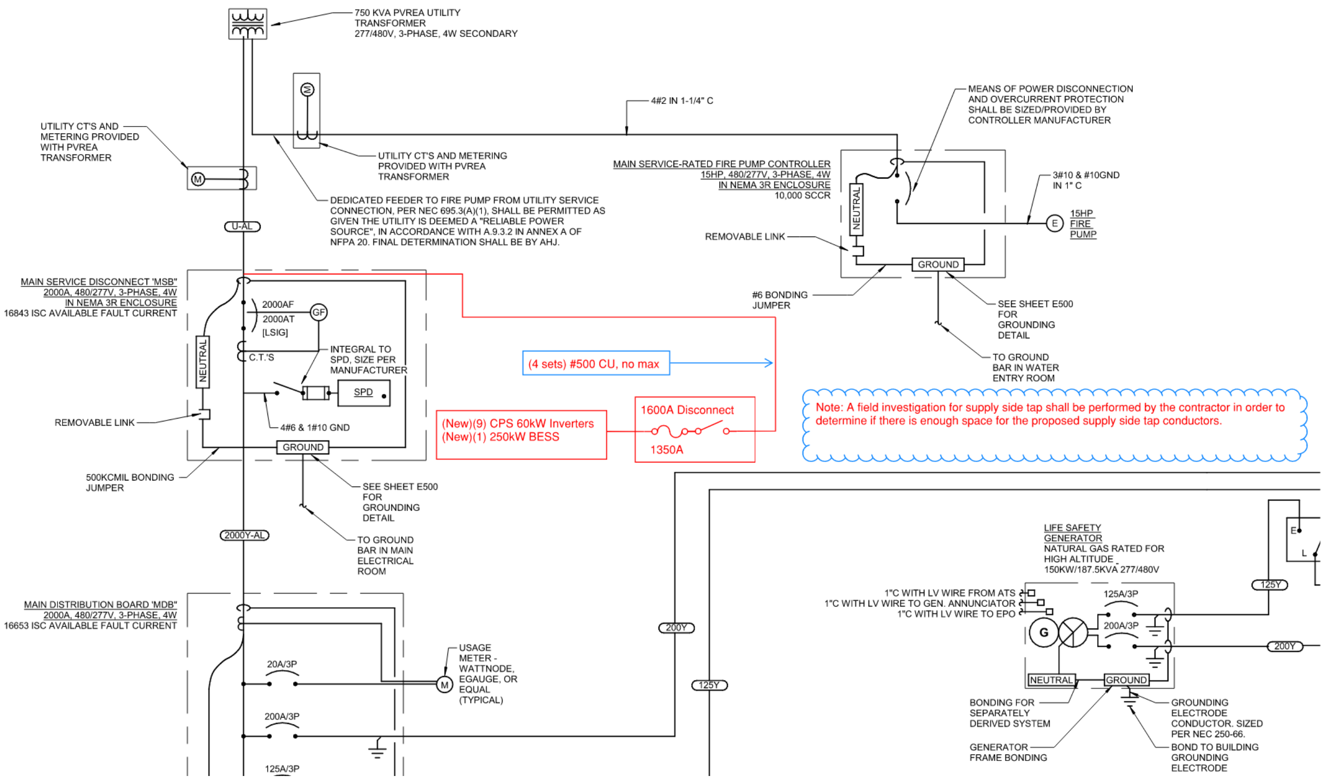
Financial performance details are provided in the table below. This system would be a capital improvement measure as the system payback far exceeds the expected system life of 10 years.

Wellington Middle / High School– BESS Direct Ownership	
Total Project Cost	$753,600
Total Project Cost with 30% IRA Contribution	$527,500
Bill Savings, Year 1	$25,700
Payback (years)	20.6
10-year Total Lifetime Savings	$257,000
Additional Funding Needed for 10 Year Payback	$270,900

PV AND BESS INTERCONNECTION

An electrical field investigation would be required to ensure there is room for a supply side tap interconnection. See Appendix B for full SLD mark-ups.

Wellington MS/HS PV System Proposed Interconnection Method



3. Portfolio Details

3.3 Financially Not Feasible Portfolio Details

The sections below give details for the Financially Not Feasible PV Portfolio along with any BESS systems, which are priced out separately from the PV system.

3.3.1 Beattie Elementary

SITE DESCRIPTION

The recommended ground mount system at Beattie Elementary totals 202.0 kWDC.

The ground mount system is comprised of 5 rows of 2 PV modules high at a 25° tilt. The location has been designed based off input from PSD. This array would need to be fenced in and would require the removal of 7 trees.

Beattie Elementary School

3. Portfolio Details

SYSTEM DETAILS

System technical and performance details are outlined in the table below.

Beattie Elementary	Ground Mount System
Utility and Current Rate	City of Fort Collins; E300
Annual Usage	336,200
System Size (kWDC/kWAC)	202.0/150.0
Production, Year 1 (kWh-AC)	327,300
Solar Offset, Year 1	97.4%
GHG Reduction, Year 1 (MT CO2e)	135.2

FINANCIAL DIRECT OWNERSHIP DETAILS

Financial performance details are provided in the table below.

Beattie Elementary – Direct Ownership	
Total Project Cost***	$816,500
Total Project Cost with 30% IRA Contribution	$571,500
Bill Savings, Year 1	$17,250
REC/ Incentive, Onetime Payment*	$50,000
Simple Payback with FCU Incentive (years)	30.2
Simple Payback without FCU Incentive (years)	33.1
Additional Funding Needed to Reach 20 Year Simple Payback**	$226,500
25-year Total Lifetime Savings	$799,980
End of Life Decommissioning Cost	$41,400

**FCU offers a onetime incentive of $0.50/ watt of installed PV, up to $50,000, two projects can qualify per calendar year.*
***Amount excludes any FCU Incentive. Additional funding could be derived from additional IRA contributions, DOLA grant awards, donations, etc.*
****Financial summary above assumes projects are contracted as a portfolio.*

MAJOR EQUIPMENT INCLUDED IN PERFORMANCE MODELING AND COST ESTIMATES

Our technical modeling and cost estimates incorporate the specifications and expected performance of the equipment outlined below. For the products listed, there are fungible alternatives with similar cost and performance characteristics available, and thus the exact specification of equipment is not expected to materially impact our estimates of capacity possible, costs, or system performance at the sites analyzed.

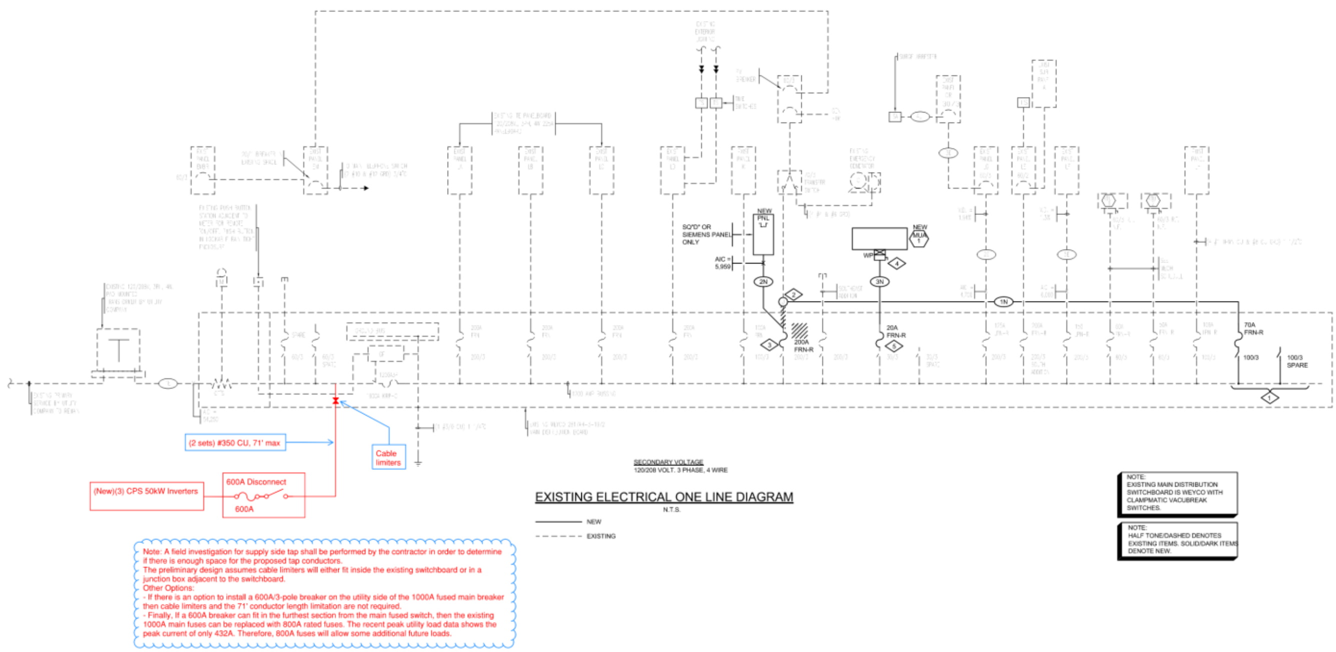
3. Portfolio Details

Equipment Type	QTY	Equipment Description
PV Modules	374	JA Solar 540-Watt Bifacial Module
Inverter	3	CPS 50kW-AC
Data Acquisition System	1	AlsoEnergy Data Acquisition System

INTERCONNECTION

The SLD below illustrates the way the proposed PV system would be interconnected to the site's electrical infostructure. Ideally Beattie's proposed PV system would be interconnected via a line side tap on the Main Distribution Board (MDB). An electrical field investigation would be required to access the available space for a line side tap. If there is not room for a line side tap, a 600-amp breaker could be placed on the utility side of the main breaker, or a 600-amp breaker could be placed on the far end of the MDB with the existing 1000 amp main fuses being replaced with 800 amp fuses. See Appendix B for full SLD mark-ups.

Bettie Elementary PV System Proposed Interconnection Method



3. Portfolio Details

3.3.2 Blevins Middle School

SITE DESCRIPTION

The PV carport system at Blevins Middle totals 248.4kW-DC.

The carport system utilizes 3 standalone canopies with 5 rows of modules in portrait at a 5° tilt, utilizing parking lots for utility consumption offset while providing shaded parking.

Blevins Middle

3. Portfolio Details

SYSTEM DETAILS

System technical and performance details are outlined in the table below.

Blevins Middle	Carport System
Utility and Current Rate	City of Fort Collins; E300
Annual Usage	389,900
System Size (kWDC/kWAC)	248.4/192.0
Production, Year 1 (kWh-AC)	363,100
Solar Offset, Year 1	93.1%
GHG Reduction, Year 1 (MT CO2e)	149.9

FINANCIAL DIRECT OWNERSHIP DETAILS

Financial performance details are provided in the table below.

Blevins Elementary – Direct Ownership	
Total Project Cost***	$1,348,100
Total Project Cost with 30% IRA Contribution	$943,700
Bill Savings, Year 1	$20,500
REC/ Incentive, Onetime Payment*	$50,000
Simple Payback with FCU Incentive (years)	43.4
Simple Payback without FCU Incentive (years)	45.8
Additional Funding Needed to Reach 20 Year Simple Payback**	$531,800
25-year Total Lifetime Savings	$708,100
End of Life Decommissioning Cost	$64,600

**FCU offers a onetime incentive of $0.50/ watt of installed PV, up to $50,000, two projects can qualify per calendar year.*
***Amount excludes any FCU Incentive. Additional funding could be derived from additional IRA contributions, DOLA grant awards, donations, etc.*
****Financial summary above assumes projects are contracted as a portfolio.*

MAJOR EQUIPMENT INCLUDED IN PERFORMANCE MODELING AND COST ESTIMATES

Our technical modeling and cost estimates incorporate the specifications and expected performance of the equipment outlined below. For the products listed, there are fungible alternatives with similar cost and performance characteristics available, and thus the exact specification of equipment is not expected to materially impact our estimates of capacity possible, costs, or system performance at the sites analyzed.

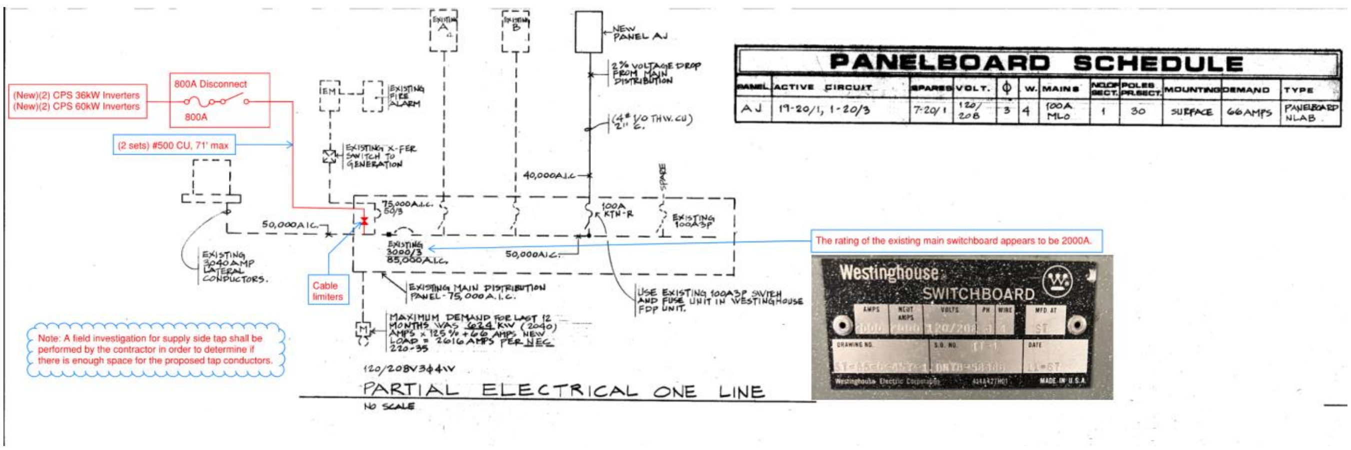
3. Portfolio Details

Equipment Type	QTY		Equipment Description	
PV Modules	460		JA Solar 540-Watt Bifacial Module	
Inverter	2	2	CPS 60kW-AC	CPS 36kW-AC
Data Acquisition System	1		AlsoEnergy Data Acquisition System	

INTERCONNECTION

The SLD below illustrates the way the proposed PV system would be interconnected to the site's electrical infostructure. Blevins' proposed PV system would be interconnected via a line side tap on the Main Distribution Panel (MDP). An electrical field investigation would be needed to confirm there is adequate space in the MDP to achieve this interconnection method. See Appendix B for full SLD mark-ups.

Blevins Middle PV System Proposed Interconnection Method



3.3.3 Boltz Middle School

SITE DESCRIPTION

The PV carport system at Boltz Middle totals 197.1kW-DC.

The carport system utilizes 1 standalone canopy with 5 rows of modules in portrait at a 5° tilt, utilizing parking lots for utility consumption offset while providing shaded parking.

Boltz Middle

SYSTEM DETAILS

System technical and performance details are outlined in the table below.

Boltz Middle	Carport System
Utility and Current Rate	City of Fort Collins; E300
Annual Usage	524,700
System Size (kWDC/kWAC)	197.1/150.0
Production, Year 1 (kWh-AC)	295,400
Solar Offset, Year 1	56.3%
GHG Reduction, Year 1 (MT CO2e)	121.9

3. Portfolio Details

FINANCIAL DIRECT OWNERSHIP DETAILS

Financial performance details are provided in the table below.

Boltz Elementary – Direct Ownership	
Total Project Cost***	$1,111,300
Total Project Cost with 30% IRA Contribution	$778,900
Bill Savings, Year 1	$17,200
REC/ Incentive, Onetime Payment*	$50,000
Simple Payback with FCU Incentive (years)	42.4
Simple Payback without FCU Incentive (years)	45.3
Additional Funding Needed to Reach 20 Year Simple Payback**	$434,900
25-year Total Lifetime Savings	$578,600
End of Life Decommissioning Cost	$51,200

**FCU offers a onetime incentive of $0.50/ watt of installed PV, up to $50,000, two projects can qualify per calendar year.*
***Amount excludes any FCU Incentive. Additional funding could be derived from additional IRA contributions, DOLA grant awards, donations, etc.*
****Financial summary above assumes projects are contracted as a portfolio.*

MAJOR EQUIPMENT INCLUDED IN PERFORMANCE MODELING AND COST ESTIMATES

Our technical modeling and cost estimates incorporate the specifications and expected performance of the equipment outlined below. For the products listed, there are fungible alternatives with similar cost and performance characteristics available, and thus the exact specification of equipment is not expected to materially impact our estimates of capacity possible, costs, or system performance at the sites analyzed.

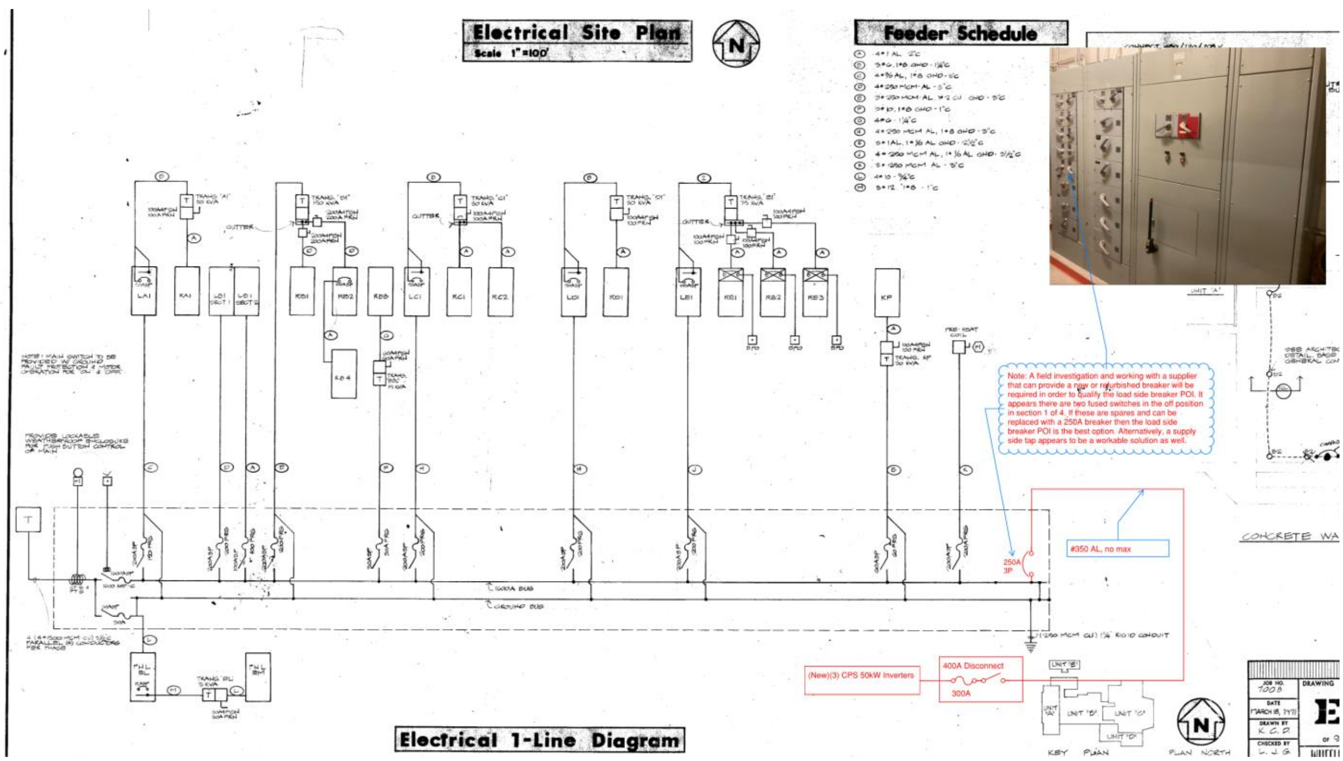
Equipment Type	QTY	Equipment Description
PV Modules	365	JA Solar 540-Watt Bifacial Module
Inverter	3	CPS 50kW-AC
Data Acquisition System	1	AlsoEnergy Data Acquisition System

3. Portfolio Details

INTERCONNECTION

Boltz's proposed PV system final interconnection method would need to be determined by an electrical field investigation and working with the Main Distribution Panel manufacturer to access if a 250-amp breaker could be procured and placed in one of the two spare breaker locations for a load side tap. A supple side tap could also be utilized if needed.

Boltz Elementary PV System Proposed Interconnection Method



3. Portfolio Details

3.3.4 Cache la Poudre Middle School

BESS AND DIRECT OWNERSHIP DETAILS

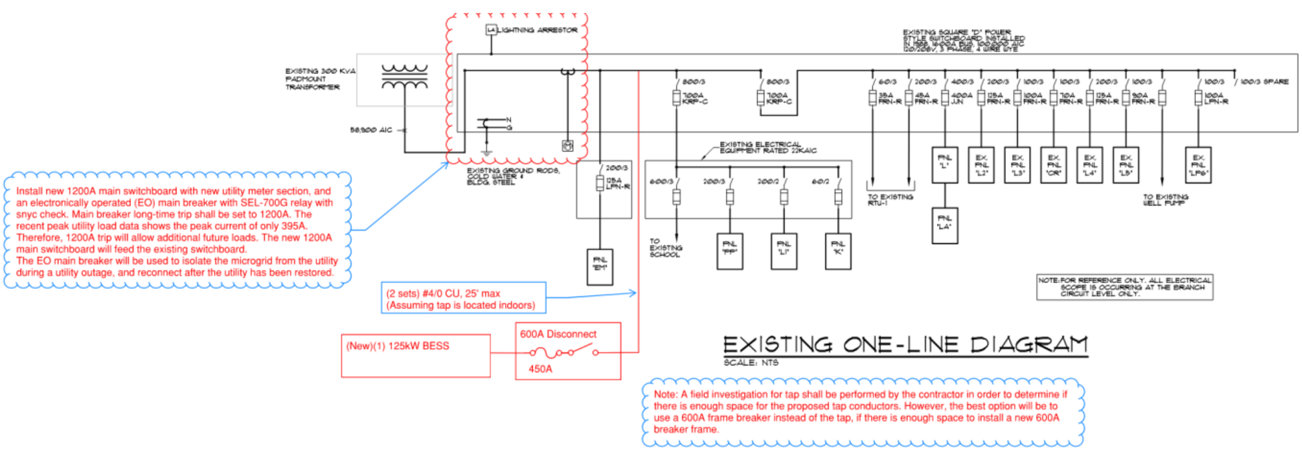
The BESS system at Cache la Poudre Middle School is intended to serve as a resiliency system. This system would be charged from the grid and provide power in an outage situation. Since this school is an emergency shelter, funding via a DOLA grant can be applied for, and would help with this capital improvement measure. The value this system offers cannot be quantified into a monetary amount on the utility bill, but rather derived by adding robustness to an emergency shelter's electrical infrastructure.

Cache la Poudre Middle School	BESS System
BESS Use Case	Backup Power
Manufacturer	SYL/ STEM
System Size (kWAC)	250
System Size (kWh)	500
Total Project Cost	$529,369

BESS INTERCONNECTION

To achieve interconnection, a new section of switchboard would need to be installed to house an SEL-700G electronically operated breaker. An electrical field investigation will also be needed to check for space for either a load side tap or 600-amp breaker. See appendix B for full SLD mark-ups.

Cache la Poudre MS PV System Proposed Interconnection Method



3. Portfolio Details

3.3.5 Fort Collins High School

SITE DESCRIPTION

The recommended PV carport system at Fort Collins High School totals 1,222.6kW-DC.

The carport system utilizes 4 standalone canopies with 5 rows of modules in portrait at a 5° tilt, utilizing parking lots for utility consumption offset while providing shaded parking.

