

Appendix G

Noise Assessment

MEMORANDUM

Date: March 31, 2021

Re: Noise Propagation and Modeling Assessment
Hayward Solar Project, Freeborn County, MN
File R0026599.00

To: Project File

From: Megan Lamb, Environmental Scientist

Westwood Professional Services, Inc. (Westwood) was authorized by Hayward Solar, LLC (Hayward Solar) to provide noise modeling for the proposed Hayward Solar Project (Project) in Freeborn County, Minnesota (**Exhibit 1**) in support of the Site Permit Application (SPA) which will be submitted to the Minnesota Public Utilities Commission (Commission or PUC) in the first quarter 2021. The planned output for the Project is up to 150 megawatts (MW) alternating current (AC) of nameplate solar-energy capacity located on approximately 1,958 acres of land (Project Area – see **Exhibit 1**). Hayward Solar plans to construct the Project on a schedule that facilitates an in-service date in 2023. It should be noted that few farmsteads, rural residence and/or other occupied structures (i.e., noise receptors) are located in the vicinity of the Project and that only one farmstead/rural resident is located within the Project Area (**Exhibit 1**).

Hayward Solar is planning to use photovoltaic (PV) solar panels with a total equivalent PV generating capacity of approximately 156.6 MW from a mixture of 48 3150 kilovolt-ampere (kVA) and 48 3600kVA central inverters. This preliminary design and Project layout takes into account applicable energy loss (approximately 2% AC losses) and would allow for up to 150 MW of solar energy generation and transmission onto the grid (which is capped at 150 MW as part of the interconnection agreement). The current layout and proposed equipment are preliminary and subject to change as the design advances.

The Project will interconnect to the existing Southern Minnesota Municipal Power Agency (SMMPA) Hayward-Murphy Creek 161 kilovolt (kV) transmission line that transects the Project boundary within in Freeborn County (**Exhibits 1 and 2**) via a new switching station. The O&M building, Project substation and new switching station will be grouped together at the north end of the Project Area with access via County Highway 46. The switching station (to be owned, permitted and constructed by SMMPA) will be used to interconnect the Project to an existing transmission line. The electrical collection lines between the solar arrays/inverters and Project substation will be 34.5 kilovolt (kV) feeders and may be either underhung on the tracker or direct buried. A short length of 161 kV overhead electrical transmission connection line (approximately 200 feet) will be installed between the Project substation and the new switching station.

It is our understanding that the purpose of this modeling is to determine noise levels generated from 48 step-up transformer locations (consisting of two inverters at each location) and one Project substation location consisting of one transformer based upon current Project design and engineering (see **Exhibit 2** for inverter and Project substation locations).

Predicted noise levels were determined using the Cadna-A noise propagation and modeling software. Because the Project is located within a residential and rural area, the Project Area is designated as a Noise Classification Area 1 (NAC 1) with daytime noise allowances of 60 decibels (dBA) and nighttime noise allowances of 50 dBA according to Minnesota Statutes §116.07 and Minnesota Rules, Chapter 7030 noise regulations. NAC 1 Areas generally consist of residential dwellings, hotels, medical service facilities, educational facilities, camping areas, and religious or cultural gathering areas. Westwood modeled the distance from the noise generation sources (i.e., step-up transformer/inverter and Project substation transformer) until rural background noise levels of 40 dBA were reestablished. The Project Area ambient environment was not evaluated prior to our modeling of the Project; therefore, rural background noise levels are congruent with the ANSI S12.9-13/Part 3 Category 6: Very Quiet Rural Residential with a typical daytime ambient noise level of approximately 40.0 dBA as an industry standard. Note the Category 6 ambient environment is considered conservative and is expected to be lower than what in-field measurements would be.

Hayward Solar is considering the use of Jinko PV solar panels (Jinko Solar, TR Bifacial 72M 505-525 Watt, JKM5XXM-7TL4-TV), 96 inverters (Sungrow, SG150U-MW), and one transformer at the Project substation. According to manufacturer provided data for this equipment, the step up location inverters are expected to produce approximately 79 dBA at 1 meter (m) from the inverter/noise source during peak production. The main power transformer (not yet specified in Project design/engineering but expected to be a 34.5-161 kV transformer) to be located at the Project substation was conservatively modeled to produce approximately 90 dBA at 1 m from the transformer/power source based upon comparable solar facility transformers. It is our experience that comparable transformers produce approximately 76-84 dBA at 1 m from the transformer. Since the final transformer for the Project was not selected at the issuance of this report, Westwood modeled the transformer decibel output as significantly higher than what we have seen used at other facilities to ensure a wide range of transformers would comply with Minnesota noise regulations.

