



Saint Paul Public Schools Solar Panel Feasibility Roof Study

The goal of this study was to identify potential buildings in the SPPS district that would be feasible for the installation of solar arrays. Each building roof was analyzed with the following criteria:

Age of Roof

The life of a typical roof in the district is 25 years before it needs to be stripped off and replaced along with the underlying insulation and curbing. The effective life of a solar panel is 20-25 years, so we are only looking at buildings with roofs that are 5 years old or less or going to be replaced in the next 5 years. Many of the buildings have roofs that are different ages due to additions or only replacing expired portions of roofs. These were separated out in the study.

Size of Roof

The building roofs are primarily multi-level and broken up with curbing. They are made of many sections. Only the sections of 2000 sf or more were considered for solar arrays because of efficiencies.

Roof Interference

Roofs typically have interference from Roof Top Mechanical Units, vents, equipment, skylights, etc. Roof areas with equipment that would need to be serviced and replaced were not considered or if there were areas that had excessive penetrations of vents, hatches, etc. and wouldn't allow for access to repair leaks or service.

Roof Orientation

Roofs were analyzed for unobstructed and proper exposure to the sun. Trees shadows, higher building sections casting shadows and poor orientation to the sun were considered.

Structural Integrity

Solar panels and supporting structures add additional loads to the building structure. Building codes are constantly evolving. The requirements for snow and drift load have recently increased and many SPPS buildings were constructed before these codes were implemented.

25 SPPS buildings met the above criteria and were further reviewed for structural integrity to support and attach solar panels on the building. A licensed structural engineer from TKDA reviewed the buildings plans and design criteria to make sure that the additional loading of the solar arrays would meet the current code requirements.



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August 21, 2019

Facilities Department
Saint Paul Public Schools
1930 Como Avenue
Saint Paul, Minnesota
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Re: Solar Panel Feasibility Study
St. Paul Area Schools, St. Paul, Minnesota
TKDA Project No. 12800.150

Per your request, TKDA has conducted a preliminary review of facility roof structures for the potential addition of photovoltaic solar panels on 25 schools in the Saint Paul Public School (Owner) system. The following provides a summary of the existing conditions and TKDA's recommendations for solar panel feasibility.

PROJECT SUMMARY

The study involved the review of existing drawings of 25 buildings selected by the owner to identify possible candidates for further evaluation of solar panel installations. Areas of review were limited to the highlighted areas provided to TKDA by the Owner. The buildings were not fully evaluated structurally. The schools included in our scope are:

- Adams Spanish Immersion
- Bridgeview
- Cherokee Heights Elementary
- Como Park Senior High School
- Eastern Heights Elementary
- Focus Beyond
- Four Seasons A+ Elementary
- Galtier Elementary
- Groveland Elementary
- Highland Park Elementary
- Homecroft Early Learning Center
- Horace Mann School
- Hubbs Elementary
- Humboldt High School
- Johnson Senior High School
- Journey's Secondary
- L'etoile Du Nord Lower
- L'etoile Du Nord Upper
- Leap Senior High School
- Linwood Monroe Elementary
- Nokomis Montessori – South
- River East School
- Sheridan Elementary
- St. Anthony Park Elementary
- Washington Technological Magnet

REVIEW AND RECOMMENDATIONS

Upon review, TKDA was able to group the 25 candidate schools into three categories: Feasible, Feasible with Exceptions, and Not Feasible.

Feasible schools include facilities whose existing roof systems have the potential to support the installation of solar panels without large scale modifications to existing infrastructure. However, a more in-depth structural review is necessary to confirm if the roof framing has sufficient capacity. Feasible with Exception schools include facilities that have the potential to support solar panels; however, a more in depth structural review is necessary to confirm if the roof framing has sufficient capacity, and structural modifications will likely be necessary prior to any installation. Not Feasible schools include facilities whose existing infrastructure is not conducive to roof connections without significant reinforcement or modifications to the framing system.