Fort Collins High School

SYSTEM DETAILS

System technical and performance details are outlined in the table below.

Fort Collins HS	Carport System
Utility and Current Rate	City of Fort Collins; E300
Annual Usage	1,876,400
System Size (kWDC/kWAC)	1,222.6/960.0
Production, Year 1 (kWh-AC)	1,715,800
Solar Offset, Year 1	91.4%
GHG Reduction, Year 1 (MT CO2e)	708.7

3. Portfolio Details

FINANCIAL DIRECT OWNERSHIP DETAILS

Financial performance details are provided in the table below.

Fort Collins HS – Direct Ownership	
Total Project Cost***	$5,140,500
Total Project Cost with 30% IRA Contribution	$3,598,400
Bill Savings, Year 1	$95,800
REC/ Incentive, Onetime Payment*	$50,000
Simple Payback with FCU Incentive (years)	37.0
Simple Payback without FCU Incentive (years)	37.5
Additional Funding Needed to Reach 20 Year Simple Payback**	$1,681,800
25-year Total Lifetime Savings	$3,361,100
End of Life Decommissioning Cost	$317,900

**FCU offers a onetime incentive of $0.50/ watt of installed PV, up to $50,000, two projects can qualify per calendar year.*
***Amount excludes any FCU Incentive. Additional funding could be derived from additional IRA contributions, DOLA grant awards, donations, etc.*
****Financial summary above assumes projects are contracted as a portfolio.*

MAJOR EQUIPMENT INCLUDED IN PERFORMANCE MODELING AND COST ESTIMATES

Our technical modeling and cost estimates incorporate the specifications and expected performance of the equipment outlined below. For the products listed, there are fungible alternatives with similar cost and performance characteristics available, and thus the exact specification of equipment is not expected to materially impact our estimates of capacity possible, costs, or system performance at the sites analyzed.

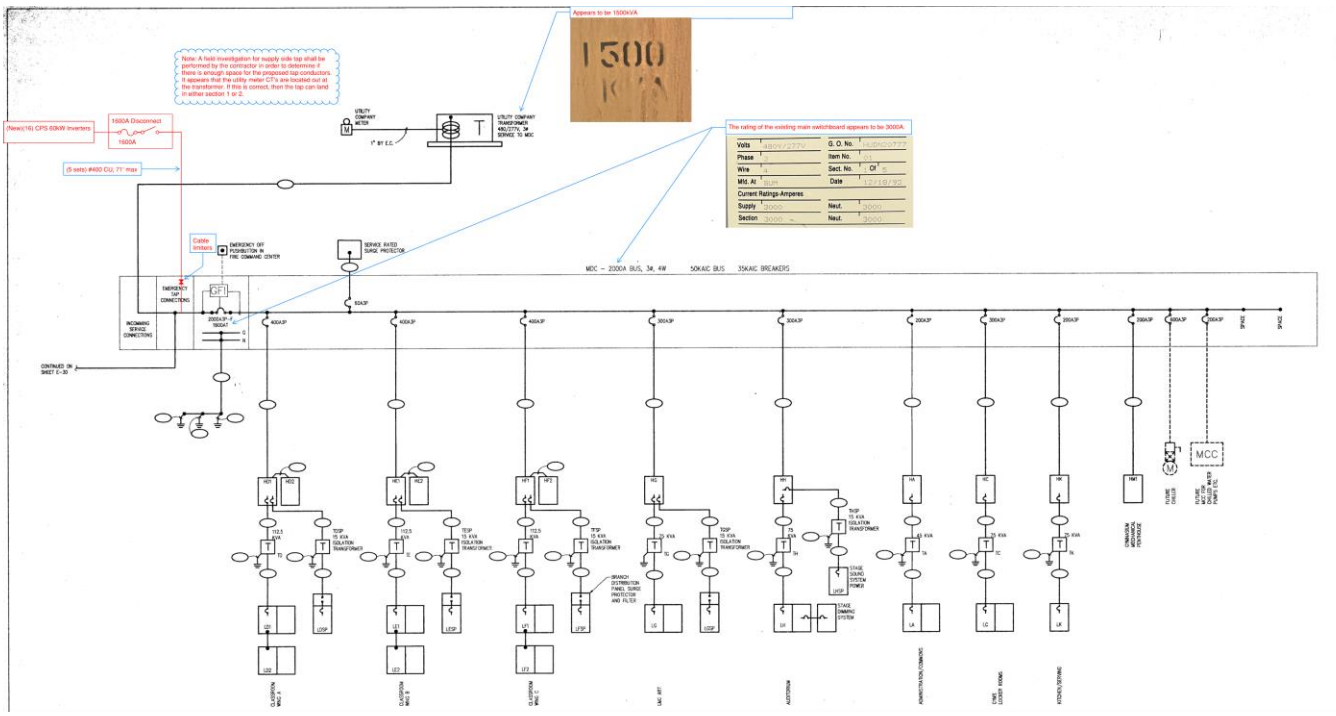
Equipment Type	QTY	Equipment Description
PV Modules	2,264	JA Solar 540-Watt Bifacial Module
Inverter	16	CPS 60kW-AC
Data Acquisition System	1	AlsoEnergy Data Acquisition System

3. Portfolio Details

INTERCONNECTION

The SLD below illustrates the way the proposed PV system would be interconnected to the site's electrical infostructure. Blevins' proposed PV system would be interconnected via a line side tap on the Main Distribution Center (MDC). An electrical field investigation would be needed to confirm there is adequate space in the MDC to achieve this interconnection method. See Appendix B for full SLD mark-ups.

Fort Collins HS PV System Proposed Interconnection Method



3.3.6 Fossil Ridge High School

SITE DESCRIPTION

The recommended ground mount system at Fossil Ridge High School totals 679.3 kWDC.

The ground mount system is comprised of 10 rows of 2 PV modules high at a 25° tilt. The location has been designed based off input from PSD. This array would need to be fenced in and would require the removal of 9 trees.

Fossil Ridge High School

3. Portfolio Details

SYSTEM DETAILS

System technical and performance details are outlined in the table below.

Fossil Ridge HS	Ground Mount System
Utility and Current Rate	City of Fort Collins; E370
Annual Usage	2,029,500
System Size (kWDC/kWAC)	679.3/540.0
Production, Year 1 (kWh-AC)	1,126,300
Solar Offset, Year 1	55.5%
GHG Reduction, Year 1 (MT CO2e)	465.2

FINANCIAL DIRECT OWNERSHIP DETAILS

Financial performance details are provided in the table below.

Fossil Ridge HS – Direct Ownership	
Total Project Cost***	$2,174,200
Total Project Cost with 30% IRA Contribution	$1,521,900
Bill Savings, Year 1	$63,300
REC/ Incentive, Onetime Payment*	$50,000
Simple Payback with FCU Incentive (years)	23.2
Simple Payback without FCU Incentive (years)	24.0
Additional Funding Needed to Reach 20 Year Simple Payback**	$255,300
25-year Total Lifetime Savings	$2,130,500
End of Life Decommissioning Cost	$139,300

**FCU offers a onetime incentive of $0.50/ watt of installed PV, up to $50,000, two projects can qualify per calendar year.*
***Amount excludes any FCU Incentive. Additional funding could be derived from additional IRA contributions, DOLA grant awards, donations, etc.*
****Financial summary above assumes projects are contracted as a portfolio.*

MAJOR EQUIPMENT INCLUDED IN PERFORMANCE MODELING AND COST ESTIMATES

Our technical modeling and cost estimates incorporate the specifications and expected performance of the equipment outlined below. For the products listed, there are fungible alternatives with similar cost and performance characteristics available, and thus the exact specification of equipment is not expected to materially impact our estimates of capacity possible, costs, or system performance at the sites analyzed.

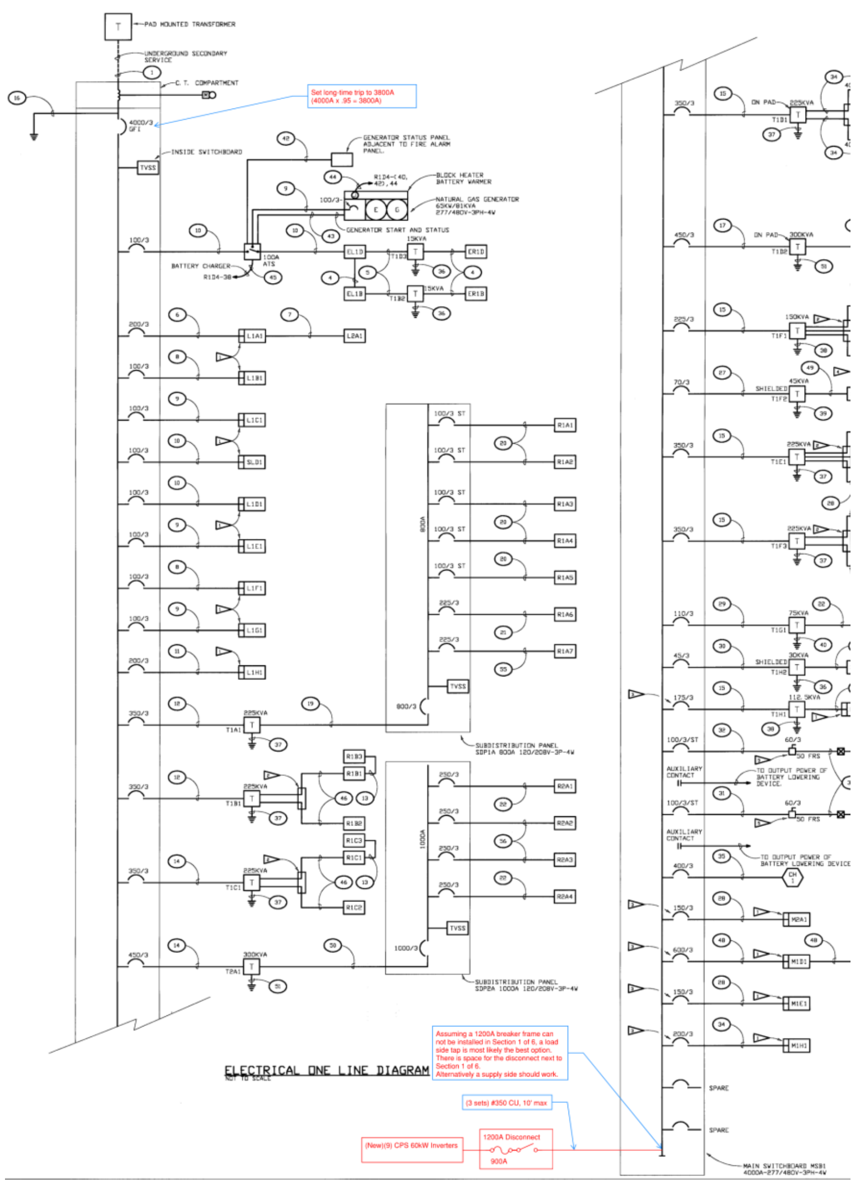
3. Portfolio Details

Equipment Type	QTY	Equipment Description
PV Modules	1,258	JA Solar 540-Watt Bifacial Module
Inverter	9	CPS 60kW-AC
Data Acquisition System	1	AlsoEnergy Data Acquisition System

INTERCONNECTION

The SLD below illustrates the way the proposed PV system would be interconnected to the site's electrical infostructure. Fort Collins HS' proposed PV system would be interconnected by either a load side, or supply side tap on the Main Switchboard (MSB1). The main breaker on MSB1 would need the long-time trip setting changed to 3800 amps. See Appendix B for full SLD mark-ups.

Fossil Ridge HS PV System Proposed Interconnection Method



3.3.7 Johannsen Support Services Center

SITE DESCRIPTION

The recommended PV carport system at Johannsen Support Service Center totals 151.2kW-DC.

The carport system utilizes 1 standalone canopy with 5 rows of modules in portrait at a 5° tilt, utilizing parking lots for utility consumption offset while providing shaded parking.

Johannsen Support Services Center

SYSTEM DETAILS

System technical and performance details are outlined in the table below.

Johannsen Support Services Center	Carport System
Utility and Current Rate	City of Fort Collins; E300
Annual Usage	240,500
System Size (kWDC/kWAC)	151.2/120.0
Production, Year 1 (kWh-AC)	216,800
Solar Offset, Year 1	90.1%
GHG Reduction, Year 1 (MT CO2e)	89.6

3. Portfolio Details

FINANCIAL DIRECT OWNERSHIP DETAILS

Financial performance details are provided in the table below.

Johannsen Support Services Center – Direct Ownership	
Total Project Cost***	$895,300
Total Project Cost with 30% IRA Contribution	$626,700
Bill Savings, Year 1	$12,800
REC/ Incentive, Onetime Payment*	$50,000
Simple Payback with FCU Incentive (years)	45.1
Simple Payback without FCU Incentive (years)	49.0
Additional Funding Needed to Reach 20 Year Simple Payback**	$370,900
25-year Total Lifetime Savings	$430,300
End of Life Decommissioning Cost	$39,300

**FCU offers a onetime incentive of $0.50/ watt of installed PV, up to $50,000, two projects can qualify per calendar year.*
***Amount excludes any FCU Incentive. Additional funding could be derived from additional IRA contributions, DOLA grant awards, donations, etc.*
****Financial summary above assumes projects are contracted as a portfolio.*

MAJOR EQUIPMENT INCLUDED IN PERFORMANCE MODELING AND COST ESTIMATES

Our technical modeling and cost estimates incorporate the specifications and expected performance of the equipment outlined below. For the products listed, there are fungible alternatives with similar cost and performance characteristics available, and thus the exact specification of equipment is not expected to materially impact our estimates of capacity possible, costs, or system performance at the sites analyzed.

Equipment Type	QTY	Equipment Description
PV Modules	280	JA Solar 540-Watt Bifacial Module
Inverter	2	CPS 60kW-AC
Data Acquisition System	1	AlsoEnergy Data Acquisition System

INTERCONNECTION

This site appears to be difficult to interconnect any size PV system due to the age of the existing equipment, bus ratings and no available space for a new breaker/fused switch. An electrical field investigation is required to determine if a supply side tap or load side tap is possible. If the electrical field investigation determines either (2 sets) of #4/0 can terminate on the supply side or (2 sets) of #250 can terminate on the load side of the 1200A bus (right section) then the proposed (2) CPS 60kW inverters can be interconnected. The limitations of length of tap conductors for both cases must be factored in the electrical field investigation. See appendix B for full SLD mark-ups.

3. Portfolio Details

3.3.8 Kinard Core Knowledge Middle School

SITE DESCRIPTION

The recommended PV carport system at Kinard Core Knowledge Middle School totals 268.9kW-DC.

The carport system utilizes 5 standalone canopies with 5 rows of modules in portrait at a 5° tilt, utilizing parking lots for utility consumption offset while providing shaded parking.

Kinard Core Knowledge Middle School

SYSTEM DETAILS

System technical and performance details are outlined in the table below.

Kinard Core Knowledge MS	Carport System
Utility and Current Rate	City of Fort Collins; E300
Annual Usage	642,200
System Size (kWDC/kWAC)	1268.9/236.0
Production, Year 1 (kWh-AC)	388,700
Solar Offset, Year 1	60.5%
GHG Reduction, Year 1 (MT CO2e)	163.5

3. Portfolio Details

FINANCIAL DIRECT OWNERSHIP DETAILS

Financial performance details are provided in the table below.

Kinard Core Knowledge MS – Direct Ownership	
Total Project Cost***	$1,443,100
Total Project Cost with 30% IRA Contribution	$1,010,200
Bill Savings, Year 1	$19,700
REC/ Incentive, Onetime Payment*	$50,000
Simple Payback with FCU Incentive (years)	48.7
Simple Payback without FCU Incentive (years)	51.2
Additional Funding Needed to Reach 20 Year Simple Payback**	$615,500
25-year Total Lifetime Savings	$663,900
End of Life Decommissioning Cost	$69,900

**FCU offers a onetime incentive of $0.50/ watt of installed PV, up to $50,000, two projects can qualify per calendar year.*

***Amount excludes any FCU Incentive. Additional funding could be derived from additional IRA contributions, DOLA grant awards, donations, etc.*

****Financial summary above assumes projects are contracted as a portfolio.*

MAJOR EQUIPMENT INCLUDED IN PERFORMANCE MODELING AND COST ESTIMATES

Our technical modeling and cost estimates incorporate the specifications and expected performance of the equipment outlined below. For the products listed, there are fungible alternatives with similar cost and performance characteristics available, and thus the exact specification of equipment is not expected to materially impact our estimates of capacity possible, costs, or system performance at the sites analyzed.

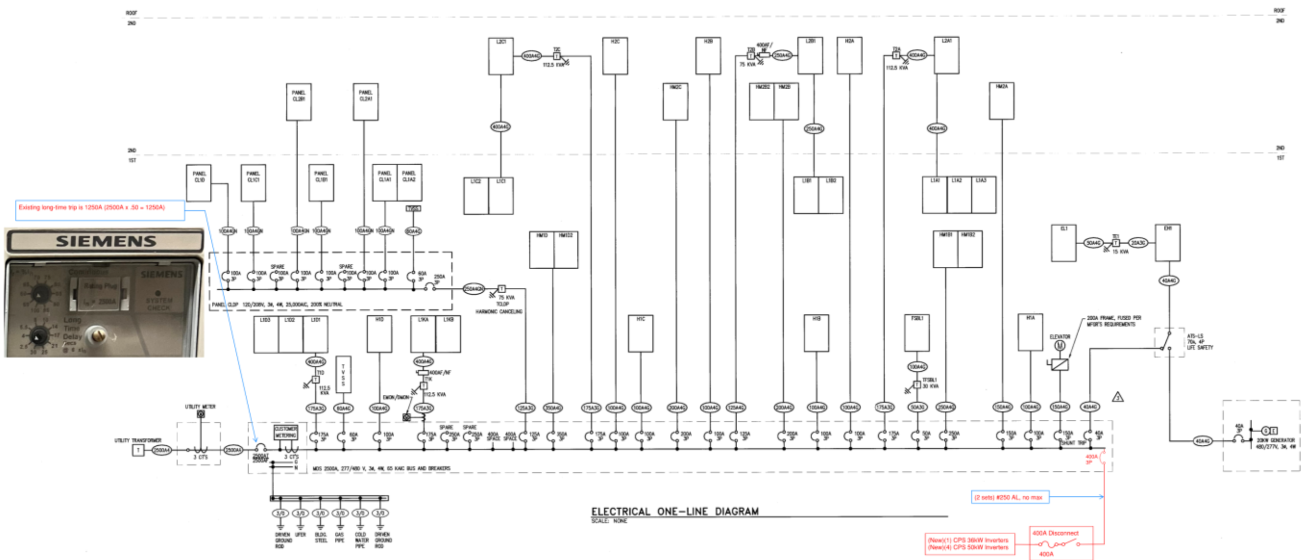
Equipment Type	QTY		Equipment Description	
PV Modules	460		JA Solar 540-Watt Bifacial Module	
Inverter	4	1	CPS 50kW-AC	CPS 36kW-AC
Data Acquisition System	1		AlsoEnergy Data Acquisition System	

3. Portfolio Details

INTERCONNECTION

The proposed PV system would interconnect to the main distribution panel via a back feed 400-amp breaker which can be seen in below. See appendix B for full SLD mark-ups.

Kinard Core Knowledge MS PV System Proposed Interconnection Method



3.3.9 Preston Middle School

SITE DESCRIPTION

The recommended ground mount system at Preston Middle totals 388.8 kWDC.

The ground mount system is comprised of 12 rows of 2 PV modules high at a 25° tilt. The location has been designed based off input from PSD. This array would need to be fenced in and would require the removal of 8 trees.

Preston MS

3. Portfolio Details

SYSTEM DETAILS

System technical and performance details are outlined in the table below.

Preston MS	Roof System
Utility and Current Rate	City of Fort Collins; E300
Annual Usage	828,900
System Size (kWDC/kWAC)	388.8/300.0
Production, Year 1 (kWh-AC)	626,800
Solar Offset, Year 1	75.6%
GHG Reduction, Year 1 (MT CO2e)	258.9

FINANCIAL DIRECT OWNERSHIP DETAILS

Financial performance details are provided in the table below.

Preston MS – Direct Ownership	
Total Project Cost***	$1,381,100
Total Project Cost with 30% IRA Contribution	$966,800
Bill Savings, Year 1	$34,900
REC/ Incentive, Onetime Payment*	$50,000
Simple Payback with FCU Incentive (years)	26.3
Simple Payback without FCU Incentive (years)	27.7
Additional Funding Needed to Reach 20 Year Simple Payback**	$268,200
25-year Total Lifetime Savings	$1,174,400
End of Life Decommissioning Cost	$79,700

**FCU offers a onetime incentive of $0.50/ watt of installed PV, up to $50,000, two projects can qualify per calendar year.*

***Amount excludes any FCU Incentive. Additional funding could be derived from additional IRA contributions, DOLA grant awards, donations, etc.*

****Financial summary above assumes projects are contracted as a portfolio.*

MAJOR EQUIPMENT INCLUDED IN PERFORMANCE MODELING AND COST ESTIMATES

Our technical modeling and cost estimates incorporate the specifications and expected performance of the equipment outlined below. For the products listed, there are fungible alternatives with similar cost and performance characteristics available, and thus the exact specification of equipment is not expected to materially impact our estimates of capacity possible, costs, or system performance at the sites analyzed.

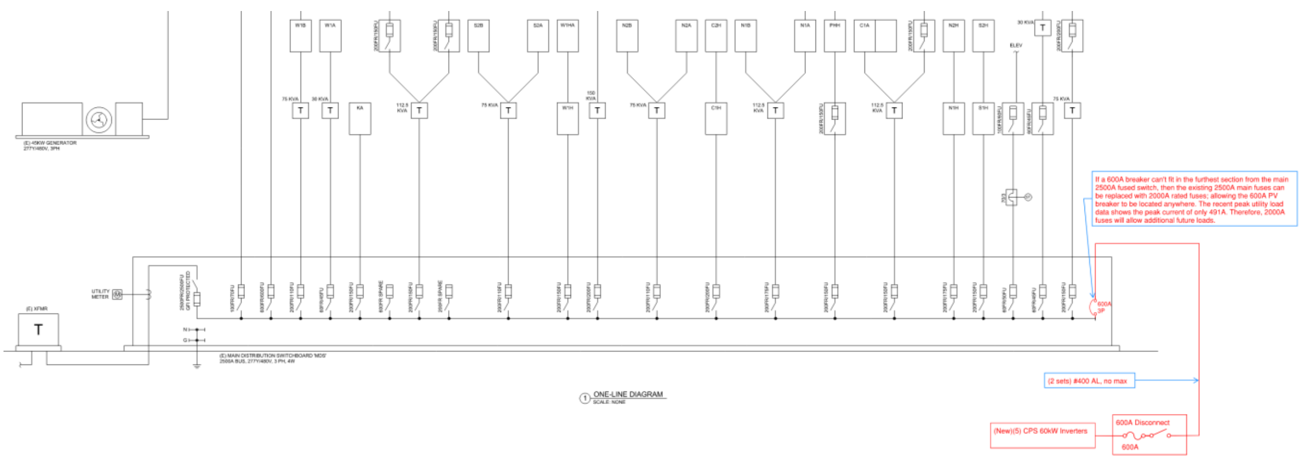
3. Portfolio Details

Equipment Type	QTY	Equipment Description
PV Modules	720	JA Solar 540-Watt Bifacial Module
Inverter	5	CPS 60kW-AC
Data Acquisition System	1	AlsoEnergy Data Acquisition System

INTERCONNECTION

The proposed PV system would ideally be interconnected via a 600 amp back feed breaker. In the event the breaker will not fit into the far end of the Main Distribution Switchboard (MDS), the main 2500-amp fuses could be replaced with 2000-amp fuses which would allow the 600 amp breaker to be placed in any section of the MDS. An electrical field investigation would be required to determine the breaker placement. See appendix B for full SLD mark-ups.