Predicted noise levels were determined using an aggregate of output levels from the Project substation transformer and inverters. The total distance from the noise generation sources until rural background noise levels are reestablished are discussed below.

The planned inverter locations throughout the Project Area reestablished rural background sound levels of 40 dBA on an average of 37.2 m (122.0 feet [ft]) from the inverter location centers (**Exhibit 2**). The transformer within the Project substation located on the north-central portion of the Project Area reestablished rural background sound levels of 40 dBA on an average of 88.4 m (290.0 ft) from the transformer center (**Exhibit 3**).

Ambient levels were reestablished within the Project Area boundary; therefore no increased sound levels are expected outside the Project Area and no noise impacts from the proposed Project solar facility are expected at any of the few nearby occupied dwellings. The predicted noise concentration zones and propagation model are shown on the attached **Exhibits 2-4**.

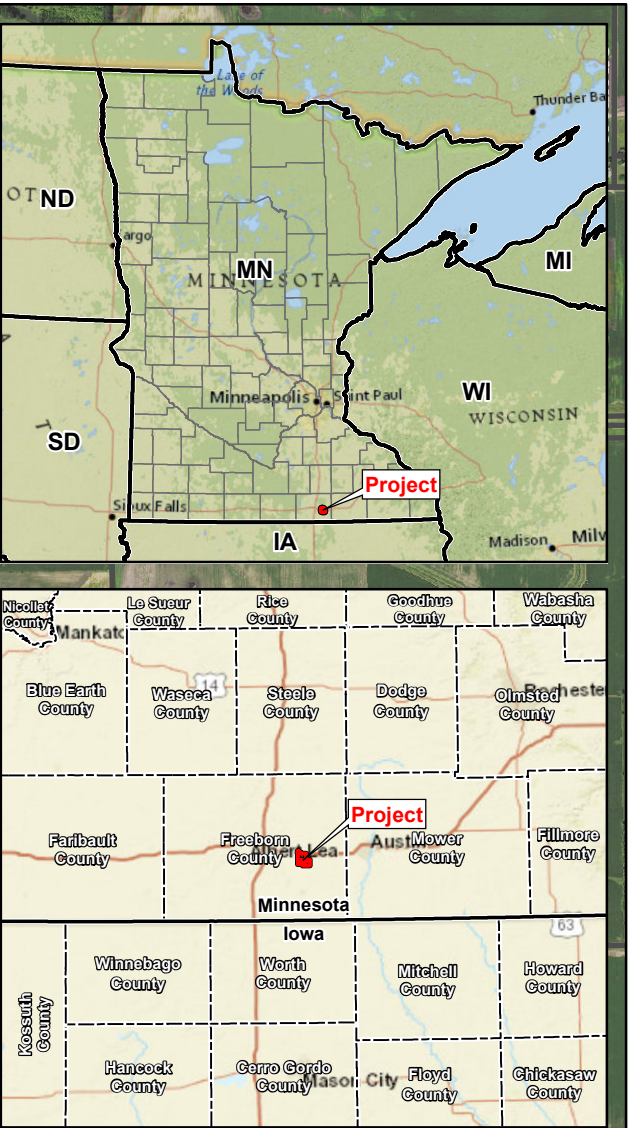
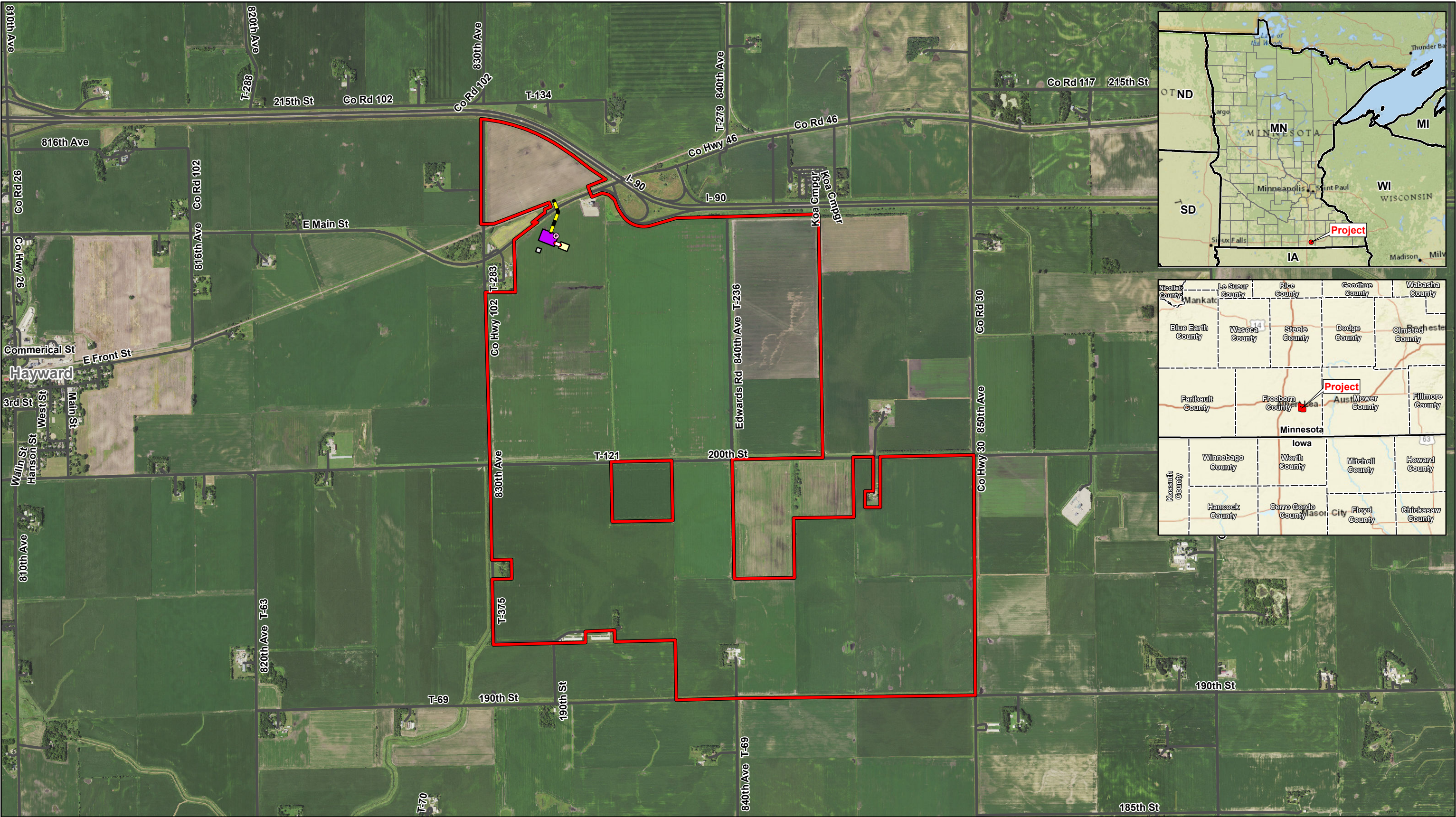
Based on the total predicted distances to reestablishing rural background sounds levels of 40 dBA assessed in modeling results, the noise levels produced by the Hayward Solar Project planned facilities will be much below NAC-1 standards and not expected to be near regulatory limits. As such, noise impacts are not expected on the surrounding area from the Project and Project noise is properly mitigated by existing topographical variances, distances within and between Project noise sources and the relatively few