Feasible

After preliminary review, the following schools have been deemed feasible for solar panel installation.

Eastern Heights Elementary: This building's existing roof infrastructure consists of concrete slabs a minimum of 4-1/2 inches thick over concrete beams, which are conducive to potential connections for solar panels. The building is also rated for a 60 PSF roof load, which includes snow and ponding, and an additional snow drift load in accordance with ASCE 7. See figure 1.

Four Seasons A+ Elementary: The original 1974 building's infrastructure consists of precast double tee concrete beams with a 4-inch topping slab. While the structure is supported by steel columns, solar panels could potentially be connected via anchors into the concrete beams. Only the original 1974 roof falls into the feasible category. See figure 2.

Galtier Elementary: This building's existing infrastructure consists of precast double tee concrete beams with a topping slab. Design loads are unknown; however, connections could potentially be made to the beams themselves or the concrete columns. See figure 3.

Feasible with Exceptions

The schools deemed Feasible with Exceptions mainly consist of precast hollow core concrete planks. While it is possible to anchor into hollow core planks, it requires careful consideration and poses more challenges in comparison to a conventional reinforced concrete slab. After preliminary review, the following schools have been deemed feasible with exceptions for solar panel installation.

Como Park Senior High School: While all of the highlighted areas are not eligible for solar panels, parts of the existing roof system consist of 10-inch hollow core concrete planks with thin topping slabs. The building is also designed for an extra 10 psf superimposed load. See figure 4.

Nokomis Montessori – South : The 1994 addition consists of hollow core concrete planks over concrete beams. Concrete beams frame into concrete columns, which could potentially provide viable connection options. See figure 5.

Washington Technological Magnet: The existing infrastructure ranges from 4-inch concrete slabs to 8-inch precast hollow core concrete planks. The existing loads also account for ponding, which may need to be addressed prior to solar panel installation. See figure 6.



Not Feasible

The schools deemed not feasible consist of bar joists with metal decks or clay tile roofs. While some of the schools may be capable of accommodating additional load due to solar panel installation, the existing infrastructure is not conducive to roof connections. After preliminary review, the following schools have been deemed not feasible for solar panel installation.

- Adams Spanish Immersion
- Bridgeview
- Cherokee Heights Elementary
- Focus Beyond
- Groveland Park Elementary
- Highland Park Elementary
- Homecroft Early Learning Center
- Horace Mann
- Hubbs Elementary
- Humboldt High School
- Johnson Senior High School
- Journey's Secondary
- L'etoile Du Nord Lower
- L'etoile Du Nord Upper
- Leap Senior High School
- Linwood Monroe Elementary
- Nokomis Montessori – South
- River East School
- St. Anthony Park Elementary

SUMMARY

After preliminary review, TKDA has determined that Eastern Heights Elementary, Four Seasons A+ Elementary, and Galtier Elementary are worthy candidates for further investigation for solar panel installation. Como Park Senior High School, Sheridan Elementary, and Washington Technological Magnet represent the next tier of schools worthy of further investigation for solar panel installation; however, they will likely require structural modifications. All schools will require further in-depth structural analysis in order to confirm these assumptions.

Please feel free to contact me with any questions regarding the information provided in this letter, or if further discussion is necessary for clarifying TKDA's position on this matter.

I hereby certify that this Plan, Specification, or Report was prepared by me or under my direct supervision and that I am duly licensed Professional Engineer under the Laws of the State of Minnesota.