Preston MS PV System Proposed Interconnection Method



3. Portfolio Details

3.3.10 Poudre High School

SITE DESCRIPTION

The PV carport system at Poudre High School totals 871.6kW-DC.

The carport system utilizes 6 standalone canopies, 3 canopies with rows 4 of modules, and 3 canopies with rows of 5 modules in portrait at a 5° tilt. This system utilizes parking lots for utility consumption offset while providing shaded parking.

Poudre High School

SYSTEM DETAILS

System technical and performance details are outlined in the table below.

Poudre High School	Carport System
Utility and Current Rate	City of Fort Collins; E300
Annual Usage	1,585,800
System Size (kWDC/kWAC)	871.6/726.0
Production, Year 1 (kWh-AC)	1,301,400
Solar Offset, Year 1	82.1%
GHG Reduction, Year 1 (MT CO2e)	538.0

3. Portfolio Details

FINANCIAL DIRECT OWNERSHIP DETAILS

Financial performance details are provided in the table below.

Poudre High School – Direct Ownership	
Total Project Cost***	$3,858,500
Total Project Cost with 30% IRA Contribution	$2,700,900
Bill Savings, Year 1	$72,800
REC/ Incentive, Onetime Payment*	$50,000
Simple Payback with FCU Incentive (years)	36.4
Simple Payback without FCU Incentive (years)	37.0
Additional Funding Needed to Reach 20 Year Simple Payback**	$1,244,000
25-year Total Lifetime Savings	$2,450,700
End of Life Decommissioning Cost	$226,600

**FCU offers a onetime incentive of $0.50/ watt of installed PV, up to $50,000, two projects can qualify per calendar year.*
***Amount excludes any FCU Incentive. Additional funding could be derived from additional IRA contributions, DOLA grant awards, donations, etc.*
****Financial summary above assumes projects are contracted as a portfolio.*

MAJOR EQUIPMENT INCLUDED IN PERFORMANCE MODELING AND COST ESTIMATES

Our technical modeling and cost estimates incorporate the specifications and expected performance of the equipment outlined below. For the products listed, there are fungible alternatives with similar cost and performance characteristics available, and thus the exact specification of equipment is not expected to materially impact our estimates of capacity possible, costs, or system performance at the sites analyzed.

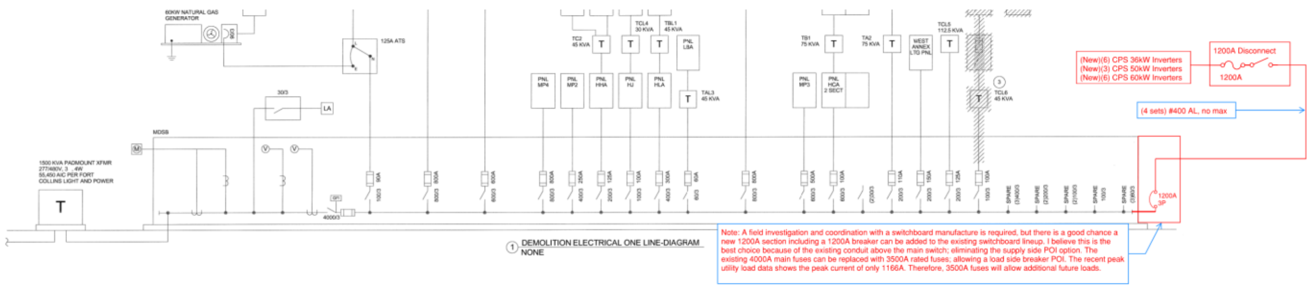
Equipment Type	QTY			Equipment Description		
PV Modules	1,614			JA Solar 540-Watt Bifacial Module		
Inverter	6	3	6	CPS 60kW-AC	CPS 50kW-AC	CPS 36kW-AC
Data Acquisition System	1			AlsoEnergy Data Acquisition System		

3. Portfolio Details

INTERCONNECTION

An electrical field investigation and coordination with the Main Distribution Switchboard (MDSB) manufacturer will be needed to finalize the interconnection method. A new 1200-amp section of switchboard could be added to the existing MDSB with the PV system interconnected to a 1200 amp back feed breaker. The existing 4000-amp fuses would need to be replaced with 3500-amp fuses. See Appendix B for full SLD mark-ups.

Poudre HS PV System Proposed Interconnection Method



3. Portfolio Details

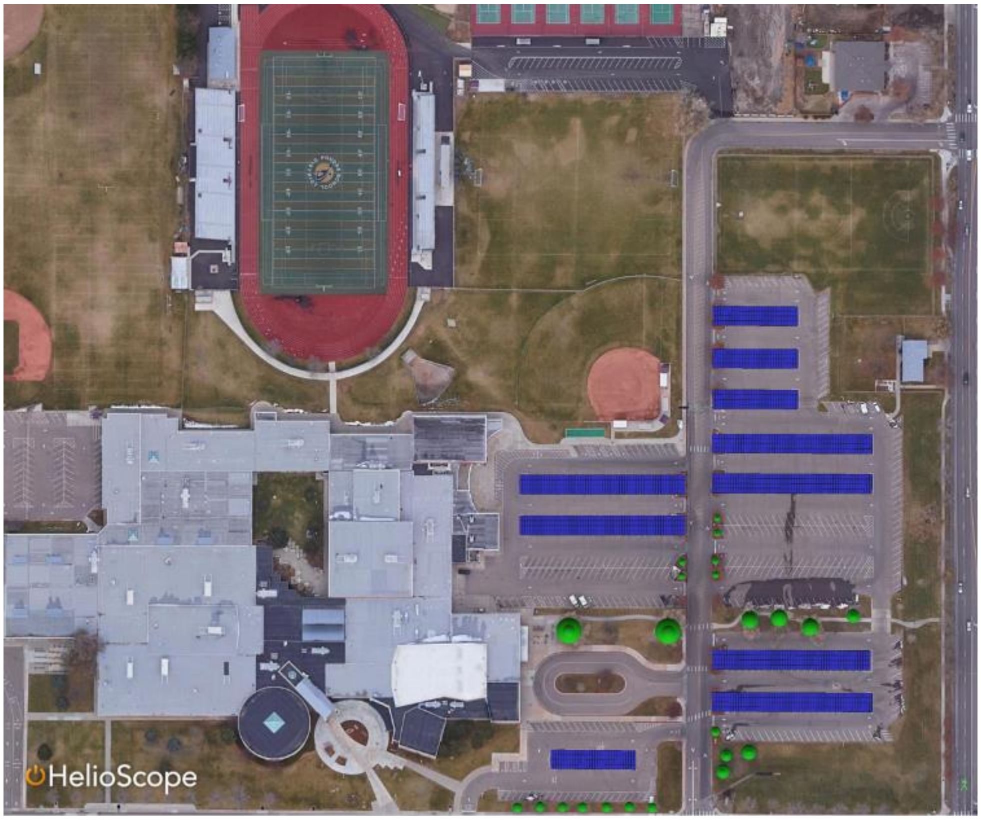
3.3.11 Rocky Mountain High School

SITE DESCRIPTION

The recommended PV carport system at Rocky Mountain High School totals 1,164.2kW-DC.

The carport system utilizes 10 standalone canopies with rows 4 of modules in portrait at a 5° tilt. This system utilizes parking lots for utility consumption offset while providing shaded parking. As can be seen in the layout below, there are 3 sections of double row parking without PV due to excessive shading from the large trees (green circles).

Rocky Mountain High School



SYSTEM DETAILS

System technical and performance details are outlined in the table below.

Rocky Mountain High School	Carport System
Utility and Current Rate	City of Fort Collins; E300
Annual Usage	1,851,700
System Size (kWDC/kWAC)	1,164.2/960.0
Production, Year 1 (kWh-AC)	1,761,400
Solar Offset, Year 1	95.1%
GHG Reduction, Year 1 (MT CO2e)	727.5

3. Portfolio Details

FINANCIAL DIRECT OWNERSHIP DETAILS

Financial performance details are provided in the table below.

Rocky Mountain High School – Direct Ownership	
Total Project Cost***	$4,930,000
Total Project Cost with 30% IRA Contribution	$3,451,000
Bill Savings, Year 1	$97,400
REC/ Incentive, Onetime Payment*	$50,000
Simple Payback with FCU Incentive (years)	34.9
Simple Payback without FCU Incentive (years)	35.4
Additional Funding Needed to Reach 20 Year Simple Payback**	$1,503,500
25-year Total Lifetime Savings	$3,275,800
End of Life Decommissioning Cost	$302,700

**FCU offers a onetime incentive of $0.50/ watt of installed PV, up to $50,000, two projects can qualify per calendar year.*

***Amount excludes any FCU Incentive. Additional funding could be derived from additional IRA contributions, DOLA grant awards, donations, etc.*

****Financial summary above assumes projects are contracted as a portfolio.*

MAJOR EQUIPMENT INCLUDED IN PERFORMANCE MODELING AND COST ESTIMATES

Our technical modeling and cost estimates incorporate the specifications and expected performance of the equipment outlined below. For the products listed, there are fungible alternatives with similar cost and performance characteristics available, and thus the exact specification of equipment is not expected to materially impact our estimates of capacity possible, costs, or system performance at the sites analyzed.

Equipment Type	QTY	Equipment Description
PV Modules	2,156	JA Solar 540-Watt Bifacial Module
Inverter	16	CPS 60kW-AC
Data Acquisition System	1	AlsoEnergy Data Acquisition System

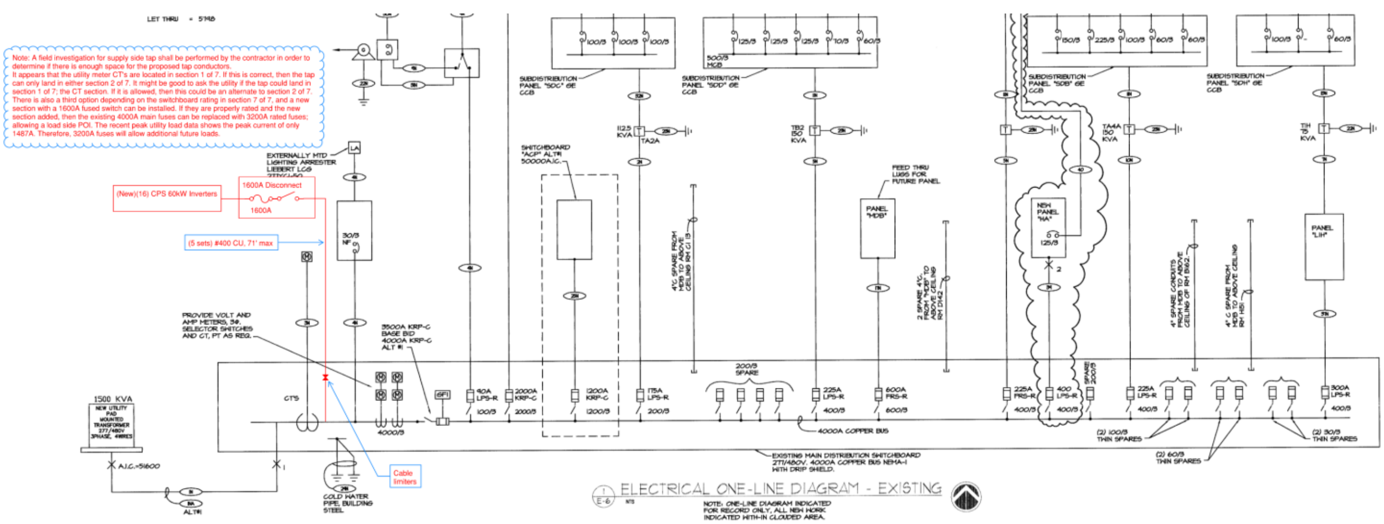
3. Portfolio Details

INTERCONNECTION

An electrical field investigation and utility guidance will be needed for final interconnection methodology. There are 3 potential options:

- A supply side tap could be implemented if there is enough space in the Main Distribution Switchboard (MDS).
    - It appears that the utility meter current transformers (CT's) are located in section 1 of 7. If this is correct, then the tap can only land in section 2 of 7.
    - If it is allowed by the utility, the taps could be placed in section 1 of 7.
- The third option depends on the switchboard rating in section 7 of 7. A new section with a 1600-amp fused switch could be installed. If they are properly rated and the new section added, then the existing 4000-amp main fuses can be replaced with 3200 amp rated fuses; allowing a load side interconnection. The recent peak utility load data shows the peak current of only 1487 amps. Therefore, 3200A fuses will allow additional future loads. See appendix B for full SLD mark-ups.

Rocky Mountain HS PV System Proposed Interconnection Method



3. Portfolio Details

3.3.12 South Bus Terminal

SITE DESCRIPTION

The recommended flush mount PV system at the South Bus Terminal totals 101.0 kW-DC.

The roof mount system over the bus parking canopy is a great way to offset energy consumption and could be expanded in the event PSD adds electric busses and chargers. There is a slim margin for structural feasibility at this site, as the available structural capacity is nearly the same as the weight of the proposed PV system.

South Bus Terminal

SYSTEM DETAILS

System technical and performance details are outlined in the table below.

South Bus Terminal	Flush Mount System
Utility and Current Rate	City of Fort Collins; E254
Annual Usage	172,500
System Size (kWDC/kWAC)	101.0/85.0
Production, Year 1 (kWh-AC)	136,800
Solar Offset, Year 1	79.3%
GHG Reduction, Year 1 (MT CO2e)	56.5

3. Portfolio Details

FINANCIAL DIRECT OWNERSHIP DETAILS

Financial performance details are provided in the table below.

South Bus Terminal – Direct Ownership	
Total Project Cost***	$403,500
Total Project Cost with 30% IRA Contribution	$282,500
Bill Savings, Year 1	$10,700
REC/ Incentive, Onetime Payment*	$50,000
Simple Payback with FCU Incentive (years)	21.8
Simple Payback without FCU Incentive (years)	26.5
Additional Funding Needed to Reach 20 Year Simple Payback**	$69,200
25-year Total Lifetime Savings	$358,600
End of Life Decommissioning Cost	$17,700

**FCU offers a onetime incentive of $0.50/ watt of installed PV, up to $50,000, two projects can qualify per calendar year.*
***Amount excludes any FCU Incentive. Additional funding could be derived from additional IRA contributions, DOLA grant awards, donations, etc.*
****Financial summary above assumes projects are contracted as a portfolio.*

MAJOR EQUIPMENT INCLUDED IN PERFORMANCE MODELING AND COST ESTIMATES

Our technical modeling and cost estimates incorporate the specifications and expected performance of the equipment outlined below. For the products listed, there are fungible alternatives with similar cost and performance characteristics available, and thus the exact specification of equipment is not expected to materially impact our estimates of capacity possible, costs, or system performance at the sites analyzed.

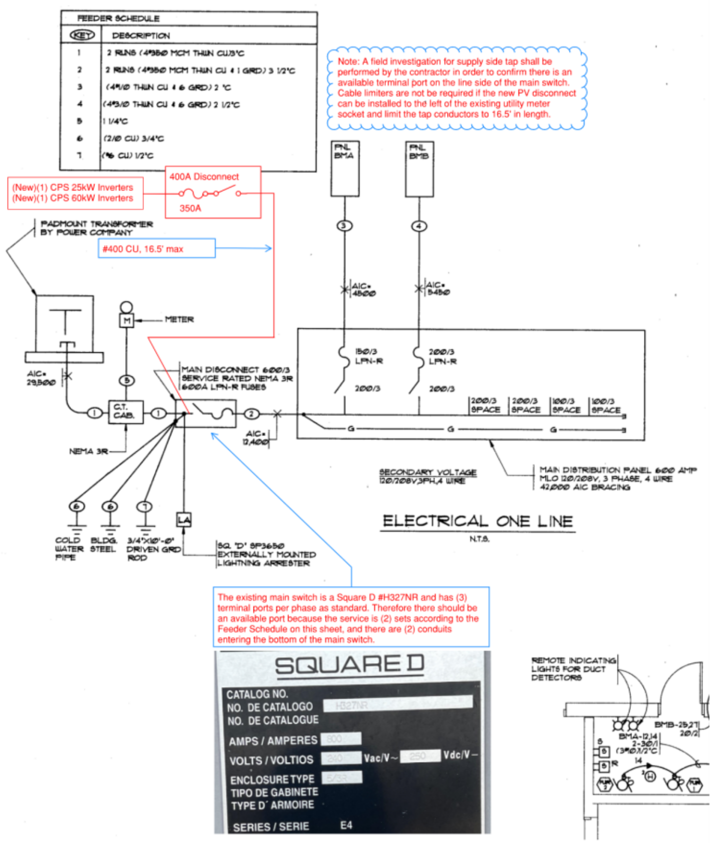
Equipment Type	QTY		Equipment Description	
PV Modules	187		JA Solar 540-Watt Bifacial Module	
Inverter	1	1	CPS 60kW-AC	CPS 25kW-AC
Data Acquisition System	1		AlsoEnergy Data Acquisition System	
Module Shutdown Unit	99		Tigo TS4-A-2F – Tigo PV Module Rapid Shutdown Unit	

3. Portfolio Details

INTERCONNECTION

An electrical field investigation would be required to identify if there are terminal ports available on the main switch to land a supply side tap. See appendix B for full SLD mark-ups.

South Bus Terminal PV System Proposed Interconnection Method



3.3.13 Traut Core Knowledge Elementary School

SITE DESCRIPTION

The recommended PV carport system at Traut totals 156.6kW-DC.

The carport system utilizes 1 standalone canopy with rows 5 of modules in portrait at a 5° tilt. This system utilizes parking lots for utility consumption offset while providing shaded parking.

Traut Core Knowledge Elementary School

SYSTEM DETAILS

System technical and performance details are outlined in the table below.

Traut Core Knowledge Elementary School	Carport System
Utility and Current Rate	City of Fort Collins; E300
Annual Usage	267,900
System Size (kWDC/kWAC)	156.6/120.0
Production, Year 1 (kWh-AC)	234,400
Solar Offset, Year 1	87.5%
GHG Reduction, Year 1 (MT CO2e)	96.8

3. Portfolio Details

FINANCIAL DIRECT OWNERSHIP DETAILS

Financial performance details are provided in the table below.

Traut Core Knowledge Elementary School – Direct Ownership	
Total Project Cost***	$925,700
Total Project Cost with 30% IRA Contribution	$648,000
Bill Savings, Year 1	$13,200
REC/ Incentive, Onetime Payment*	$50,000
Simple Payback with FCU Incentive (years)	45.2
Simple Payback without FCU Incentive (years)	49.0
Additional Funding Needed to Reach 20 Year Simple Payback**	$383,500
25-year Total Lifetime Savings	$444,800
End of Life Decommissioning Cost	$40,700

**FCU offers a onetime incentive of $0.50/ watt of installed PV, up to $50,000, two projects can qualify per calendar year.*
***Amount excludes any FCU Incentive. Additional funding could be derived from additional IRA contributions, DOLA grant awards, donations, etc.*
****Financial summary above assumes projects are contracted as a portfolio.*

MAJOR EQUIPMENT INCLUDED IN PERFORMANCE MODELING AND COST ESTIMATES

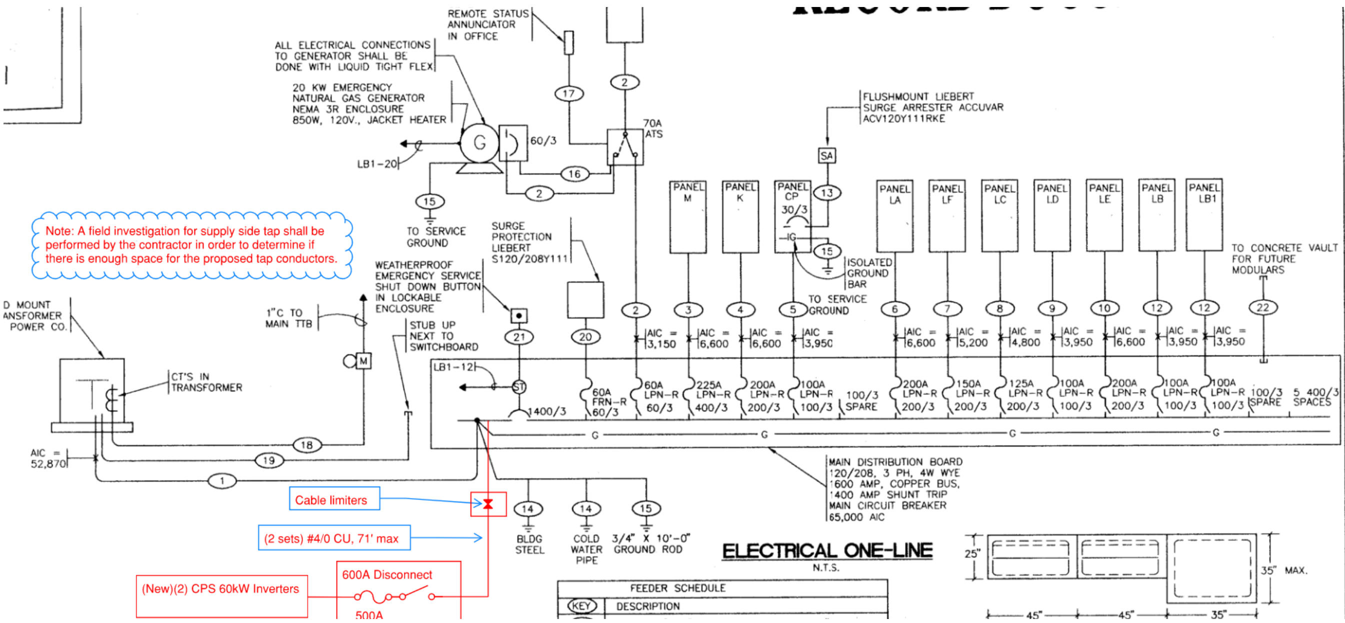
Our technical modeling and cost estimates incorporate the specifications and expected performance of the equipment outlined below. For the products listed, there are fungible alternatives with similar cost and performance characteristics available, and thus the exact specification of equipment is not expected to materially impact our estimates of capacity possible, costs, or system performance at the sites analyzed.

Equipment Type	QTY	Equipment Description
PV Modules	290	JA Solar 540-Watt Bifacial Module
Inverter	2	CPS 60kW-AC
Data Acquisition System	1	AlsoEnergy Data Acquisition System

INTERCONNECTION

The proposed PV system at Traut Core Knowledge Elementary School would be interconnected via a supply side tap. An electrical field investigation would be required to determine if there is enough space in the Main Distribution Board (MDB) to achieve this interconnection method.

Traut ES PV System Proposed Interconnection Method



3.3.14 Warehouse 5

SITE DESCRIPTION

This flush mount roof system layout was designed around the roof capacity assessment where PV will need to be centered over the roof joists, totaling 110.2 kWDC.

Warehouse 5

PV SYSTEM DETAILS

System technical and performance details are outlined in the table below.

Warehouse 5	Roof System
Utility and Current Rate	City of Fort Collins; E300
Annual Usage	520,600
System Size (kWDC/kWAC)	110.2/ 100.0
Production, Year 1 (kWh-AC)	151,800
Solar Offset, Year 1	29.2%
GHG Reduction, Year 1 (MT CO2e)	62.7

3. Portfolio Details

PV FINANCIAL DIRECT OWNERSHIP DETAILS

Financial performance details are provided in the table below.