receptors, and the equipment planned to be used for the Project (inverter step-up transformers and Project substation transformer). No additional mitigation is required to address noise from the Project.

In performing its services, Westwood used that degree of care and skill ordinarily exercised under similar circumstances by reputable members of its profession currently practicing in the same locality. No warranty, express or implied, is made.

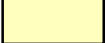
If you have any questions regarding the noise modeling conducted for the Project, please feel free to call me at (612) 619-9230.

Attachments Exhibit 1 Project Overview
 Exhibit 2 Noise Impact Assessment Results
 Exhibit 3 Project Substation Noise Impact Assessment Results
 Exhibit 4 Inverter Noise Impact Assessment



Data Source(s): Westwood (2021); Minnesota NAIP Imagery (2019); ESRI WMS National Geographic & World Streets Basemaps (Accessed 2021); Census Bureau (2019).

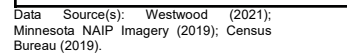
Legend

- | | | |
|--|--|--|
|  Project Area |  Proposed Project Substation |  POI |
|  Census Road |  SMMPA Switchyard |  SMMPA Line Tap |
|  Proposed Project O&M Building |  Project Gen-Tie Line | |

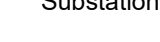
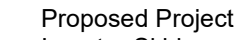
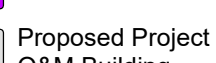
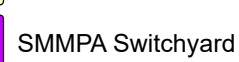
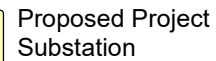


Hayward Solar Project
Freeborn County, Minnesota

Project Overview



Data Source(s): Westwood (2021); Minnesota NAIP Imagery (2019); Census Bureau (2019).