Sincerely,



Marco A. Weidmer, P.E.
Registered Engineer, MN License No. PE-55560

MAW:mas

c: Troy Androli, TKDA





Figure 1: Eastern Heights Elementary



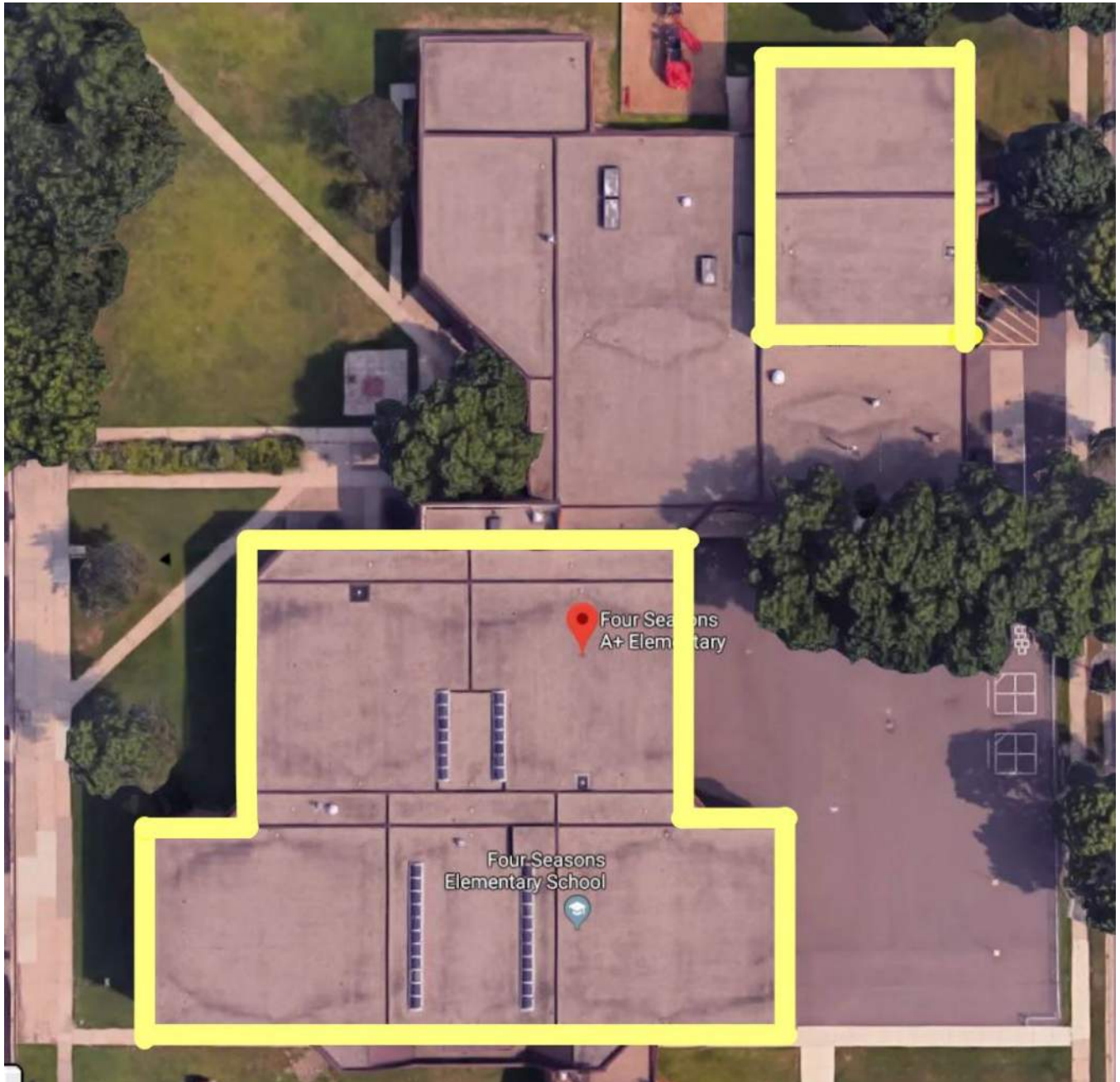


Figure 2: Four Seasons A+ Elementary



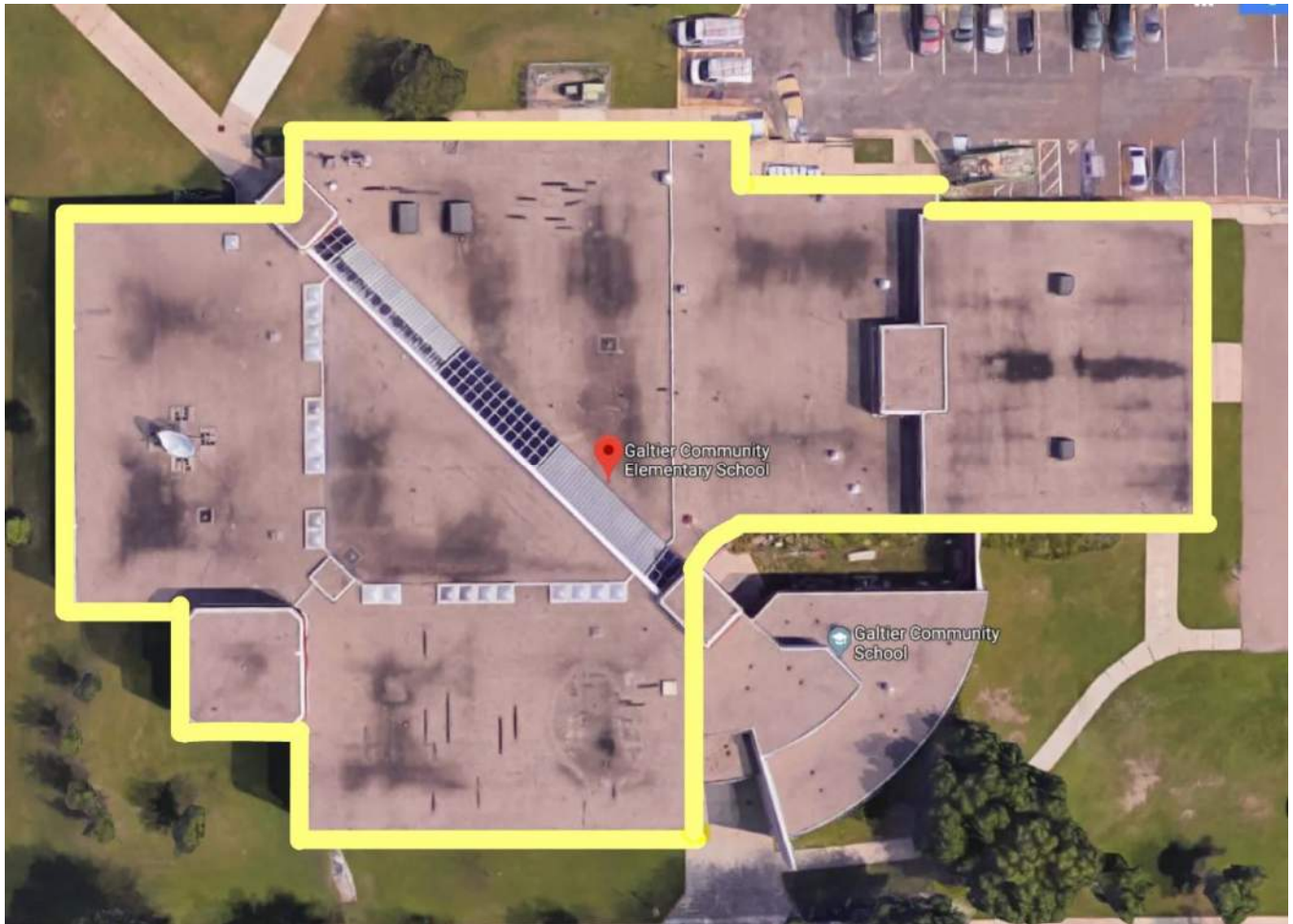


Figure 3: Galtier Elementary