Warehouse 5 – Direct Ownership	
Total Project Cost***	$404,900
Total Project Cost with 30% IRA Contribution	$283,400
Bill Savings, Year 1	$9,300
REC/ Incentive, Onetime Payment*	$50,000
Simple Payback with FCU Incentive (years)	25.2
Simple Payback without FCU Incentive (years)	30.6
Additional Funding Needed to Reach 20 Year Simple Payback**	$98,000
25-year Total Lifetime Savings	$232,500
End of Life Decommissioning Cost	$40,700

**FCU offers a onetime incentive of $0.50/ watt of installed PV, up to $50,000, two projects can qualify per calendar year.*
***Amount excludes any FCU Incentive. Additional funding could be derived from additional IRA contributions, DOLA grant awards, donations, etc.*
****Financial summary above assumes projects are contracted as a portfolio.*

MAJOR PV EQUIPMENT INCLUDED IN PERFORMANCE MODELING AND COST ESTIMATES

Our technical modeling and cost estimates incorporate the specifications and expected performance of the equipment outlined below. For the products listed, there are fungible alternatives with similar cost and performance characteristics available, and thus the exact specification of equipment is not expected to materially impact our estimates of capacity possible, costs, or system performance at the sites analyzed.

Equipment Type	QTY	Equipment Description
PV Modules	204	JA Solar 540-Watt Bifacial Module
Inverter	2	CPS 50kW-AC
Data Acquisition System	1	AlsoEnergy Data Acquisition System
Module Shutdown Unit	108	Tigo TS4-A-2F – Tigo PV Module Rapid Shutdown Unit

3. Portfolio Details

BESS DETAILS

The BESS system at Warehouse 5 is intended to be implemented along with the PV system. This system would be charged from PV and generate savings by lowering the demand from the utility, while providing 50% of the system's capacity for resiliency power.

Warehouse 5	BESS System
BESS Use Case	Demand Management/ Backup Power
Manufacturer	SYL/ STEM
System Size (kWAC)	125
System Size (kWh)	250

BESS FINANCIAL DIRECT OWNERSHIP DETAILS

Financial performance details are provided in the table below. This system would be a capital improvement measure as the system payback far exceeds the expected system life of 10 years. There is additional value in having backup power at the Warehouse by allowing the refrigeration system to remain online in the event of a blackout. Since this value is difficult to quantify, the savings figures below only include bill reduction from demand management.

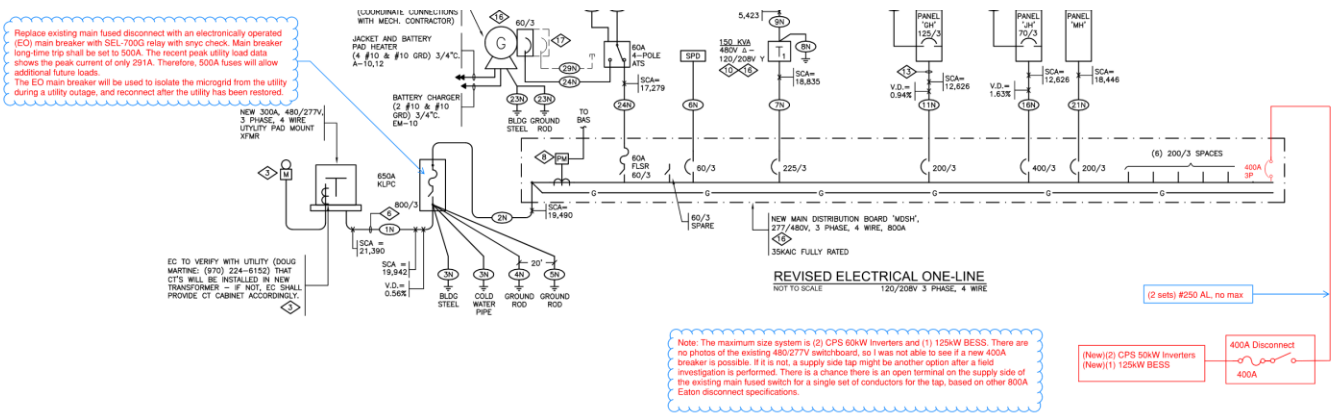
Warehouse 5 – BESS Direct Ownership	
Total Project Cost	$529,400
Total Project Cost with 30% IRA Contribution	$370,600
Bill Savings, Year 1	$7,800
Payback (years)	63.7
10-year Total Lifetime Savings	$78,000
Additional Funding Needed for 10 Year Payback	$370,600

3. Portfolio Details

PV AND BESS INTERCONNECTION

An electrical field investigation will be required to determine the final interconnection method. A 400 amp back feed breaker could be used to interconnect both the BESS and PV systems. If the breaker does not fit, a supply side tap can be utilized. For both situations, the existing main fused disconnect would need to be replaced with an electronically operated SEL-700G relay with sync check, and the main breaker long trip setting would need to be set to 500 amps. See Appendix B for full SLD mark-ups.

Warehouse 5 BESS and PV System Proposed Interconnection Method



3. Portfolio Details

3.3.15 Werner Elementary School

SITE DESCRIPTION

The recommended ground mount system at Werner Elementary totals 128.5 kWDC.

The ground mount system is comprised of 4 rows of 2 PV modules high at a 25° tilt. The location has been designed based off input from PSD. This array would need to be fenced in and would require the removal of 4 trees, the backstop, and 2 small benches.

Werner Elementary School

SYSTEM DETAILS

System technical and performance details are outlined in the table below.

Werner Elementary	Ground Mount System
Utility and Current Rate	City of Fort Collins; E300
Annual Usage	220,500
System Size (kWDC/kWAC)	128.5/100.0
Production, Year 1 (kWh-AC)	213,800
Solar Offset, Year 1	96.9%
GHG Reduction, Year 1 (MT CO2e)	88.2

3. Portfolio Details

FINANCIAL DIRECT OWNERSHIP DETAILS

Financial performance details are provided in the table below.

Werner Elementary – Direct Ownership	
Total Project Cost**	$599,800
Total Project Cost with 30% IRA Contribution	$419,900
Bill Savings, Year 1	$11,700
REC/ Incentive, Onetime Payment*	$50,000
Simple Payback with FCU Incentive (years)	31.7
Simple Payback without FCU Incentive (years)	36.0
Additional Funding Needed to Reach 20 Year Simple Payback**	$186,800
25-year Total Lifetime Savings	$392,000
End of Life Decommissioning Cost	$26,300

**FCU offers a onetime incentive of $0.50/ watt of installed PV, up to $50,000, two projects can qualify per calendar year.*
***Amount excludes any FCU Incentive. Additional funding could be derived from additional IRA contributions, DOLA grant awards, donations, etc.*
****Financial summary above assumes projects are contracted as a portfolio.*

MAJOR EQUIPMENT INCLUDED IN PERFORMANCE MODELING AND COST ESTIMATES

Our technical modeling and cost estimates incorporate the specifications and expected performance of the equipment outlined below. For the products listed, there are fungible alternatives with similar cost and performance characteristics available, and thus the exact specification of equipment is not expected to materially impact our estimates of capacity possible, costs, or system performance at the sites analyzed.

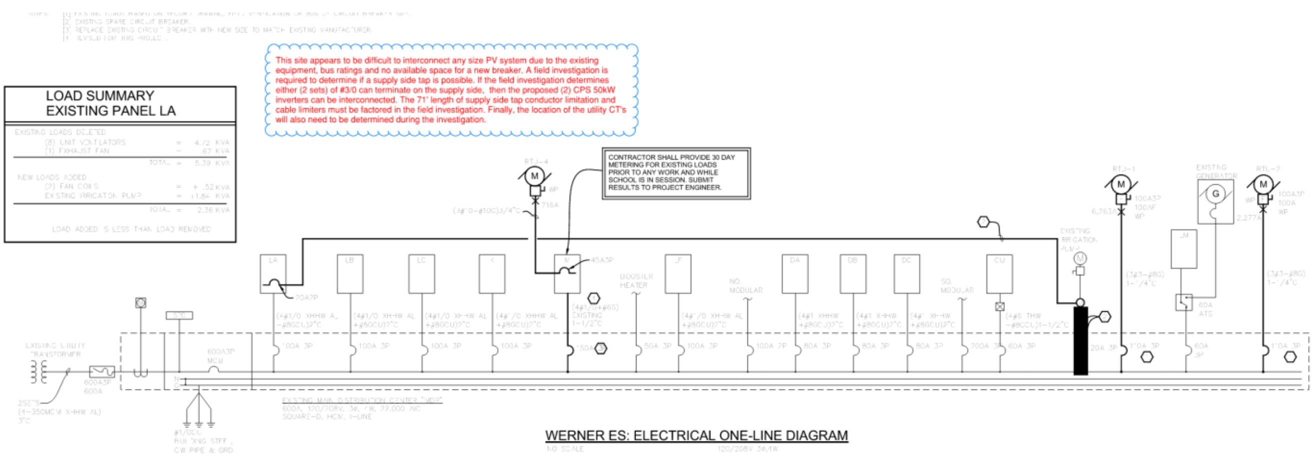
Equipment Type	QTY	Equipment Description
PV Modules	238	JA Solar 540-Watt Bifacial Module
Inverter	2	CPS 50kW-AC
Data Acquisition System	1	AlsoEnergy Data Acquisition System

3. Portfolio Details

INTERCONNECTION

The existing electrical infostructure at Werner Elementary appears to be difficult to interconnect any PV system. An electrical field investigation would be needed to determine if there is space for a supply side tap.

Werner ES PV System Interconnection Notes



Section

4

Environmental, Permitting, Zoning and Risk Considerations

4. Environmental, Permitting, Zoning and Risk

This section describes environmental, permitting, zoning, and other risk items to consider in any project portfolio implementation. Generally, we believe the PSD sites would require relatively straightforward permitting pathways and are characterized by low environmental impact and other risks.

4.1 Environmental Considerations

HAZARDOUS MATERIALS AND SOIL/GROUNDWATER CONTAMINATION

Roof systems do not produce any environmental hazards or concerns, nor do they typically disturb existing contamination given that they are constructed on top of existing buildings and structures.

Construction of ground mounts and parking canopies require additional environmental due diligence because of the boring and trenching required to achieve interconnection. McKinstry has included costs for Phase 1 Environmental Assessments for these sites.

If present, asbestos can be a factor when installing roof anchors, or routing conduit through the building. The abatement of asbestos can lead to added project costs.

GLINT AND GLARE

Glint and glare studies are sometimes required when any type of PV system is sited at, or within the immediate vicinity of an airport or airfield. Some neighborhood districts also require glare studies. Bethke Elementary would require such analysis due to its proximity to WKR Airport.

4.2 Permitting, and Planning and Zoning

PERMITTING

The Colorado Department of Regulatory Agencies (DORA) is one permitting authority over public schools in Colorado and all electrical permitting will be through DORA. Building permits will be issued by the State School Construction Department of the Division of Fire Prevention and Control. Local fire authorities will also review the project drawings since they would be the first responders to the site in case of any emergency.

PLANNING AND ZONING

Most of the sites are within the City of Fort Collins and require a Planning and Zoning (P&Z) review. Below is a breakdown of the sites and which type of review is required. No P&Z requirements were found for the sites in the City of Loveland, Town of Timnath, Town of Wellington or Larimer County (Town of Laporte).

4. Environmental, Permitting, Zoning and Risk

Site	Zoning Type	Basic Development Review	Type 2 (P&Z Commission)
Beattie ES	Low Density Residential		x
Blevins MS	Low Density Residential		x
Boltz MS	Low Density Residential		x
Fort Collins HS	Medium Density Mixed-Use Neighborhood		x
Fossil Ridge HS GM	Low Density Mixed-Use Neighborhood		x
Johannsen Support Services Center	Low Density Residential		x
Kinard Core Knowledge MS	Low Density Mixed-Use Neighborhood		x
North Transportation Center	Low Density Residential		x
Preston MS	Low Density Residential		x
Poudre HS	Low Density Residential		x
Rocky Mountain HS	Low Density Residential		x
South Bus Terminal	Employment District	x	
Traut Core Knowledge ES	Low Density Residential		x
Warehouse 5	Employment District	x	
Werner ES	Low Density Residential		x

4. Environmental, Permitting, Zoning and Risk

4.3 Other Risk Considerations

ROOF SYSTEMS

1) Since all the roofs are off limits to the public, there is no concern for unauthorized personnel accessing, tampering with, or vandalizing these systems. However, if students or other members of the public are known to access a given roof without permission, a plan should be made to mitigate this circumstance.
2) To avoid the risk of roof leaks and maintain roof warranties, McKinstry's standard process is to engage the roofing manufacturer to perform a pre-installation and post-installation inspection, as well as ensuring that the mechanical attachments are installed by a roofer certified in the specific roof system.

CANOPIES

1) All solar carport canopies in this study have been designed to have a minimum clearance of 10'-6", which will allow a typical box truck to pass underneath.
2) Since canopies are accessible to the public, the inverters and electrical wiring are typically mounted at a height on the canopy structural columns or installed in such a way that would put them out of reach of the public.
3) It is not anticipated that any parking spaces would be eliminated or significantly impeded by the installation of the canopy structures.
4) Safety and maintenance of canopies related to snow and ice can be cause for concern. Based on current single tilt design, there is likely to be some snow sloughing and additional areas of ice build-up due to canopy shade in the wintertime. Accordingly, additional snow removal and ice melting operations may be required. Alternative designs that include dual-tilts, snowguards, decking, gutters, and downspouts will control snow and water flow from canopies. However, these additional features add significant cost.
5) Design features, including at least a 10'-6" minimum clear height, will make it unlikely that damage to the canopy structure will occur. To mitigate the risk of vehicle driver damage to carport canopies, McKinstry encourages PSD to expand their insurance coverage to include the carports. If accountability is possible, it is likely that the driver's insurance would cover any damage to the structure or modules.

GROUND MOUNT

1) Ground mount systems typically require an enclosed fence around the perimeter of the array to keep the public and wildlife from accidental contact with or tampering of the electrical equipment and wiring.
2) Access roads encompassing the arrays can be required by the Fire Department, but are not typical for smaller scale projects. McKinstry has included costs for access roads into the arrays and not around the array perimeter.

Section

5

Equipment Considerations and O&M

McKinstry
For The Life Of Your Building

5. Equipment Considerations and O&M

5.1 Equipment Considerations and Recommended Operations & Maintenance (O&M)

This section provides more detail on equipment selection criteria and recommended post-implementation O&M. While we have modeled the costs and performance of specific major equipment components (e.g., modules, inverters, etc.), such components are equivalent and interchangeable with alternative brands and models from a cost and performance point of view. As such, the overall performance and financial results presented in this study are not impacted by the specific equipment manufacturers and models selected for study.

The O&M discussion includes a breakdown of O&M types, typical scopes of work, and common contract structures. It is recommended that an O&M approach and plan is considered in conjunction with portfolio development and financial modeling. Our financial estimates include an assumed preventative O&M package for the duration of the system lifespans, and further assume all inverters will require replacement at system mid-life (Year 15).

5.2 Major Equipment Selection Criteria

EQUIPMENT SELECTION

There are several factors that are considered when selecting equipment for a solar PV project. Some items may be weighted more heavily than others, but determination must be made on a case-by-case basis. The considerations for PSD when selecting equipment include:

- ***Energy Efficient Design***—In several cases, there are pieces of equipment that may work in a particular situation, but that might not be the most efficient equipment available.
- ***Financial Strength***—Solar modules are designed to last 25+ years and McKinstry only sources products from suppliers with long track records and the financial strength to honor warranties should any issues arise in the future.
- ***Experience with Equipment***—Since we are involved in numerous energy retrofit projects within diverse markets, our staff has experience with various manufacturers. After each project is started and operational, we do an informal "how is the equipment operating" question and answer exchange between McKinstry and the owner's personnel, as well as between McKinstry's commissioning and design teams. This provides firsthand feedback on the equipment that is not filtered through an equipment salesperson.
- ***Physical Size of Mechanical Equipment Does Matter***—Not all equipment provided by different manufacturers are the same physical size. We do the research necessary to understand if there are physical restraints when replacing equipment.
- ***Performance and Quality***—When selecting equipment, a crucial consideration is whether the equipment will perform as needed to meet the intent of the scope and achieve the designated savings. McKinstry selects equipment that is high quality, with proven reliability in similar settings. For this project, McKinstry has selected top tier manufacturers for modules and inverters. The solar photovoltaic market is dynamic with new manufacturers appearing regularly. McKinstry and its partners employ a selection process that emphasizes quality and performance. Particular attention is paid to viability of component manufacturers to ensure they will be available to support the warranty over the life of the

project. This puts your maintenance staff in the best position to optimally maintain the equipment while keeping operational costs at a minimum.

- ***Equipment Delivery Lead-Time***—Another key factor we consider when selecting equipment is the lead-time needed for delivery, as delays in equipment not only hurt schedules, but also can impact costs across multiple efficiency measures. As an extra level of protection for the schedule and budget, we ask for a full equipment review and approval from all team members before committing to any purchases.
- ***Best Value for Money Being Spent***—Many contractors are drawn to the lowest first-cost when selecting equipment. This may not be the best long-term value for the owner. Taking the time to evaluate what is being provided for the cost quoted can reveal that the lowest first-cost equipment may require additional options, which cost more than the equipment where first cost was a little higher. The lower cost equipment may require a higher level of maintenance, may not have as long of a useful life, or may not be as energy efficient as a slightly more expensive piece of equipment. Best value, not just first-cost, is our goal when pricing equipment.

5.3 Recommended O&M

Post-installation O&M is recommended for any portfolio to ensure reliable long-term operation. Several different types of O&M are typically available in the marketplace, and it is helpful to understand the typical terminology employed to distinguish between the various types of O&M available.

DEFINITIONS

Preventative Maintenance (PM) – Ongoing performance and alarm monitoring, and scheduled inspection(s) and servicing of equipment to prevent breakdowns and unnecessary production losses. These take place annually according to a specific maintenance plan and schedule dependent on the equipment installed onsite. Annual reports will summarize actual performance vs. expected and will typically list items recommended for correction if not addressable during the annual PM inspection. PM is typically contracted on an annual fixed cost basis, with multi-year plans also commonly available.

Corrective Maintenance (CM) – Actions and/or techniques taken to correct equipment faults, failures or damage detected during routine operations and maintenance inspections. Corrective maintenance actions are those that include the material and labor to restore a PV system to its expected performance if any equipment is damaged or deemed defective. CM is typically contracted on a time and materials basis – when corrective actions are minor, these are sometimes covered during annual Preventative Maintenance activities. Examples of CM: ground faults, inverter outage issues, blown fuses and vandalism.

Extraordinary Maintenance (EM) – Any activity(s) or action(s) required in the case of major unpredictable events, such as Force Majeure or serial defects, which are considered outside the normal course of business. These events are typically covered by a customer’s insurance policy for their PV system. EM is typically contracted on a time and materials basis.

Warranty Management – The activity that manages all equipment under warranty at the time of service with the objective of reducing costs, coordinating repairs, and facilitating any required paperwork such as Return Merchandise Authorization (RMA) receipts. Installation contractors may provide warranty management for a specified term following completion of installation – for example, McKinstry typically includes one year of warranty management for any system McKinstry installs.

TYPICAL PREVENTATIVE MAINTENANCE SCOPE OF WORK

Below is a table summarizing a typical PM services and frequency, followed by a detailed scope of work that McKinstry typically recommends for PM.

Strategy	Service	Frequency	Deliverable
Preventative	Ongoing Performance & Alarm Monitoring; integration of dashboard	Continuous	Communications/corrections coordinated with owner as appropriate.
Preventative	Preventative Maintenance Inspection	Annual	Preventative Maintenance (PM) Report
Corrective	Minor Corrective Maintenance	Annual	Summary of actions taken included in the above PM Report.

Typical Preventive O&M Scope of Work

1. Operations
   a) Performance Reporting
      i) Annual Reporting: A report will be provided on an annual basis outlining the solar installation's performance over the course of the previous year. This report will include the following measurements and additional information on non-routine procedures that resulted in system downtime.
      ii) Monthly Performance Assessment: Monthly Performance Assessment of solar asset by reviewing the Performance Ratio of the given reporting period.
         (a) $Performance\ Ratio\ (\%) = \frac{Actual\ Production\ (kWh)}{Expected\ Production\ (kWh)}$
   b) Alarm Monitoring
      i) 24/7 automatic alarms will be set during the Commissioning phase to alert any system underperformance, equipment, or communication failures.
      ii) Remote supervision of the solar asset's Data Acquisition System (DAS) to ensure there are no active alarms that require immediate attention (i.e., inverter failure).
      iii) If an alarm requires immediate attention the customer will be notified within 1 business day.
2. Preventative Maintenance
   a) Inspection will be performed once per year.
   b) Inspection will document the condition of all major system components to ensure there are no serious issues beyond expected wear and tear per the equipment operations manual. Major system components include:
      i) Grounds, Roof & Security
      ii) Inverters
      iii) AC System
      iv) DC System

v) Modules

vi) Racking

vii) Data Acquisition System, including the weather station, revenue grade meter and other applicable sensors.

c) A Preventative Maintenance Report will be provided documenting issues found onsite, photographs taken, and a description and estimate for Corrective Maintenance needs uncovered while onsite.

3. Minor Corrective Maintenance: Minor Corrective Maintenance issues will be completed during the Preventative Maintenance inspections. Should the Minor Corrective Maintenance issued require more time, the Owner will approve additional hours of work required at Time and Materials rates.
4. Deliverables

a) Monthly

i) Performance Assessment

b) Annually

i) Preventative Maintenance Report

ii) Annual Performance Report

iii) Site-Specific or Equipment-Specific Service Reports (if applicable)

c) As Needed

i) Alarm Communication to Owner

ii) Corrective Maintenance Service Order

For corrective maintenance issues that cannot be addressed during the annual inspection, typically a comprehensive report to the Owner detailing the required actions and a quote for the corrective maintenance needs are provided. This maintenance will only be performed once the Owner has approved the quote and authorizes the work to proceed.

Section

6

Financial Funding Options, and Next Steps

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6. Financial Funding Options

This section presents several funding options & considerations that are available to PSD for implementing a portfolio of solar and/or storage projects.

6.1 Funding Options & Considerations

Several funding options have been identified to support project implementation for an owner-direct or third-party owned (PPA), behind-the-meter project portfolio.

- **Energy Savings Performance Contracting (ESPC)** - Colorado legislation supports maximum 25-year term and savings would fully fund the project over the life of the term. Savings are guaranteed to PSD to ensure system performance and production for a minimum of 3 years post-construction.
- **Tax Exempt Lease Purchase (TELP)** – Lease model that allows for financing through a series of annual appropriations in a lease-to-own model. Installed equipment would be used as collateral.
- **Certificates of Participation (COP)** – Issuance of new or existing COPs could be leveraged using existing buildings as collateral (instead of installed equipment).
- **Bonds** – Issuance of new or existing bonds; this method typically has a requirement of voter approval per TABOR legislation.
- **Debt-free Mill Levy** – Funding mechanism derived from a tax applied to assessed property value. Also needs to be voter approved.
- **Power Purchase Agreement (PPA) –** Third-party ownership model, whereby PSD would pay for energy produced by projects that are sited on PSD facilities.
- **Grant funding** – the Colorado Department of Local Affairs (DOLA) has funding for renewable energy projects throughout the State. Three cycles per year currently exist, with deadlines of March 1, September 1, and December 1. Other grants could be applicable pending project implementation timeline through State or Federal government programs.
- **Xcel Renewable Energy Credits (RECs) and SPVTOU rate** – It is recommended that PSD leverage Xcel's renewable energy credits (RECs) and switch the recommended facilities to the Xcel SPV-Time-of-use (SPVTOU) rate (where applicable) to improve the portfolio value and increase annual system savings.
- **IRA Contribution** – All sites will qualify for 30% IRA contribution. See Section 2.7 for IRA information.
- **Combination of funding strategies listed above** – PSD could consider bundling several of the suggested funding strategies above.

