Maps

Applications must contain maps that show the facility in its entirety.[1] Maps are foundational to a permit application, illustrating important information on the project location, proximity to the built environment and natural resources. Effective maps convey spatial information in a clear and concise manner and are easy to interpret.

Formatting

Based on standard practice among environmental and *technical* professionals and past practices, staff recommends that the following map features for permit application purposes:

- **Title:** A map title conveys the map's purpose and what it depicts (e.g., "Population Density of Crow Wing County, Minnesota, in 2020"). It allows the reader to quickly grasp the map's focus and context.
- **Legend (or Key):** A map legend or key explains the symbols, colors, or patterns used on the map to represent various features (e.g., different shades of color for elevation or types of land use). It is crucial for interpreting the data displayed.
- **Scale:** A map scale shows the relationship between the distance on the map and the corresponding distance on the ground. It could be represented as a bar scale, a numerical ratio (e.g., 1:100,000), or a verbal description (e.g., "1 inch = 10 miles").
- **Orientation (North Arrow):** A compass rose or a north arrow indicates map orientation, helping the reader understand direction (North, South, East, West). This is especially important for navigating or aligning the map with real-world coordinates.
- **Grid or Coordinates:** A grid (latitude and longitude or a custom coordinate system) helps users find specific locations. For larger-scale maps, coordinates are essential for pinpointing locations.
- **Labels:** Labels identify key features on the map, project boundaries, proposed and alternative high voltage transmission routes (if applicable), cities, rivers, roads, or boundaries. These features and labels should be clear, appropriately sized, and placed in a way that doesn't clutter the map.
- **Data Visualization (Symbols/Coloring):** The map should visually represent the data in a clear and easy-to-understand way. This could include the use of color, shading, patterns, and symbols to convey information like elevation, population density, or land use. Consistency in these visual elements is important for interpretation. Keep in mind that the general public includes people with color-related vision challenges. Many Geographic Information System (GIS) applications contain color palettes for color-related vision challenged individuals.
- **Borders:** Borders help define the extent of the map, showing where the map starts and ends. This could be the boundary of a city, region, country, or even the overall frame of the map.
- **Inset Map (if necessary):** An inset map shows a zoomed-in portion of the main map or a map of a surrounding area. It can help clarify specific details that may be difficult to see on the main map.

[1] Minn Stat. 216I Subd.3(b)(6)

- **Source Information:** A map should include information about where the data comes from, especially if it's based on research or specific datasets. This builds credibility and allows the reader to verify the map's accuracy.
- **Date:** The date or time period the map was created or the data was collected is important, especially if the map is showing changing information like population or environmental data.

Map Scale

Aerial photos are generally used as a base layer for most maps and should be provided at a scale of at least 1:4800. The extent of the aerial photography must be inclusive enough to show the landscape context within which the proposed facilities would be placed and will require the map extent to go beyond the project boundary. Rectified orthophotos using GIS are preferred (reduced size aerial photos are not adequate). All data (shapefiles) used to create the provided maps must be submitted to EERA.

Showing several of the required layers on a single map may not be useful or practical. Applicants should submit maps that provide cartographic clarity as well as the necessary geographic information as outlined below.

Accessibility

The State of Minnesota has a design guide for best practices that will ensure maps are accessible and usable. This map design guide should be followed to the extent practicable.[2] This is especially important when choosing colors for layers that will convey aspects of your project; for instance, it's best to avoid greens on top of an aerial photo to decrease issues with colorblindness. Decreasing the transparency of the basemap's aerial photography is also a good method to decrease issues with accessibility. There are resources available in the map design guide to design your map with accessible color schemes and to check the contrast readability of your map.[3].

List of Recommended Maps

PUC staff recommends that applications Include the maps listed below as an appendix. For a smaller scale, such as with a project requiring a site permit, it may be more efficient to put all of the required maps in one appendix with numerical cover pages such as, "Map 1: Project Location" then "Map 2: Project Overview" and so forth.

If your project is too large to fit on one map with sufficient detail, such as with a HVTL route, include several maps at a scale promoting the best usability and readability. In this case, it is best to segment the same appendix by sub-labelling it such as, "Appendix A-1: North Segment", "Appendix A-2: South Segment", and so on as it applies to your project. This sub-labelling increases navigability by making it clear that all project overview maps can be found in one appendix.

If any of your maps use the grid mapping method where a network of boxes are used to identify the current map's location on an overall larger map, it is essential to include an inset map indicating which grid is being displayed in relation to the overall project.

[2] https://mn.gov/mnit/assets/Accessibility%20-%20map-design-guide%20%28updated%29_tcm38-565153.pdf
[3] See, for example, ESRI's Color Vision Deficiency Simulator tool, https://pro.arcgis.com/en/pro-app/latest/get-started/color-vision-deficiency-simulator.htm

Project Location. Include county and municipal boundaries, cities, townships, waterbodies, and all major roads and highways delineated on a US Geological Survey map, with a state locator inset map. The extent should be at least 10 miles from the project boundary.

Project Area and Facilities. Provide a project area map with an aerial photograph dated within the last 3 years as the basemap. Include:

- Boundaries of the project area, including rights-of-way and route widths for transmission lines
- Location of the proposed project components: transmission line routes, solar panels, wind turbines, and Battery Energy Storage Systems
    - Large transmission line routes should be submitted as a map series at a scale small enough to see sensitive sites such as residents, not to extend more than 2 miles from the route width. Many miles of transmission line may require a large map series. Map series should include an inset map on each map to indicate where the current map is located within the larger project route.
- Location of any new substation facilities or existing substation expansions
- Location of collector circuits, access roads, interconnection facilities, and laydown yards
- All local, state, US highways, and interstates clearly shown

Maps should include existing local infrastructure such as electric transmission and distribution lines and pipelines. Label residences, airports and private air strips, municipalities, recreational lands, and major waterbodies. If new residences, subdivisions, commercial or industrial facilities have been built since the date of the aerial photo base map, label those features accurately on the project area map.

Public Land Ownership and Recreation. Map all publicly owned lands inside the project boundary and within 5 miles of the project area (e.g., parks, trails, national/county/state forests, etc.).

Land Cover. Provide land cover for the project and surrounding areas Staff recommends that applicants use the National Land Cover to allow comparison between facilities because the underlying data is updated more frequently than some alternatives**.**

Zoning. Include local zoning in the project area and adjacent to the project boundary, including urban growth boundaries.

Topographic. Provide US Geological Survey-based topographic maps showing all project components. The topographic extent should extend no less than 2 miles out from the project boundary.

Floodplains. Include a map of the project and floodplains as established by the Federal Emergency Management Agency (FEMA).

Wetlands. Use the National Wetland Inventory dataset for a basemap up to 5 miles from the project boundary and show the site and all connecting facilities (roads, collector circuits, etc.) without obscuring map details; or create a wetlands map based on field delineations conducted for the project that shows resources within the project boundary.

Surface Waters. Map all surface waters within the project area and one-half mile from the project boundary.

Unique Natural Features. Show DNR MBS sites with their classifications, native plant communities, and calcareous fens near the project site boundary.

Soils. Provide soils within the project area grouped by soil association near the project site boundary.

Land Ownership and Parcel Boundaries. Land ownership maps extending one-half mile outside the project boundary should show ownership, roads, and municipal boundaries. Parcel boundary maps should be provided for site permit projects and short transmission lines. Labeling residents in the legend for long transmission lines is sufficient. Parcel maps should be based on the most recent data available and include corrections to reflect accurate ownership. If a tribal boundary is nearby, the tribe should be consulted to ensure the data within their boundaries is accurate.