Figure 4: Como Park Senior High School



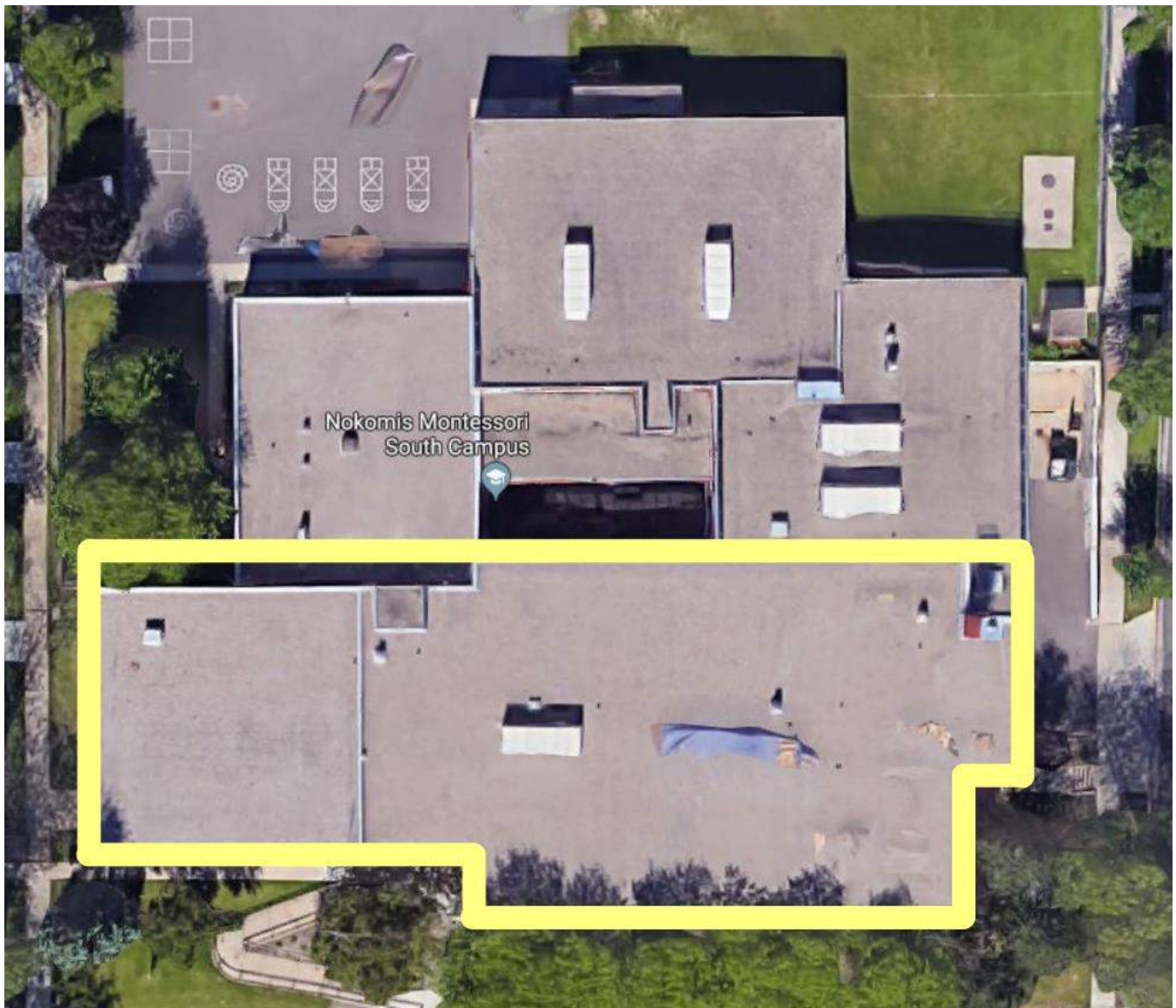


Figure 5: Nokomis Montessori – South



Figure 6: Washington Technology Magnet School