6.2 PPA Overview

The goal of PPA providers is to provide customers with a $/kWh rate that is below or close to what is currently being paid. McKinstry worked with a PPA provider local to Fort Collins to evaluate the six sites within the technically and financially feasible portfolio for a PPA approach. We also evaluated a subset of that portfolio, specifically the two large rooftop projects at Timnath and Wellington.

Advantages of a PPA approach are that a third-party owns the system, so O&M, inverter replacement, decommissioning are not the responsibility of the site host / energy off-taker. Dependent on availability of funding, there is a potential timeline advantage for a PPA approach, whereby PSD could implement projects sooner compared to a direct ownership approach.

6. Financial Funding Options

A significant disadvantage is that the long-term economic value to the customer of a PPA is lower than for customer-owned projects. The PPA provider takes on the ownership risk and responsibility, so will reap the bulk of the financial rewards.

The PPA rate range that resulted from our analysis was $0.09 – $0.12/kWh, dependent on where the final EPC pricing comes in. Buydown funds can drive down these rates, so are a key factor to consider. In the case of the high end of ~$0.12/kWh, for example, a buydown amount of ~13% of the total project price; (~$880k) would result in a ~$0.09/kWh rate. Further analysis would be incorporated into the development of a project portfolio towards final pricing. Utility rates, project pricing and other factors change over time, so what may not work today, might pencil a year or two later.

A major factor of PPA pricing is the up-front cost the PPA provider will pay for the Engineering, Procurement and Construction (EPC) of the projects. Given that the EPC pricing range we have provided is +/-20%, there may be a path to an attractive PPA rate for the technically and financially feasible portfolio. A component of reaching an attractive PPA rate is to run a competitive RFP, particularly for the installation scope of work.

6.3 Next Steps

Should PSD decide to move forward with further development of a project portfolio, it is important for efficiency and cost effectiveness to decide on which sites to prioritize first. Once favored sites are chosen, next steps include completing the remaining due diligence items, such as electrical interconnection field investigations, roof-top drone surveys, geotechnical assessments, and topographic surveys. Structural racking and electrical bid set drawings packages should also be assembled to best inform a competitive installation RFP that would yield final pricing. During development, utility interconnection applications should be considered, as hosting capacity limits are always changing, as is the availability of utility incentives.

Based on a comprehensive, big picture view of PSD facilities and goals, McKinstry proposes the further development of the a project portfolio under an IGA (investment grade audit) format, such that the renewable energy scopes of work would be bundled with other PSD facility improvements.

Section

A

Appendix A: Structural Capacity Assessments

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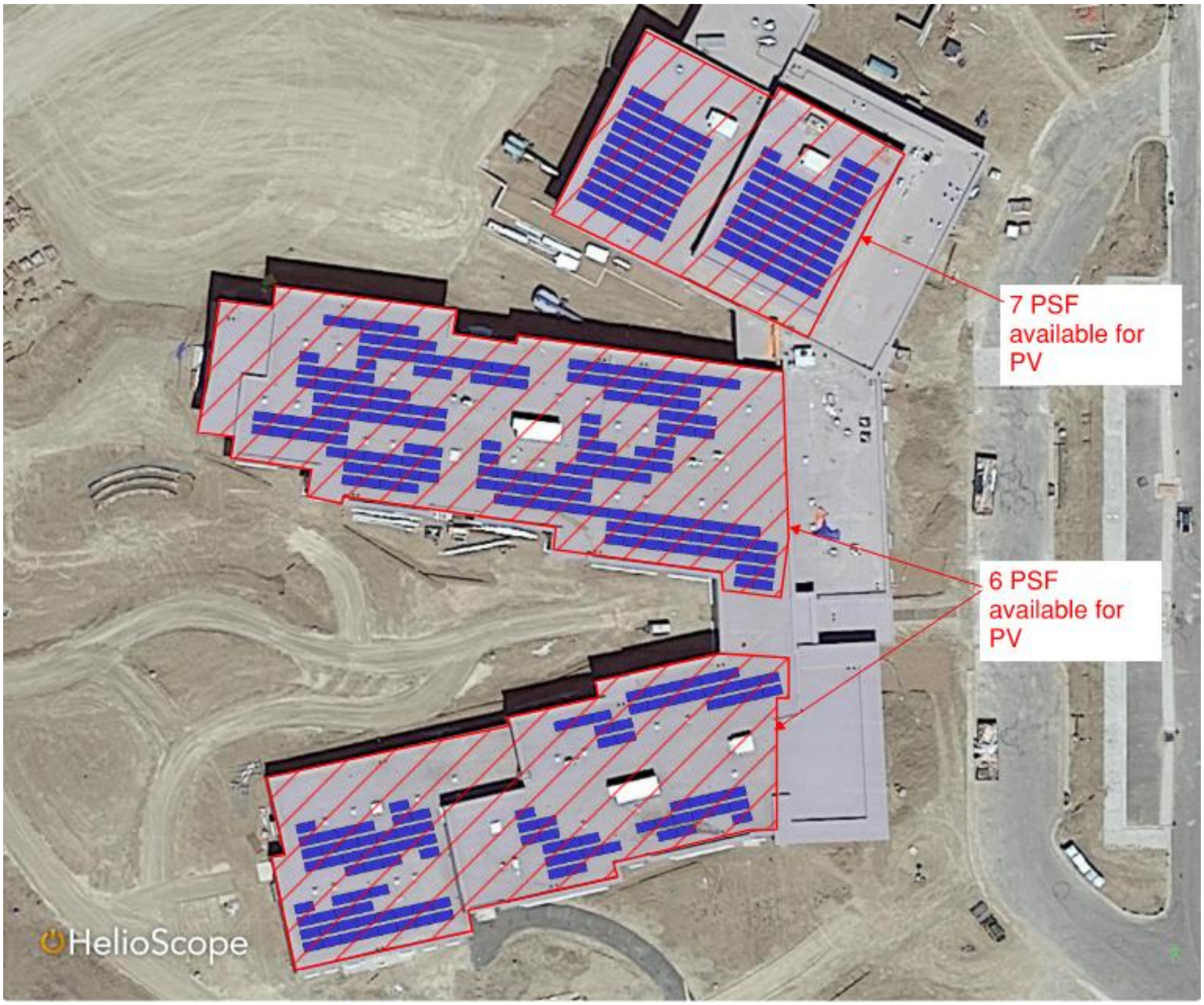
Appendix: Structural Capacity Assessments

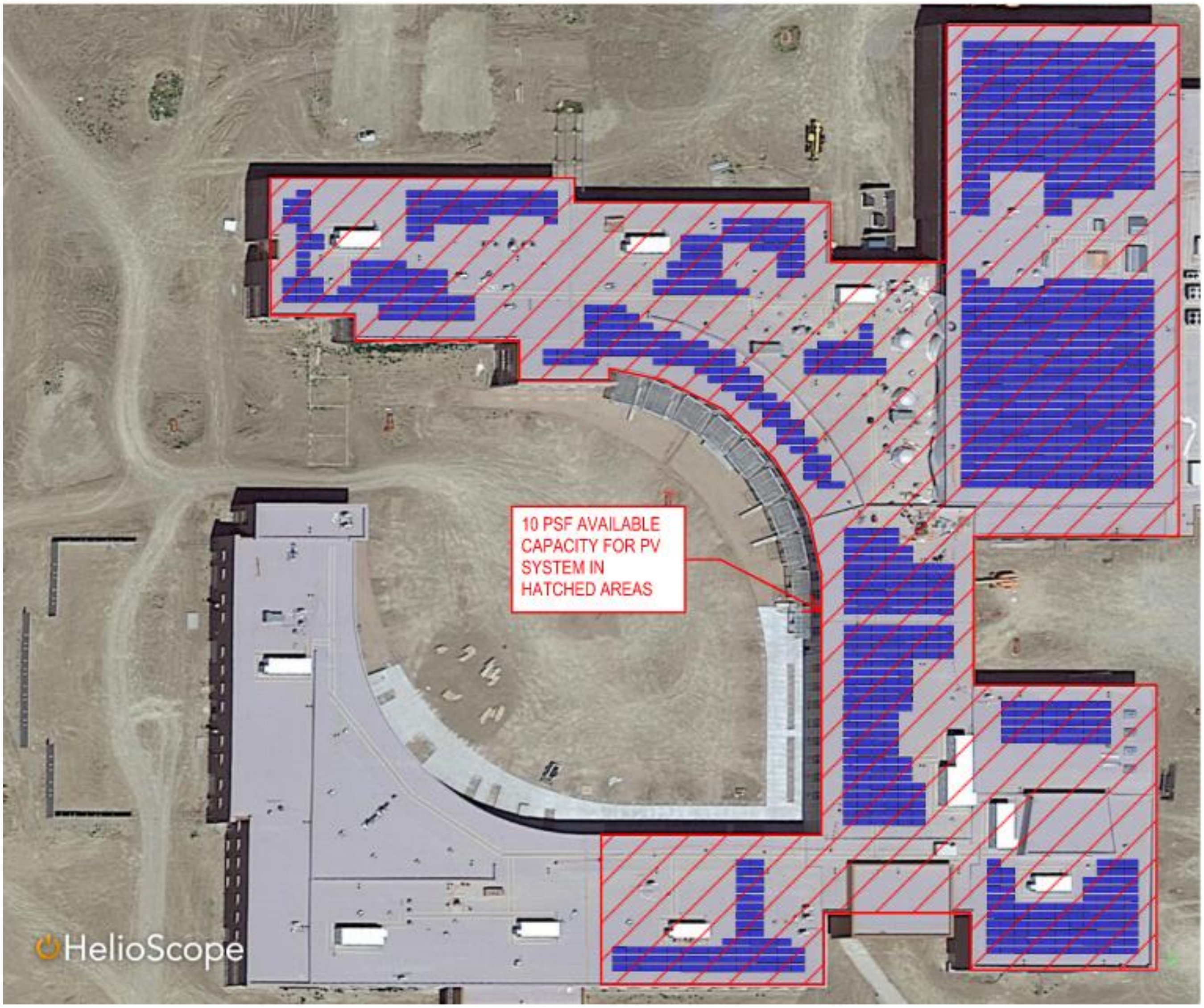
McKinstry contracted JVA Inc. to complete the rooftop structural capacity assessments provided in this appendix. Roof capacity assessments were performed on all technically and financially feasible roofs. The minimum capacity needed for rooftop PV on a flat roof is typically 4 psf, while a flush mount roof system needs a minimum of 3 psf. As seen below, all the roofs in this study have enough available capacity for the recommended solar systems.

BAMFORD ELEMENTARY SCHOOOL



Appendix: Structural Capacity Assessments

TIMNATH AND WELLINGTON MIDDLE/ HIGH SCHOOL



Appendix: Structural Capacity Assessments

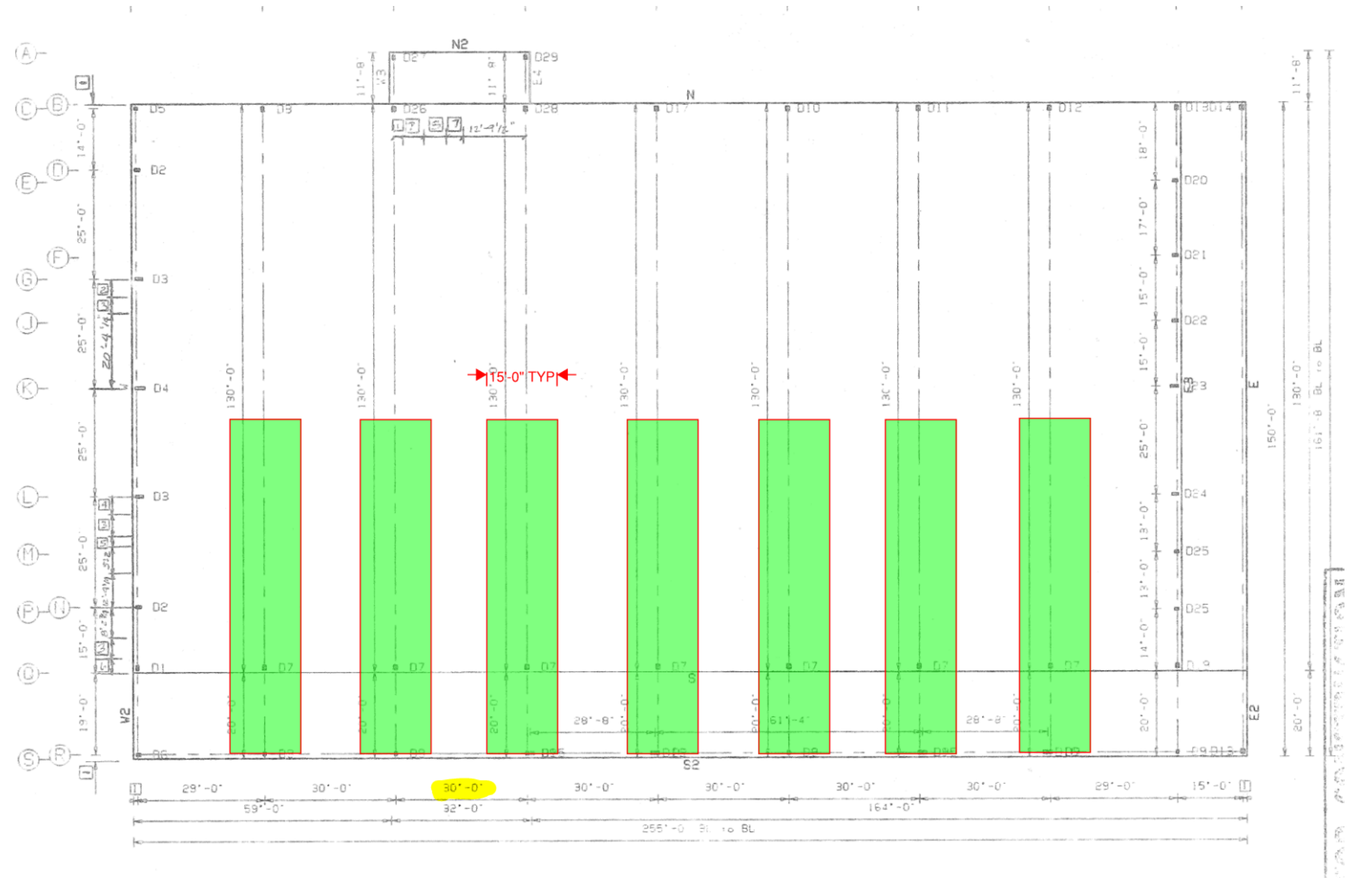
SOUTH BUS TERMINAL

Appendix: Structural Capacity Assessments

WAREHOUSE 5

JVA Notes:

"We ran the calculations on the roof structure for Warehouse 5 and came up with really no available capacity for PV—by analysis, the existing structure is right at capacity with the existing loads. We can use the IEBC provision allowing additional load on the roof if it doesn't increase the forces to any member by more than 5%--if we do that we can add up to 3 psf of PV in 15' wide strips centered on the existing building frames (see image below). "



Section

B

Appendix B: Interconnection Assessments

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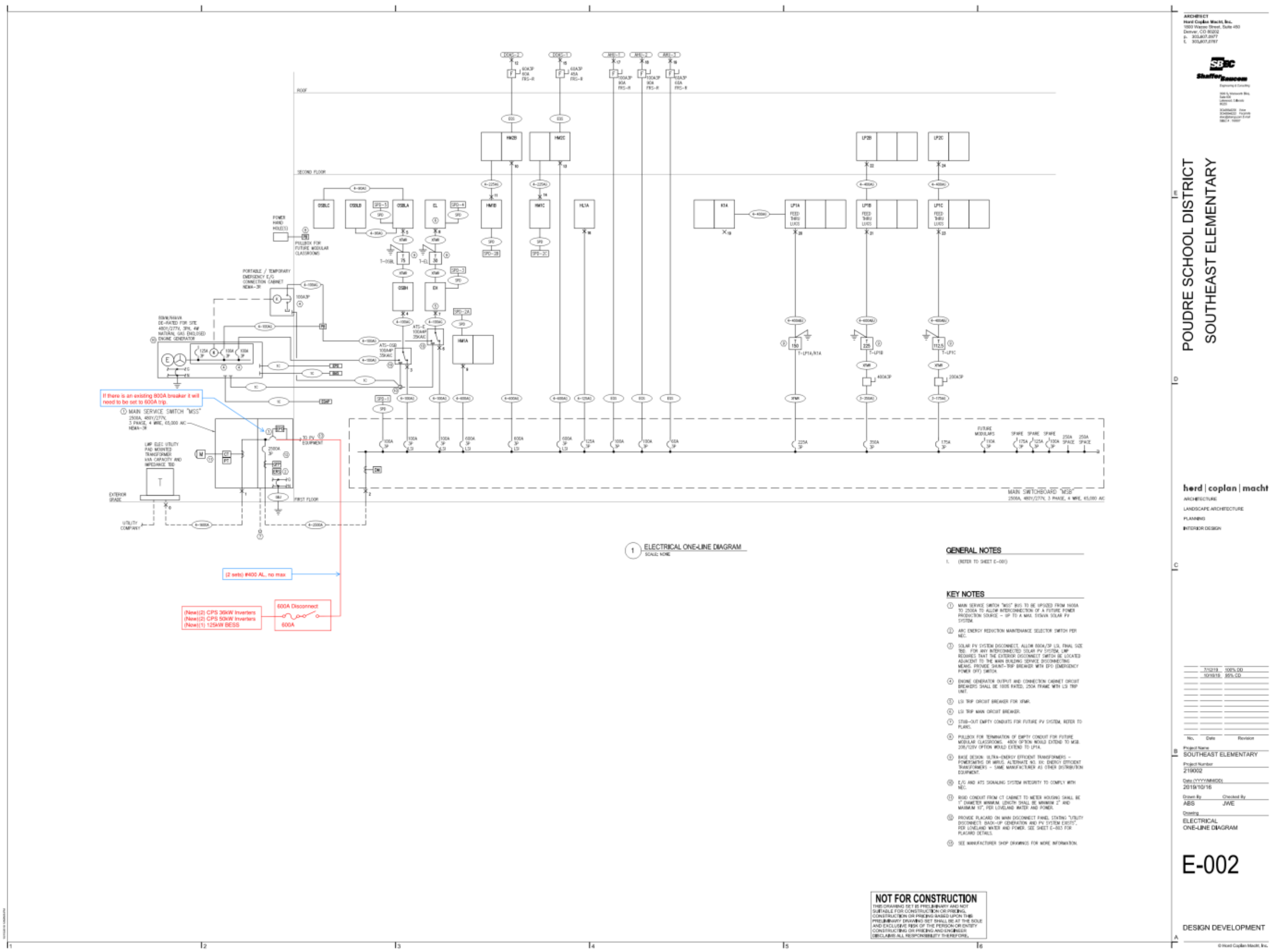
Appendix: Interconnection Assessments

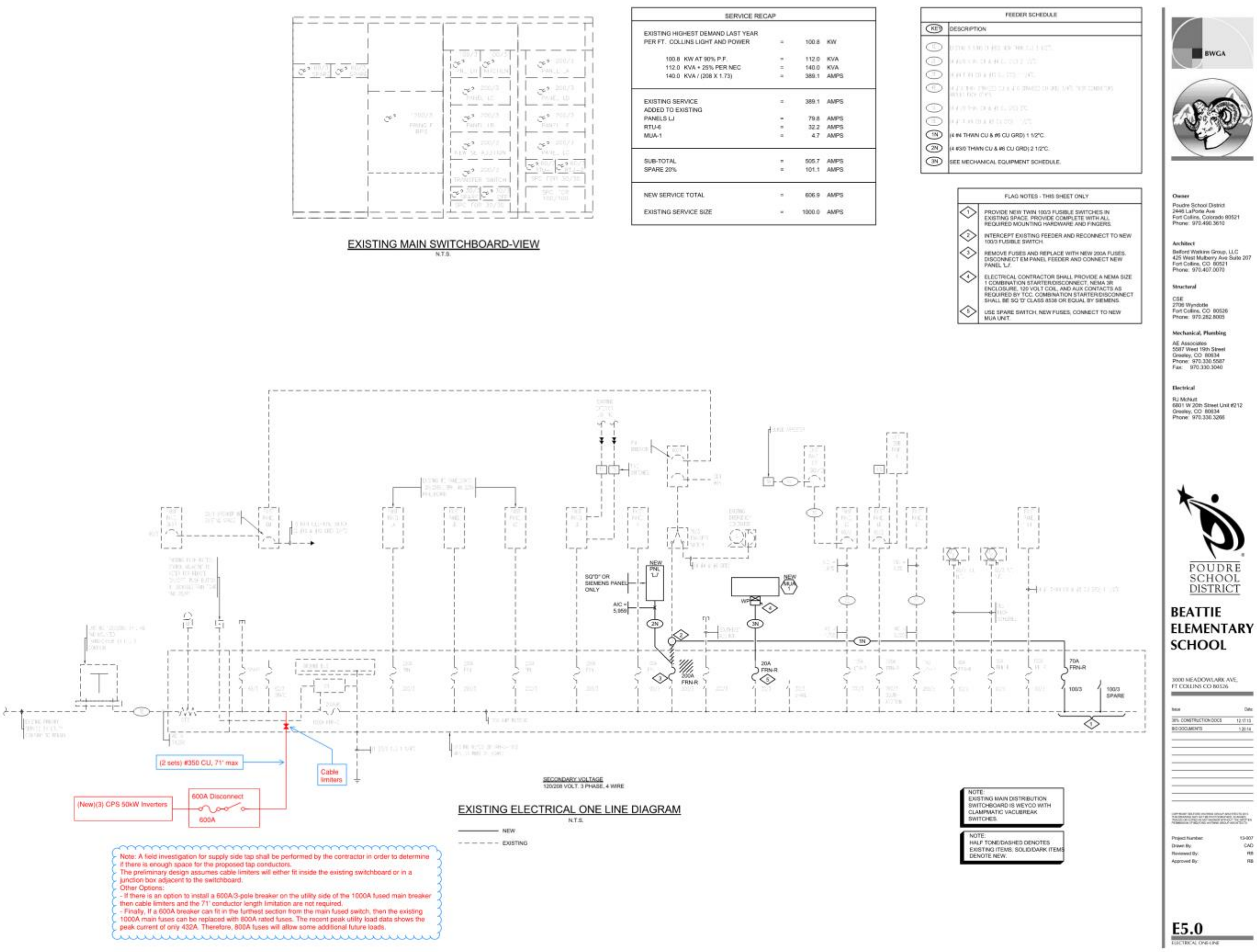
McKinstry contracted McCalmont Engineering to perform the interconnection assessments provided in this appendix. McCalmont determined the interconnection options by reviewing the site Helioscope reports, record drawings, equipment specifications, utility data, and site photos. In some cases, an electrical field investigation would be needed to further access interconnection methodology, which consists of an electrician suiting up in arc flash gear and removing the switchboard dead fronts to better assess the available space within the switchboard.