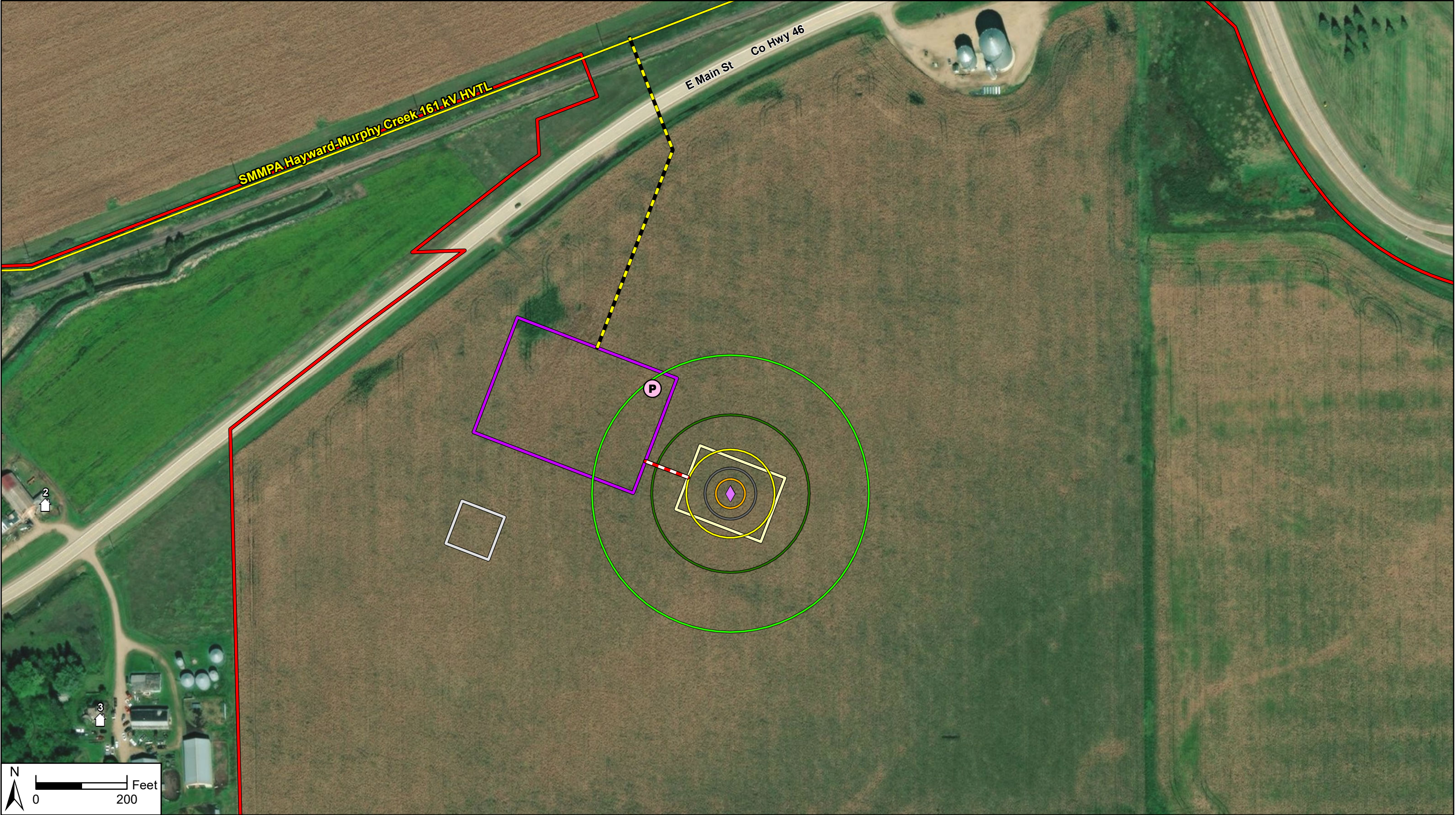
 Project Area

90dBA



Freeborn County, Minnesota

Noise Impact Assessment



Data Source(s): Westwood (2021); ESRI WMS World Imagery (Accessed 2021); Census Bureau (2019); Ventyx Velocity Suite, Ventyx Energy LLC. (2021).

Westwood
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Westwood Professional Services, Inc.