BAMFORD ELEMENTARY SCHOOL – PV AND BESS



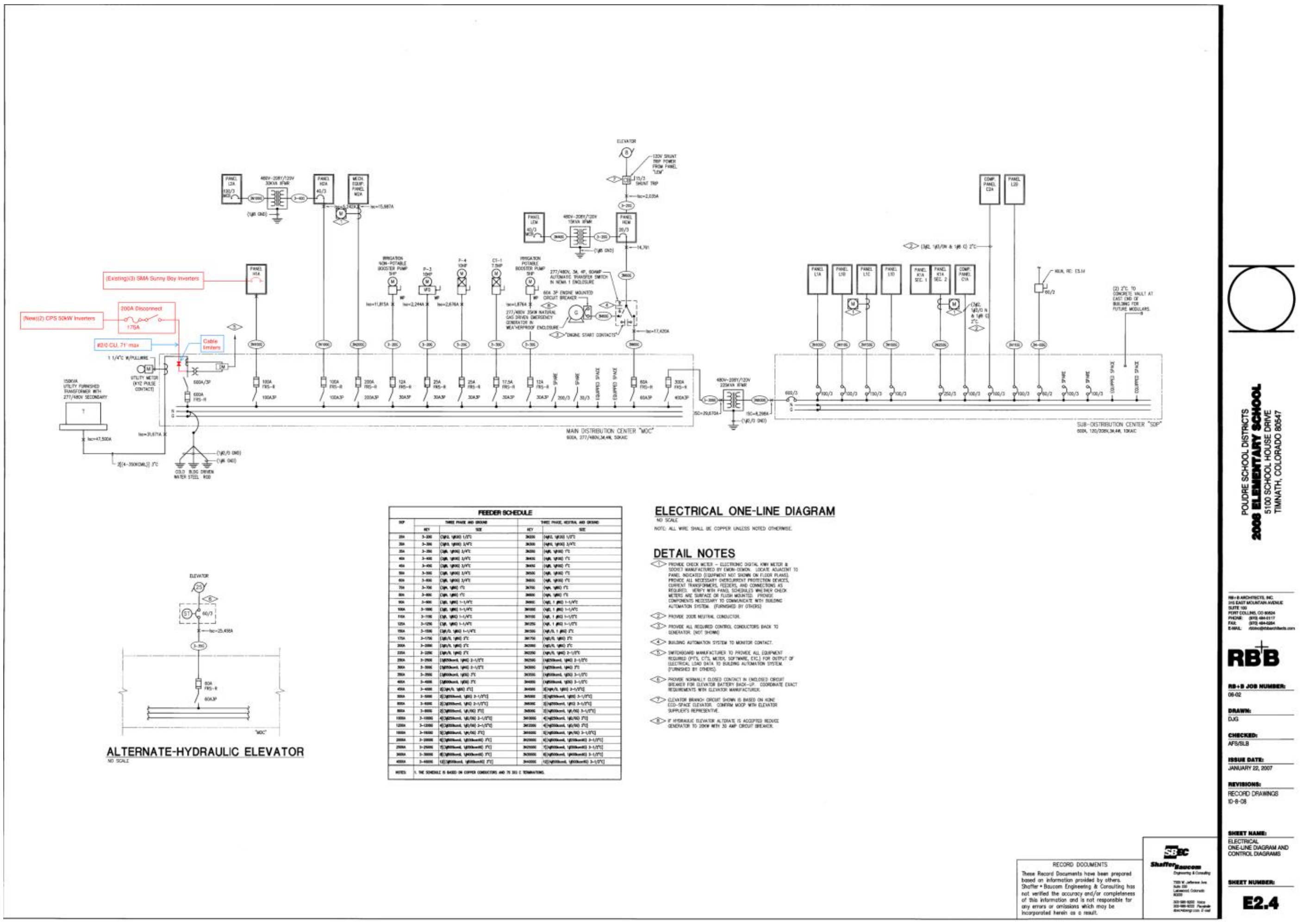
Appendix: Interconnection Assessments

BEATTIE ELEMENTARY SCHOOL



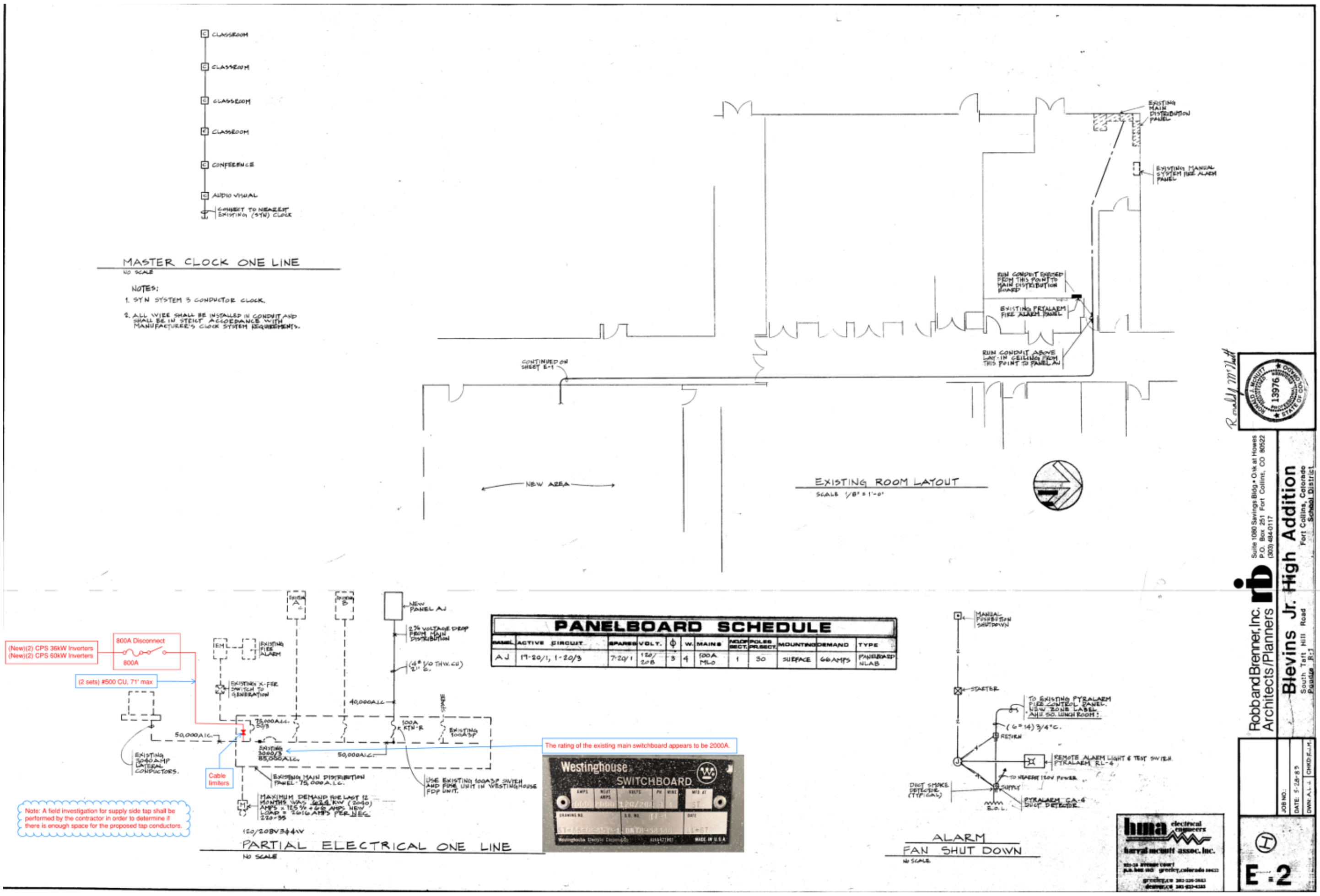
Appendix: Interconnection Assessments

BETHKE ELEMENTARY SCHOOL



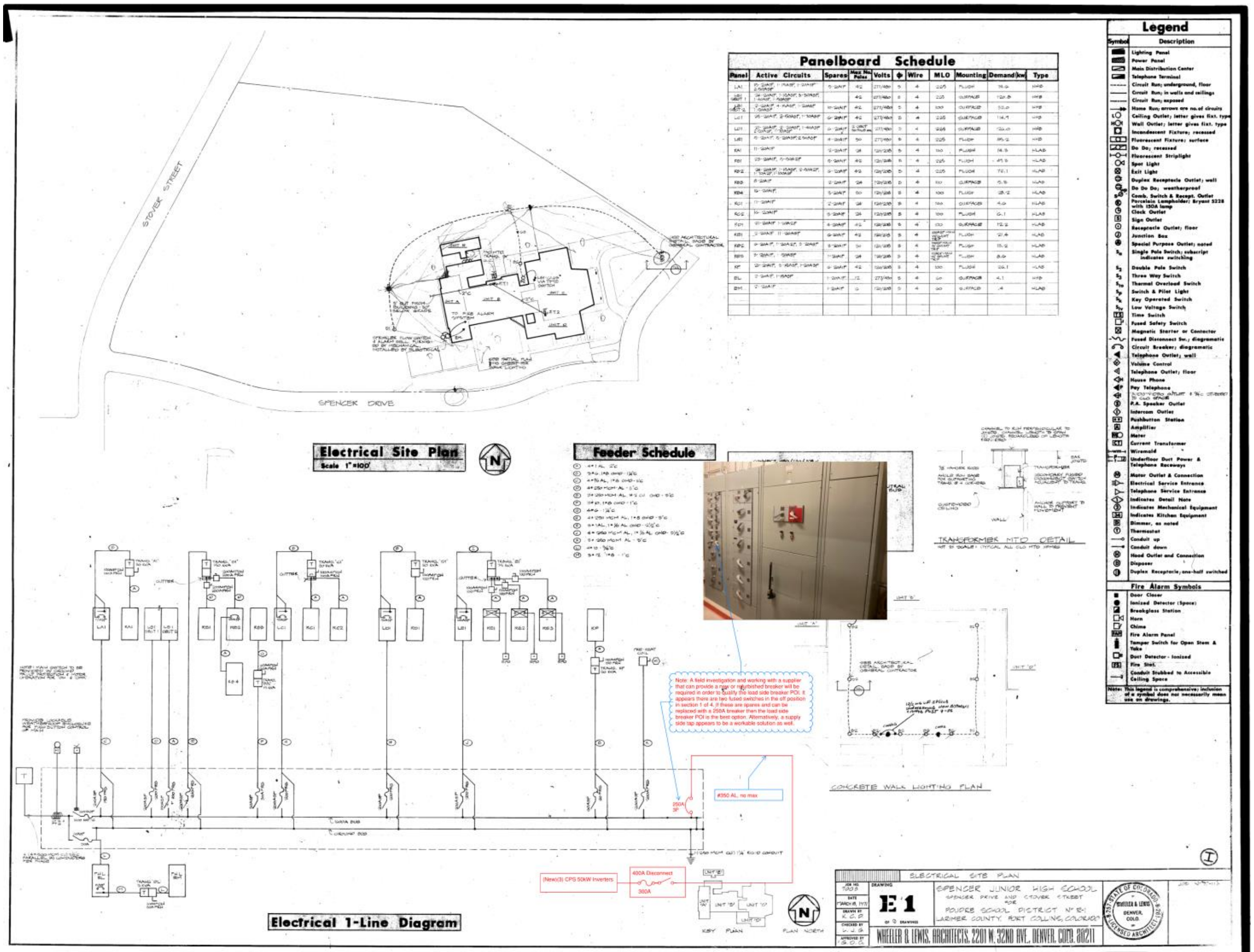
Appendix: Interconnection Assessments

BLEVINS MIDDLE SCHOOL



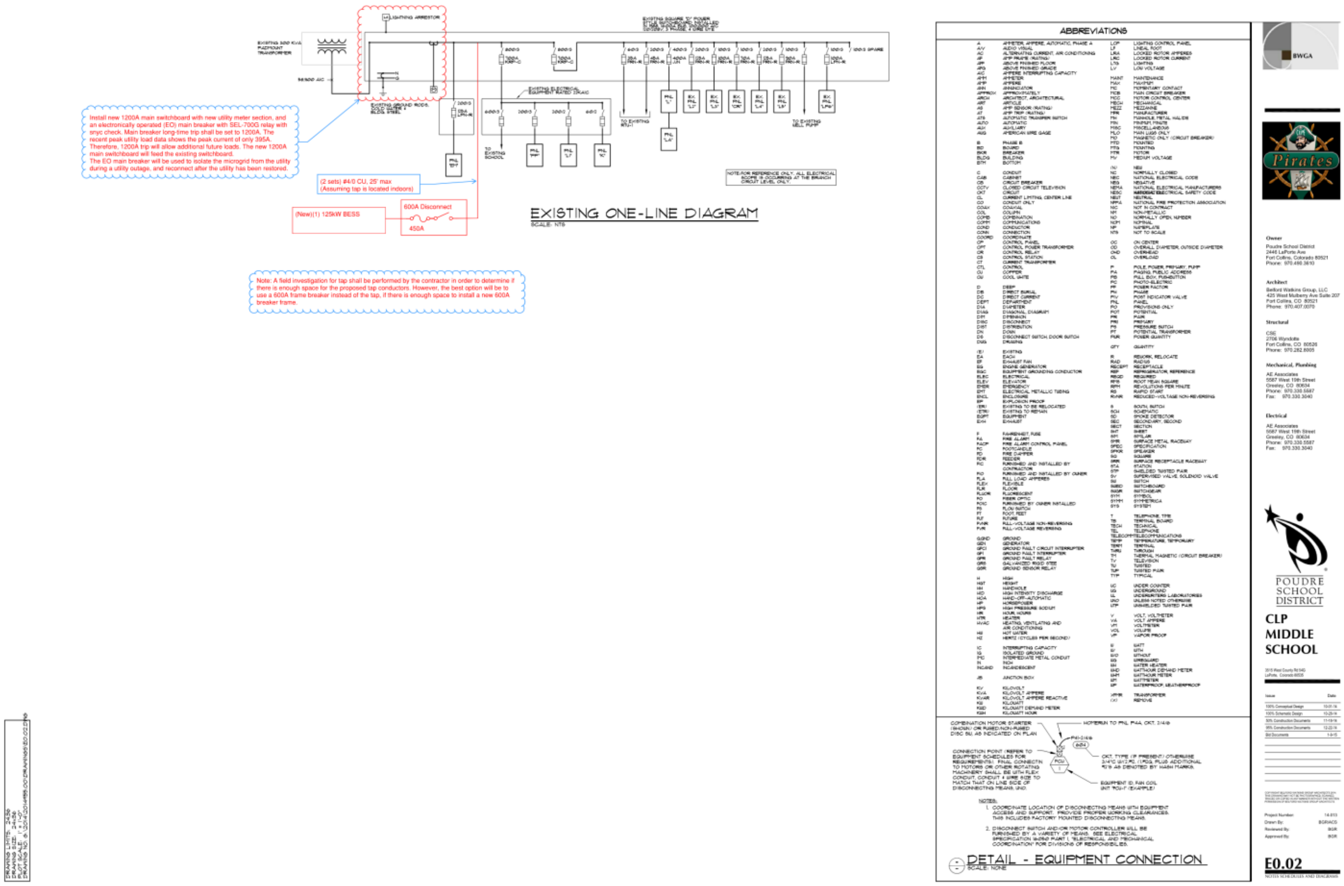
Appendix: Interconnection Assessments

BOLTZ ELEMENTARY SCHOOL



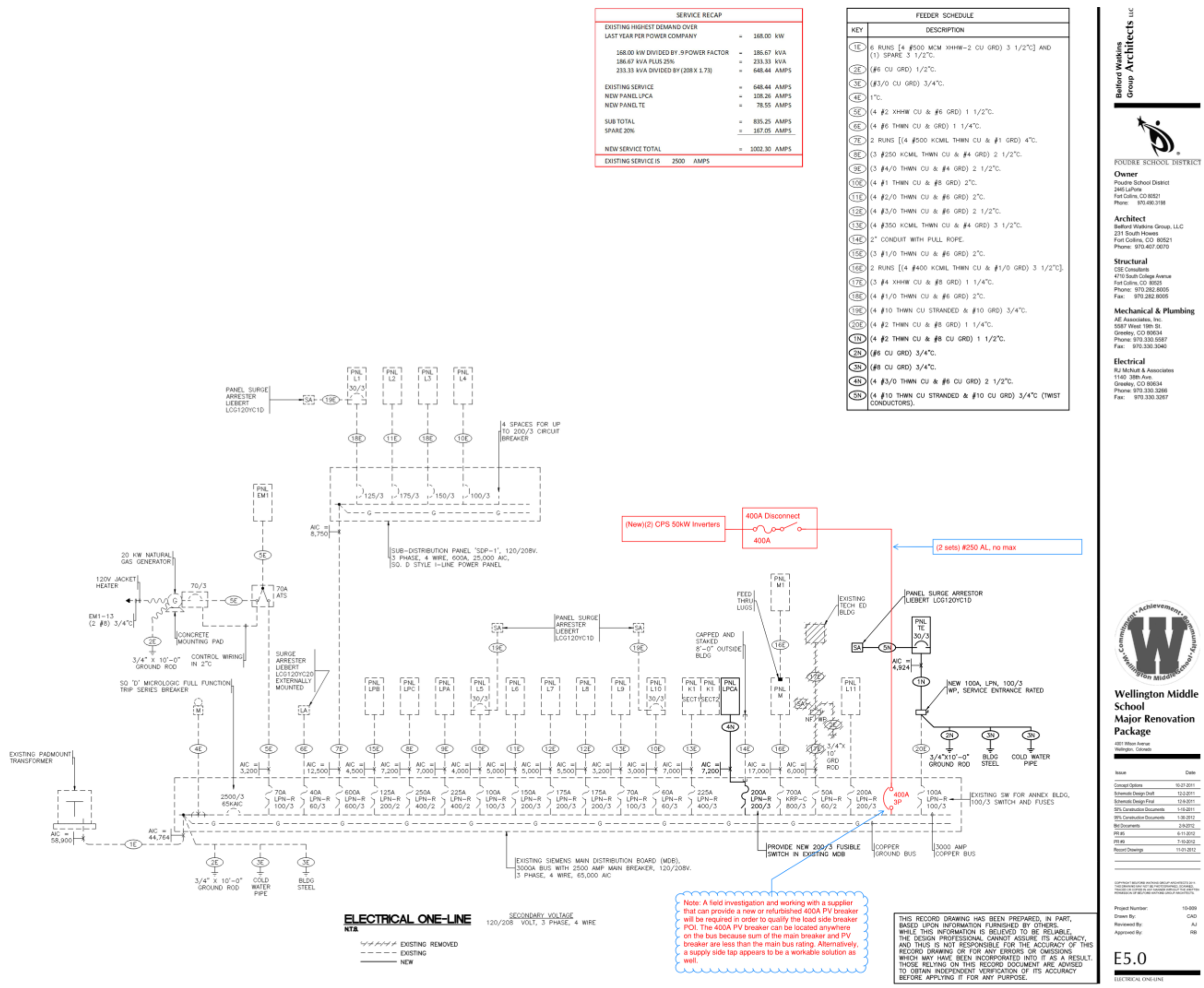
Appendix: Interconnection Assessments

CACHE LA POUDRE MIDDLE SCHOOL - BESS



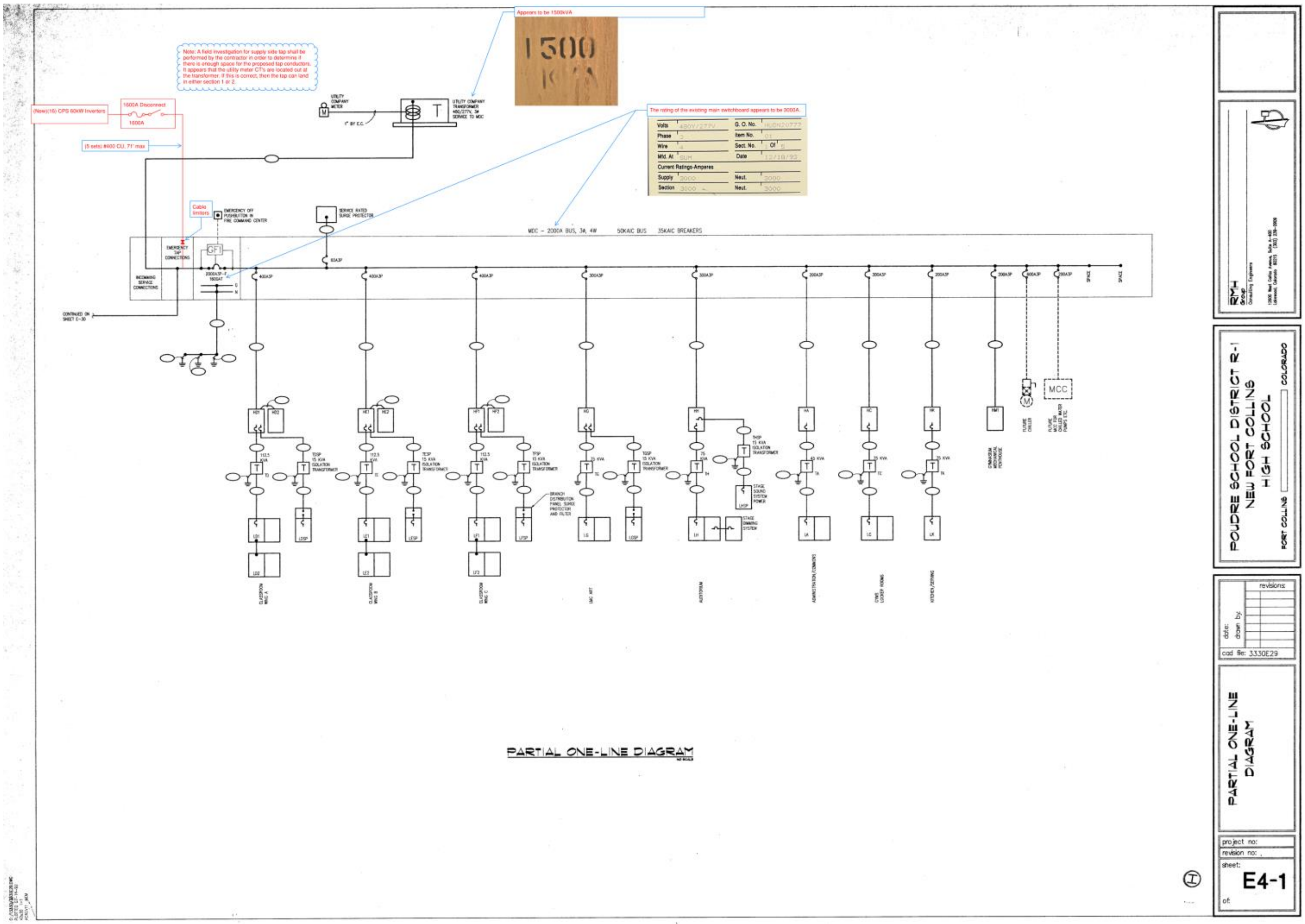
Appendix: Interconnection Assessments

EYESTONE SOUTH ELEMENTARY SCHOOL



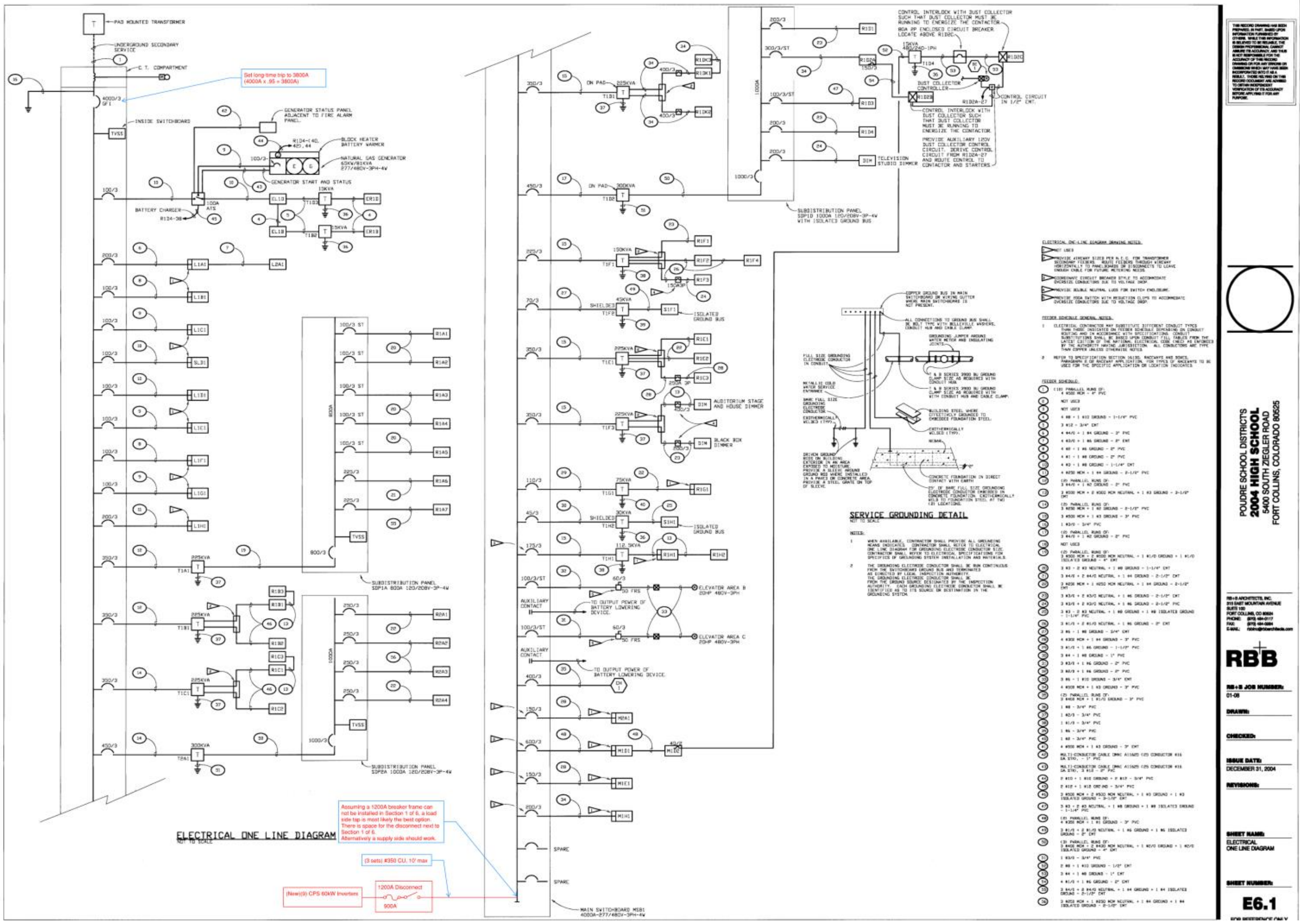
Appendix: Interconnection Assessments

FORT COLLINS HIGH SCHOOL



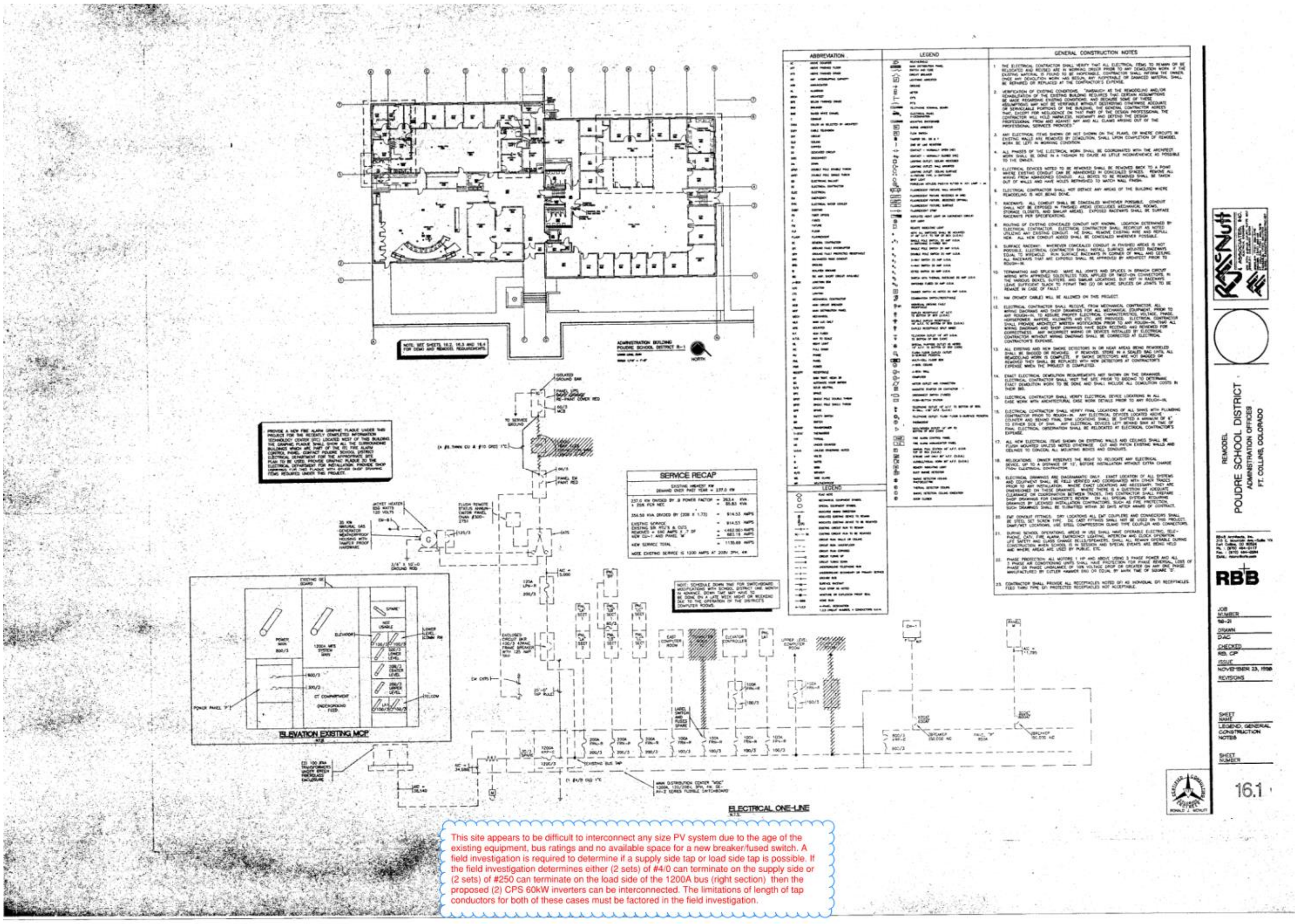
Appendix: Interconnection Assessments

FOSSIL RIDGE HIGH SCHOOL



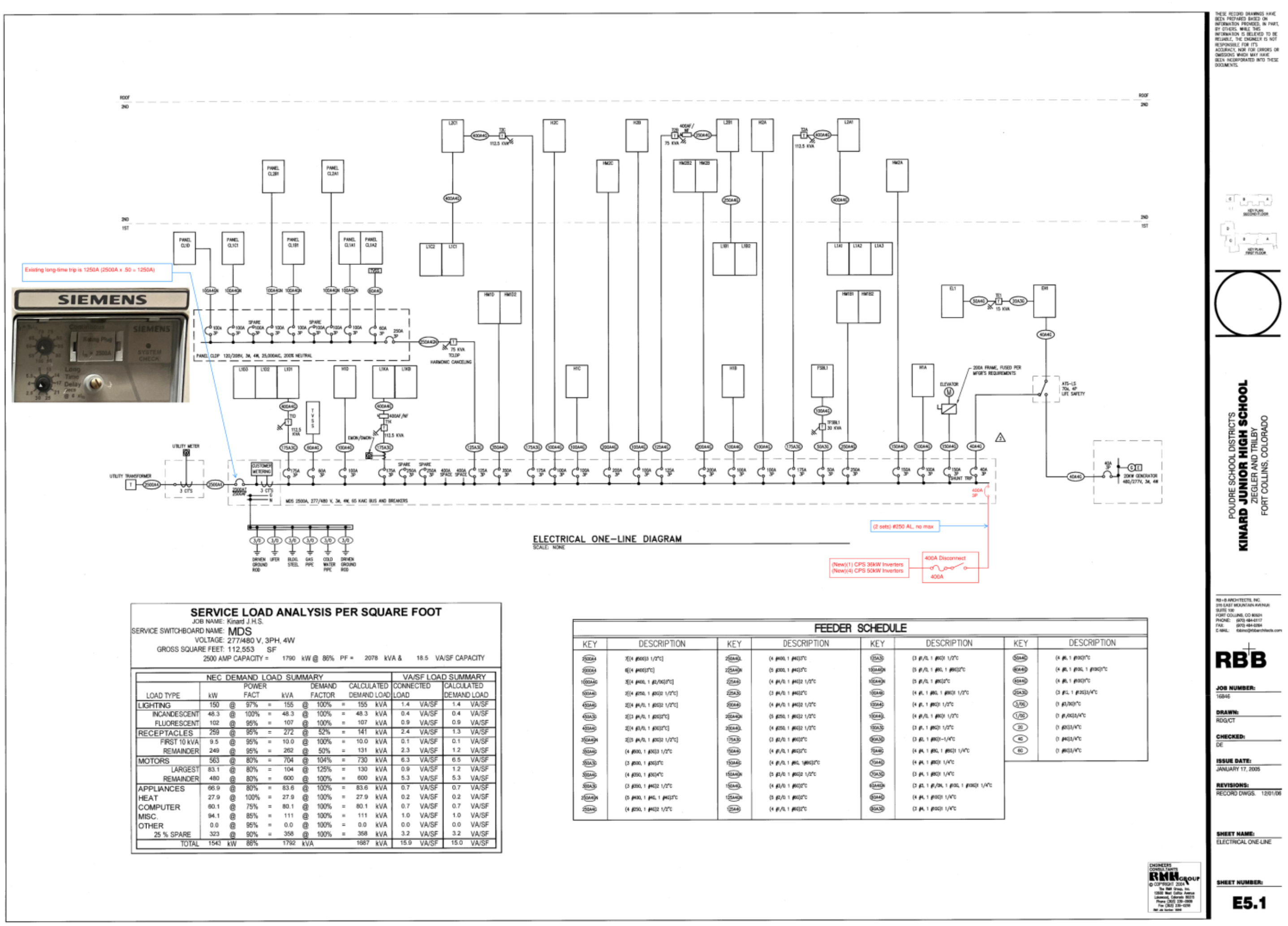
Appendix: Interconnection Assessments

JOHANNSEN SUPPORT SERVICES CENTER



Appendix: Interconnection Assessments

KINARD CORE KNOWLEDGE MIDDLE SCHOOL



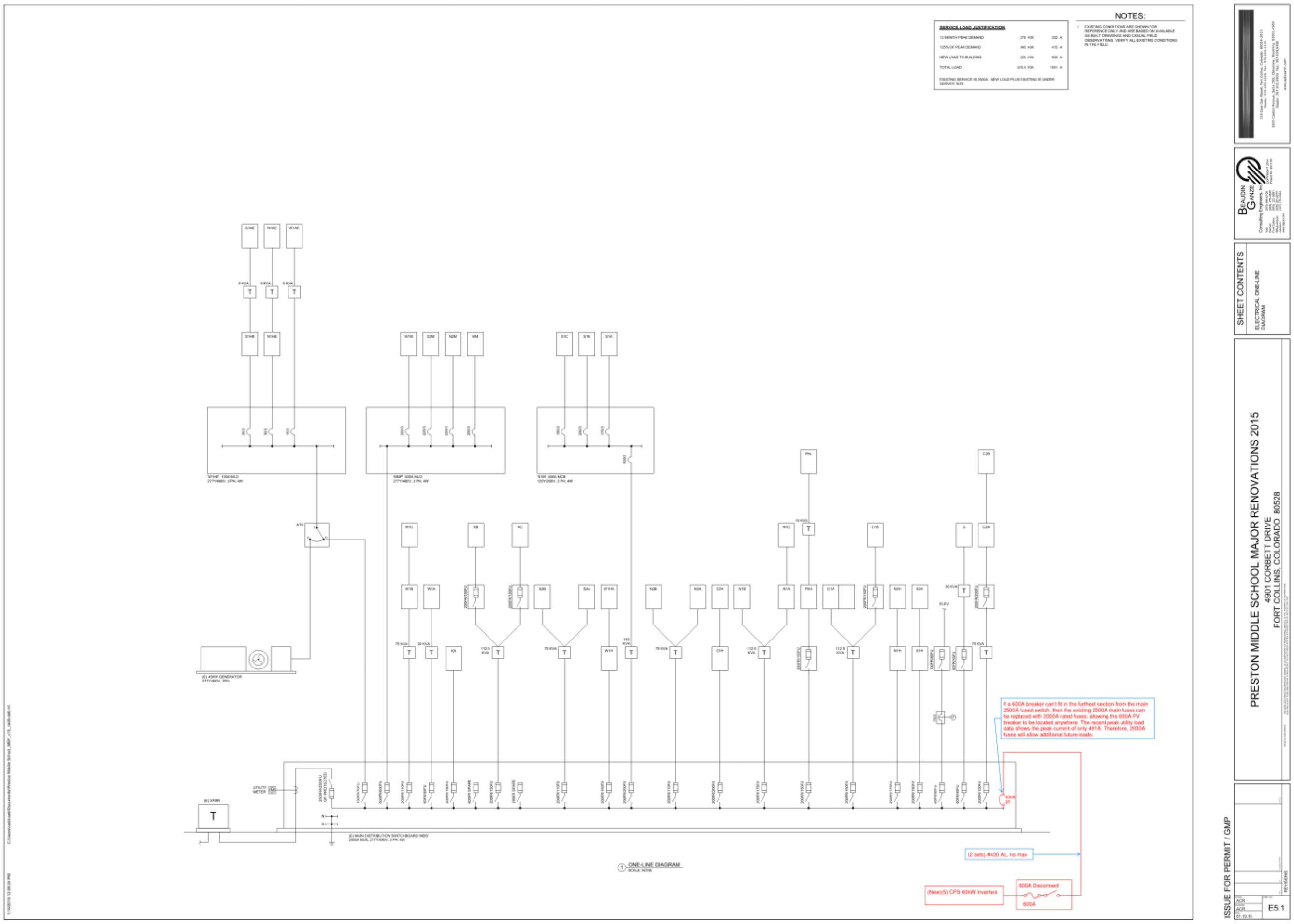
SERVICE LOAD ANALYSIS PER SQUARE FOOT

JOB NAME: Kinard J.H.S.
SERVICE SWITCHBOARD NAME: MDS
VOLTAGE: 277/480 V, 3PH, 4W
GROSS SQUARE FEET: 112,553 SF
2500 AMP CAPACITY = 1790 kW @ 86% PF = 2078 kVA & 18.5 VA/SF CAPACITY

LOAD TYPE	kW		POWER FACT		kVA		DEMAND FACTOR		CALCULATED DEMAND LOAD		CONNECTED LOAD (VA/SF LOAD SUMMARY)		CALCULATED DEMAND LOAD (VA/SF LOAD SUMMARY)	
LIGHTING	150	@	97%	=	155	@	100%	=	155	kVA	1.4	VA/SF	1.4	VA/SF
INCANDESCENT	48.3	@	100%	=	48.3	@	100%	=	48.3	kVA	0.4	VA/SF	0.4	VA/SF
FLUORESCENT	102	@	95%	=	107	@	100%	=	107	kVA	0.9	VA/SF	0.9	VA/SF
RECEPTACLES	259	@	95%	=	272	@	52%	=	141	kVA	2.4	VA/SF	1.3	VA/SF
FIRST 10 kVA	9.5	@	95%	=	10.0	@	100%	=	10.0	kVA	0.1	VA/SF	0.1	VA/SF
REMAINDER	249	@	95%	=	262	@	50%	=	131	kVA	2.3	VA/SF	1.2	VA/SF
MOTORS	563	@	80%	=	704	@	104%	=	730	kVA	6.3	VA/SF	6.5	VA/SF
LARGEST	83.1	@	80%	=	104	@	125%	=	130	kVA	0.9	VA/SF	1.2	VA/SF
REMAINDER	480	@	80%	=	600	@	100%	=	600	kVA	5.3	VA/SF	5.3	VA/SF
APPLIANCES	66.9	@	80%	=	83.6	@	100%	=	83.6	kVA	0.7	VA/SF	0.7	VA/SF
HEAT	27.9	@	100%	=	27.9	@	100%	=	27.9	kVA	0.2	VA/SF	0.2	VA/SF
COMPUTER	60.1	@	75%	=	80.1	@	100%	=	80.1	kVA	0.7	VA/SF	0.7	VA/SF
MISC.	94.1	@	85%	=	111	@	100%	=	111	kVA	1.0	VA/SF	1.0	VA/SF
OTHER	0.0	@	95%	=	0.0	@	100%	=	0.0	kVA	0.0	VA/SF	0.0	VA/SF
25 % SPARE	323	@	90%	=	358	@	100%	=	358	kVA	3.2	VA/SF	3.2	VA/SF
TOTAL	1543	kW	86%		1792	kVA			1687	kVA	15.9	VA/SF	15.0	VA/SF