Legend

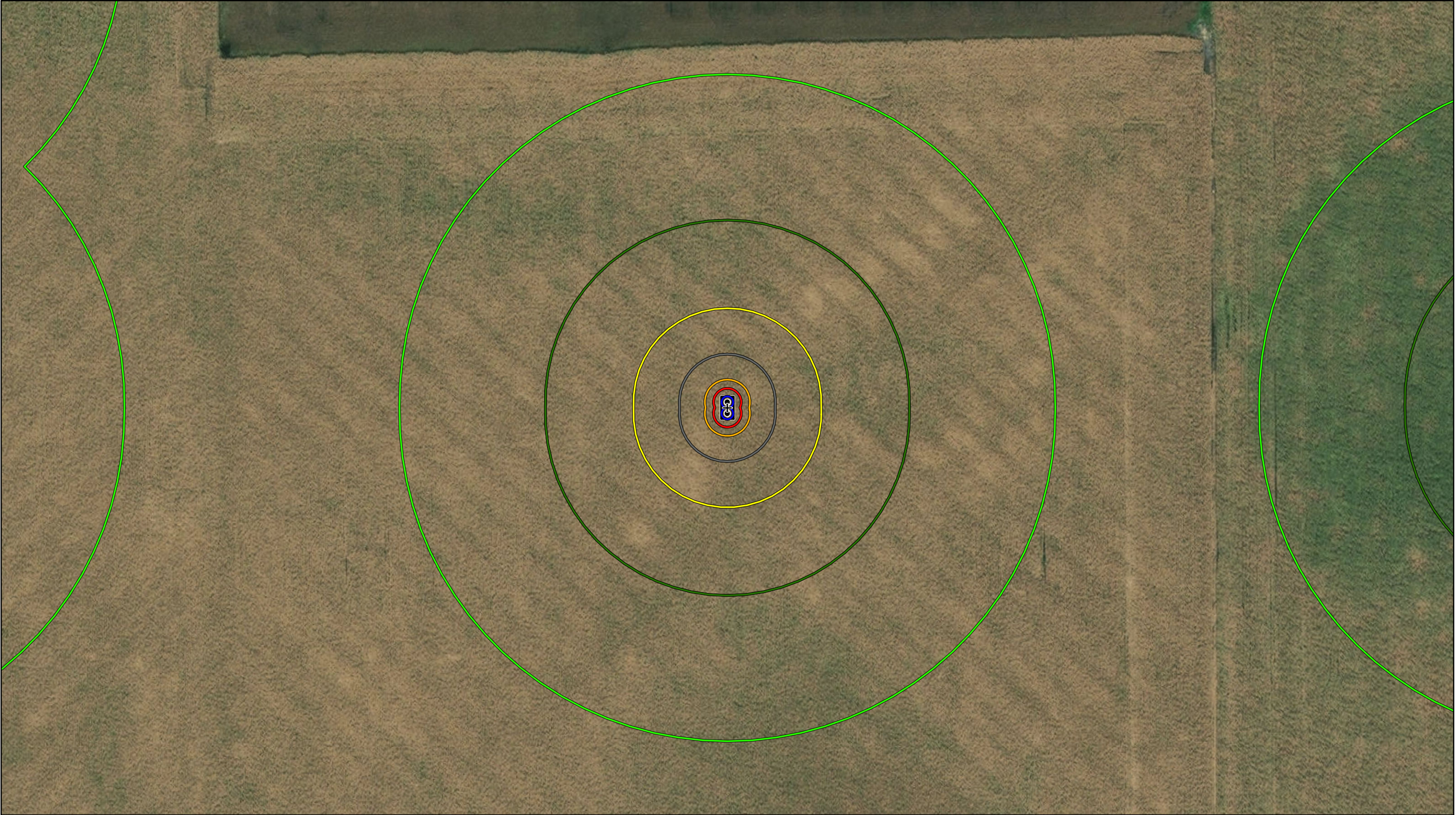
- Proposed Project Substation Transformer
- Residence
- Project Area
- Proposed Project Substation
- SMPA Switchyard
- Proposed Project O&M Building

- POI
- SMPA Line Tap
- Project Gen-Tie Line
- Existing Transmission Line

Decibel Levels

- 55dBA
- 50dBA
- 45dBA
- 40dBA
- 35dBA

Hayward Solar Project
Freeborn County, Minnesota
**Substation Noise
Impact Assessment**
EXHIBIT 3



Data Source(s): Westwood (2021); ESRI
WMS World Imagery (Accessed 2021);
Census Bureau (2019).

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Legend

• Proposed Inverter Skid
Noise Analysis Location

+ Proposed Project
Inverter Skid

Proposed Project Inverter
Skid Boundary

Decibel Levels

90dBA

75dBA

60dBA

55dBA

50dBA

45dBA

40dBA

35dBA



Hayward Solar Project
Freeborn County, Minnesota

**Inverter Noise
Impact Assessment**