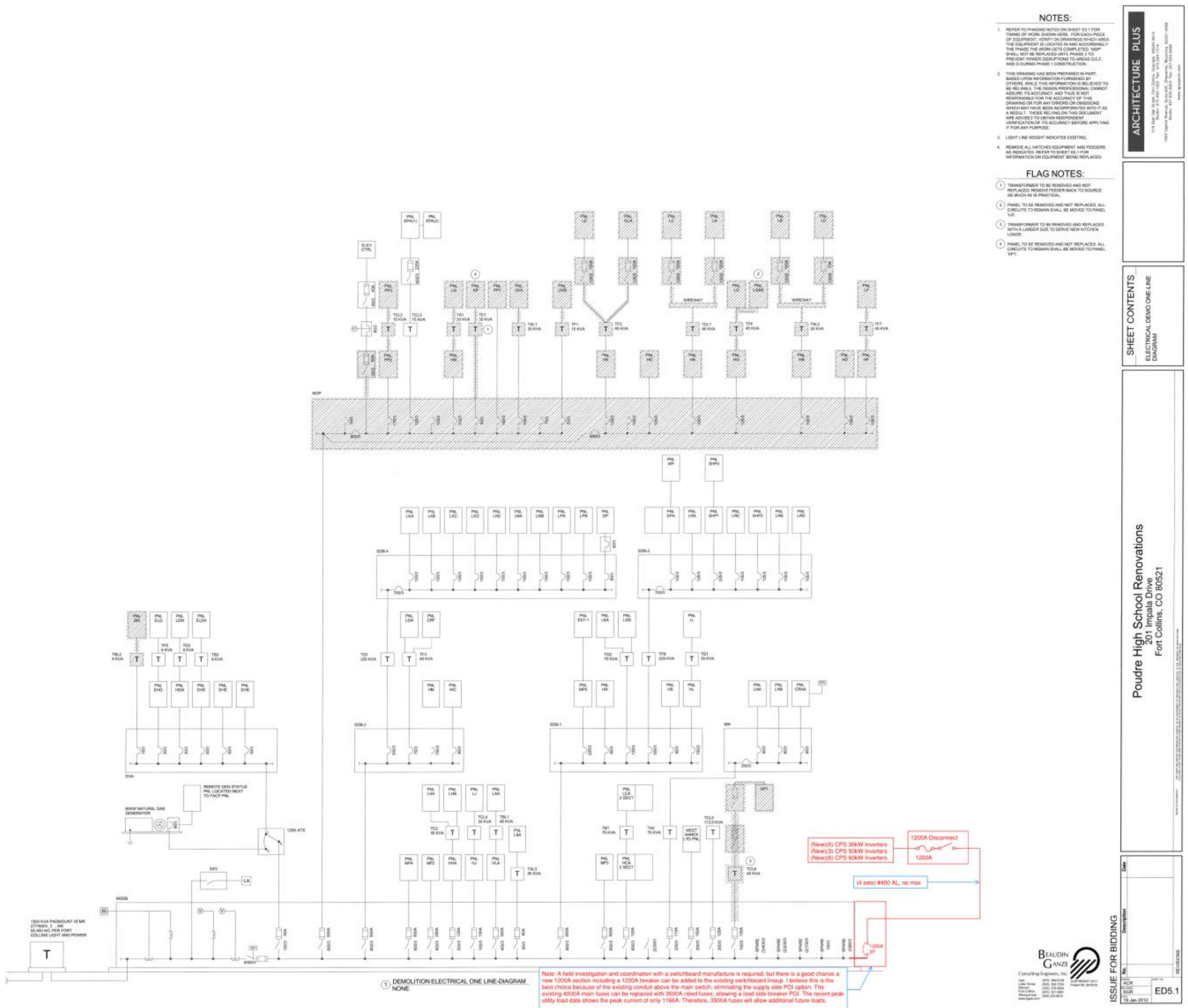
Appendix: Interconnection Assessments

PRESTON MIDDLE SCHOOL



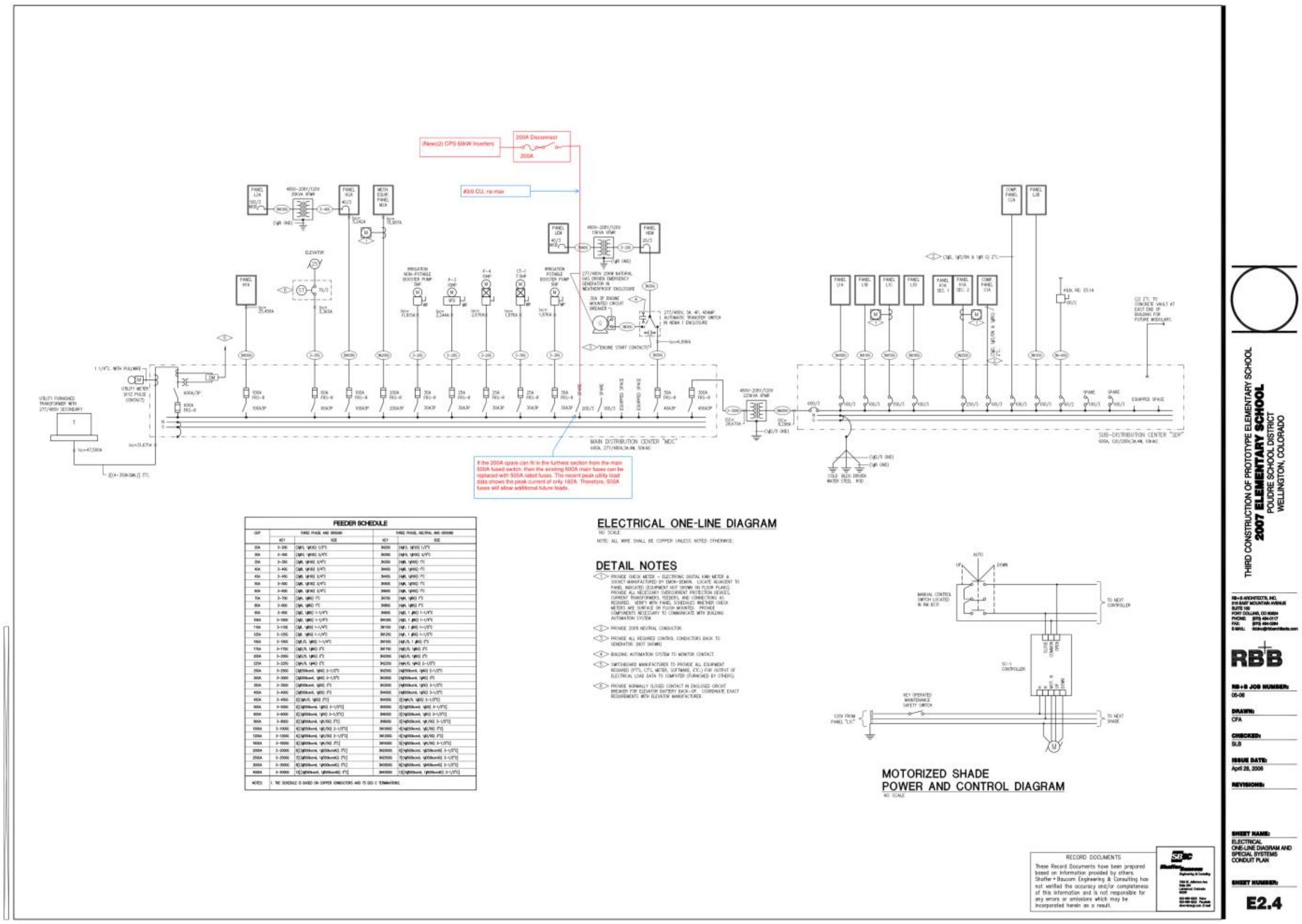
Appendix: Interconnection Assessments

POUDRE HIGH SCHOOL



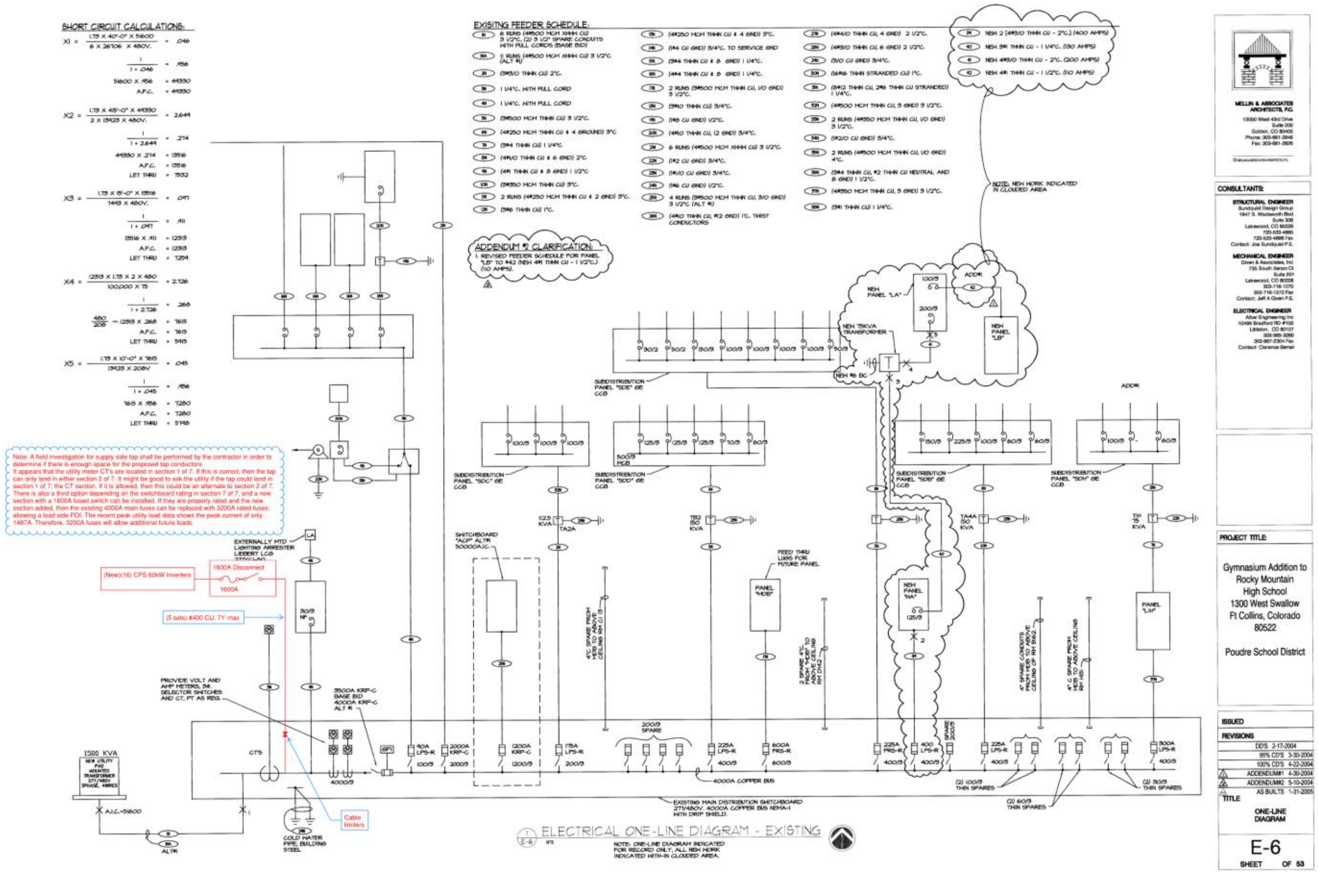
Appendix: Interconnection Assessments

RICE ELEMENTARY SCHOOL



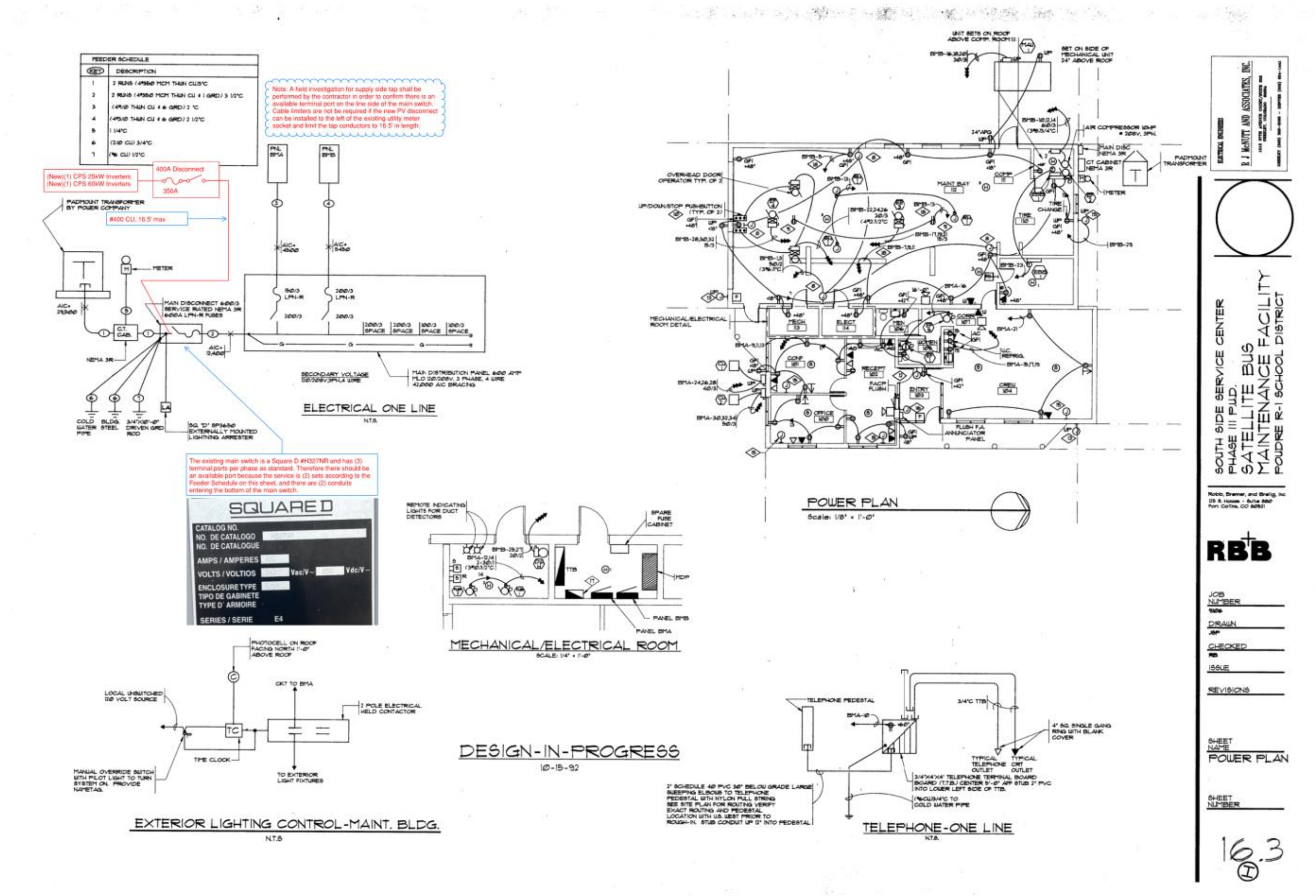
Appendix: Interconnection Assessments

ROCKY MOUNTAIN HIGH SCHOOL



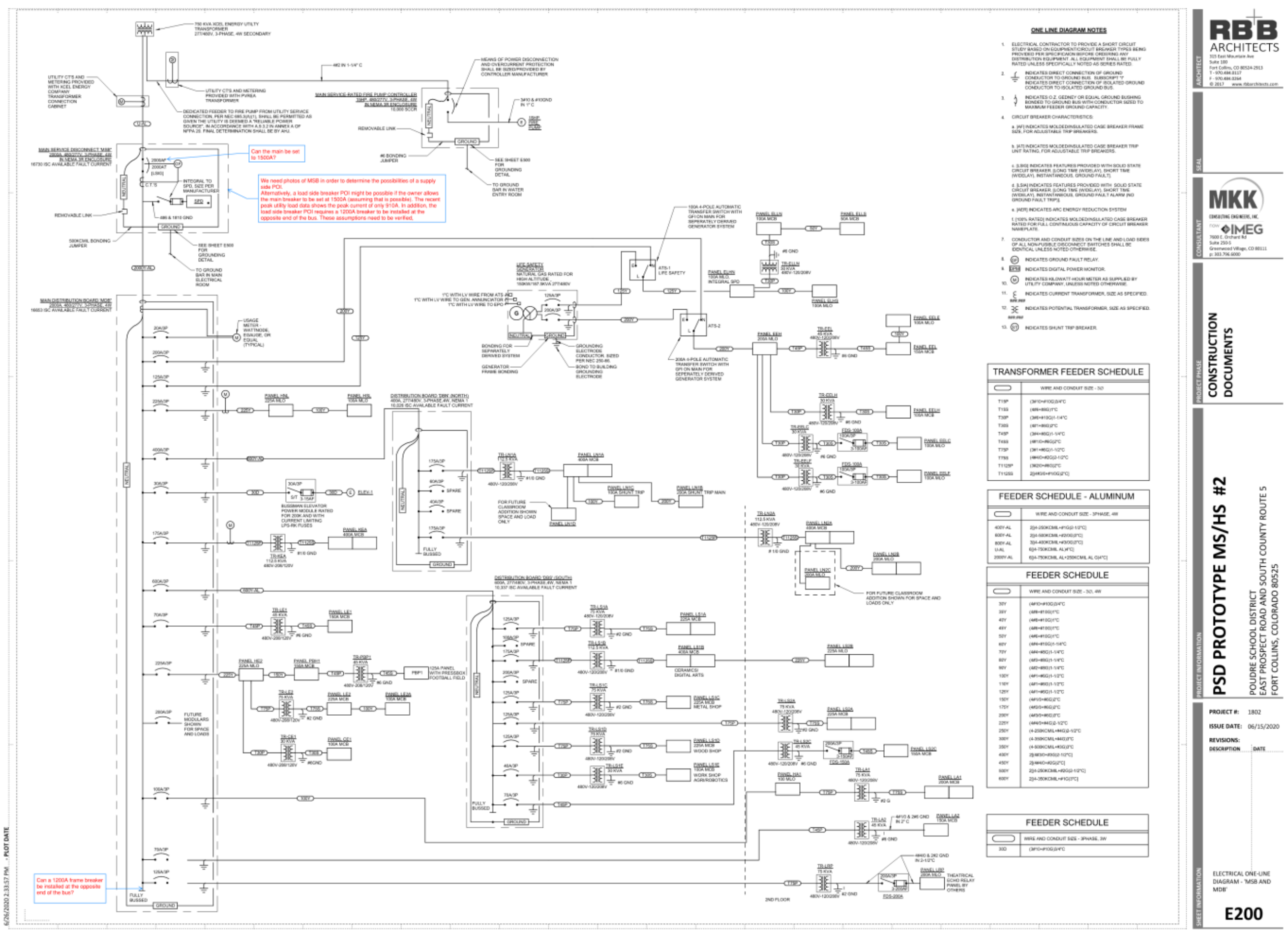
Appendix: Interconnection Assessments

SOUTH BUS TERMINAL



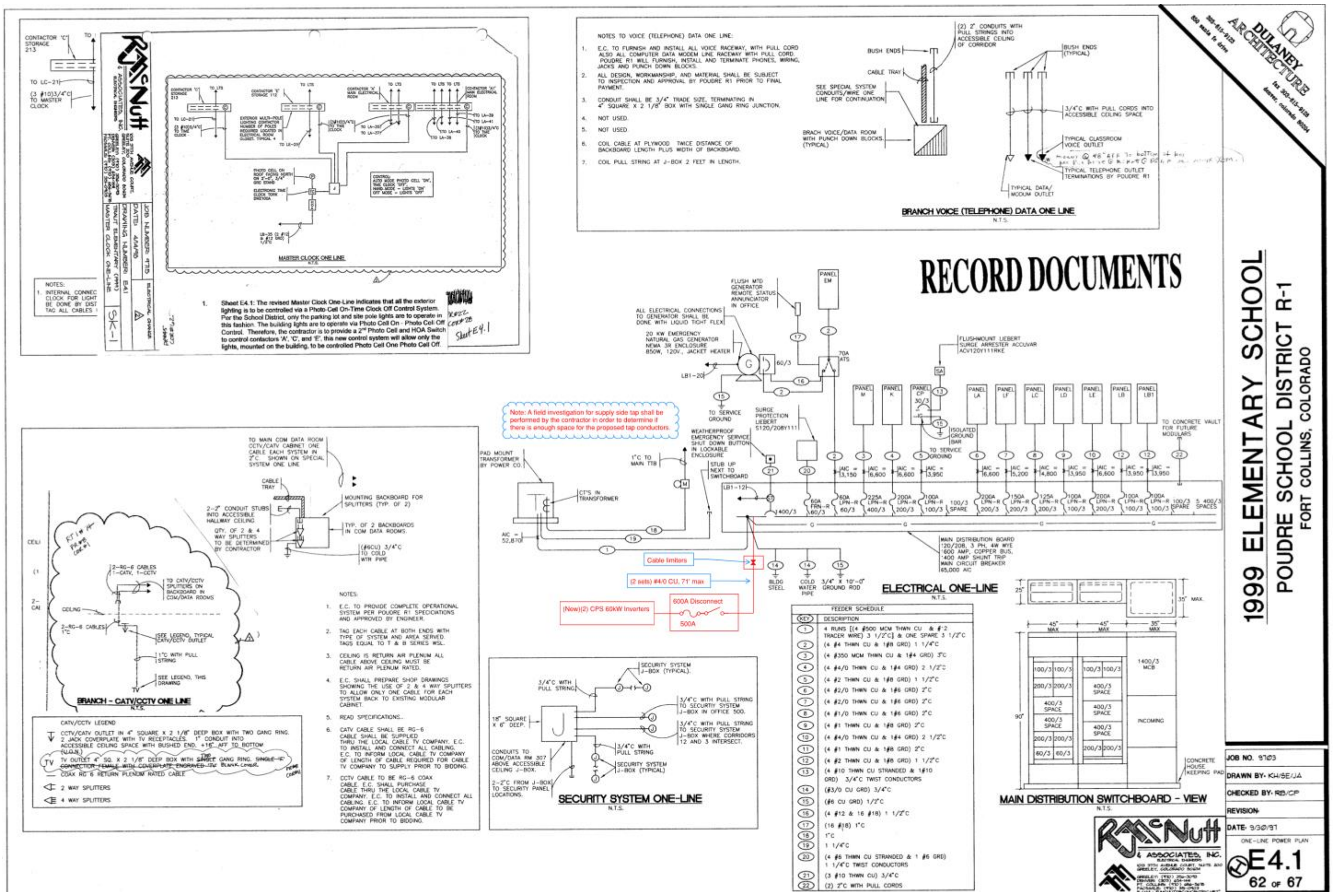
Appendix: Interconnection Assessments

TIMNATH MS/HS



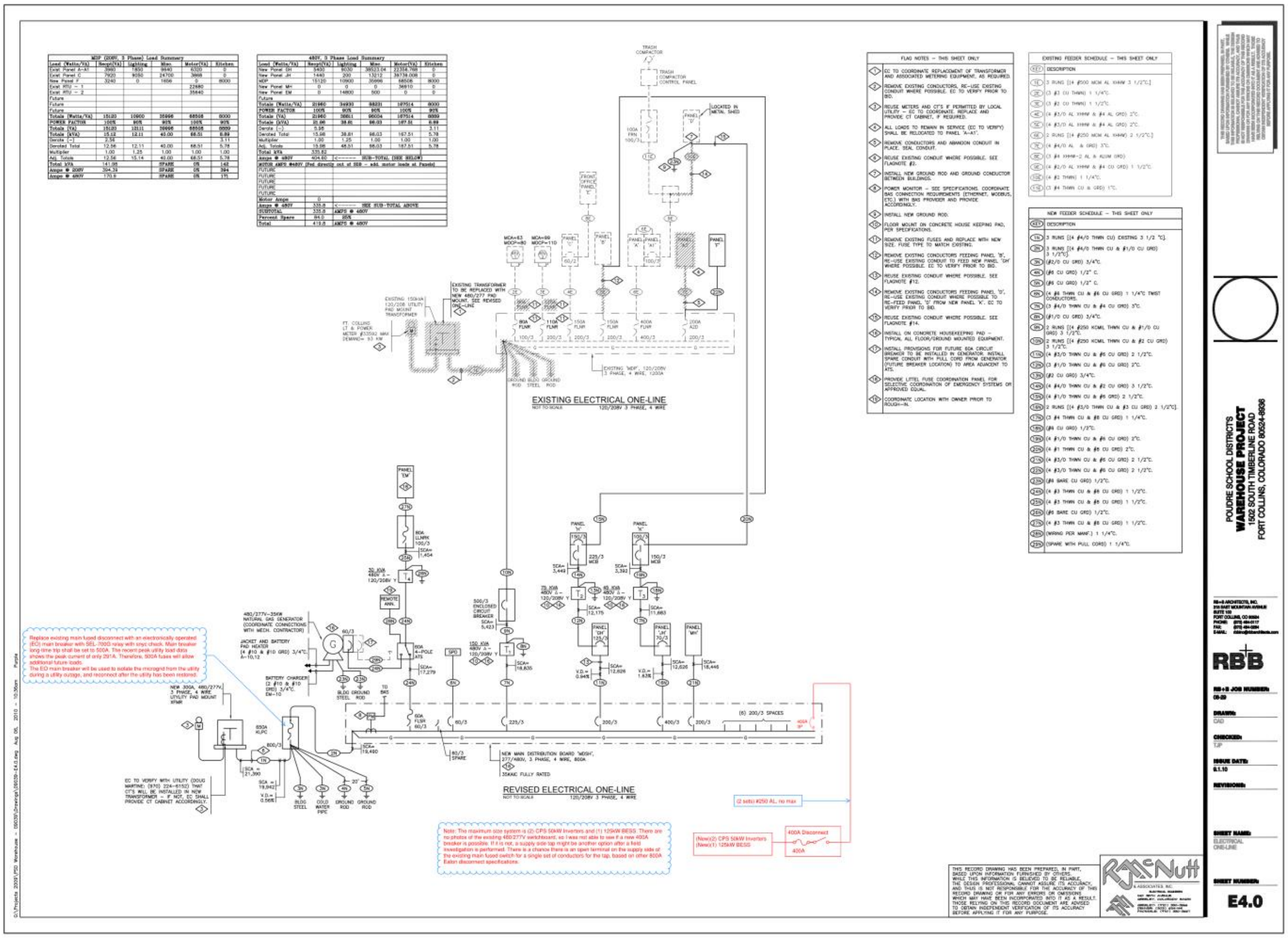
Appendix: Interconnection Assessments

TRAUT CORE KNOWLEDGE ELEMENTARY SCHOOL



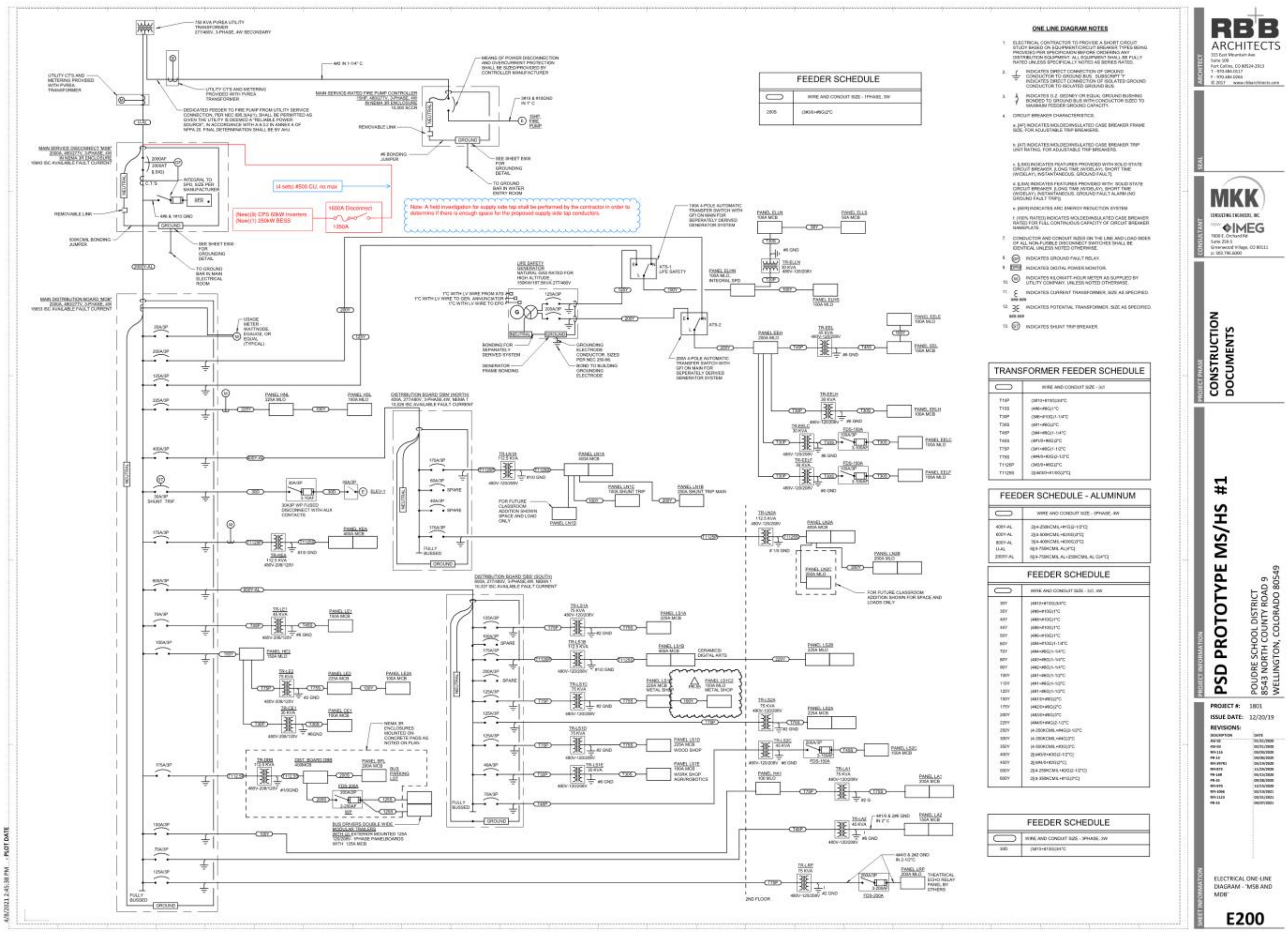
Appendix: Interconnection Assessments

WAREHOUSE 5 - PV AND BESS



Appendix: Interconnection Assessments

WELLINGTON MS/HS -PV AND BESS



Appendix: Interconnection Assessments

WERNER ELEMENTARY SCHOOL