



# State Plane Coordinate System of 2022 SPCS2022 Zone Design Submittal Form

This form is used to submit a complete design set for a single SPCS2022 zone layer in one state (as well as specific U.S. territories and the District of Columbia).

- Before using this form, a proposal must be submitted to NGS for review, using the *SPCS2022 Zone Request and Proposal Form*, available at <https://geodesy.noaa.gov/SPCS/policy.shtml>.
- The design proposal must have been approved by NGS prior to this submittal.
- A maximum of three layers may exist (one statewide zone is required, plus up to two additional multiple-zone layers). A separate proposal and design form must be submitted for each layer.
- Please download and complete the form electronically. Save and email the completed form to [NGS.SPCS@noaa.gov](mailto:NGS.SPCS@noaa.gov), along with the zone parameters file and the zone extents file (described in items #9 and #10). See page 4 for additional guidance.
- The submittal deadline is **March 31, 2021**.

Refer to SPCS2022 Policy and Procedures for additional information:

<https://geodesy.noaa.gov/INFO/Policy/files/SPCS2022-Policy.pdf>  
<https://geodesy.noaa.gov/INFO/Policy/files/SPCS2022-Procedures.pdf>

1. Select the U.S. state, territory, or federal district:

2. Date of proposal:  Date NGS approval was received:

3. Primary point of contact (preferably same as shown on the submitted proposal form).

*Organization name and postal address:*

First name:	<input type="text"/>	<input type="text"/>
Last name:	<input type="text"/>	
Job title:	<input type="text"/>	
Email:	<input type="text"/>	
Phone:	<input type="text"/>	

Point of contact for long-term technical support of submitted design (if different than above).

*Organization name and postal address:*

First name:	<input type="text"/>	<input type="text"/>
Last name:	<input type="text"/>	
Job title:	<input type="text"/>	
Email:	<input type="text"/>	
Phone:	<input type="text"/>	

4. Stakeholder organizations that endorse the design (if more than eight, list additional ones in item #11):

1	<input type="text"/>	5	<input type="text"/>
2	<input type="text"/>	6	<input type="text"/>
3	<input type="text"/>	7	<input type="text"/>
4	<input type="text"/>	8	<input type="text"/>

5. Select linear distortion design criterion, as submitted in proposal (parts per million):



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6. SPCS2022 zone design checklist (see SPCS2022 Policy and Procedures for additional details). An answer of "No" to any item below requires an exception from the NGS Director (and an entry in item #7).

**Yes No**

All zones are designed to minimize linear distortion at the topographic surface.

All zones have a unique combination of origin latitude, origin longitude, and projection axis scale (i.e., the set of three values cannot be repeated for any zones).

False northing and easting specified in meters, evenly divisible by 1000 m, for all zones.

Coordinates for all zones differ by at least 10,000 m horizontally from previous versions of SPCS, UTM, and other SPCS2022 zone layers covering the same geographic region (*if coordinates for NGS-designed zones are not yet known, contact [NGS.SPCS@noaa.gov](mailto:NGS.SPCS@noaa.gov)*).

The extent of each zone is defined by one closed polygon that does not overlap other zones.

Zone width (evaluated as the length of the short side of a rectangle that completely encloses the zone extents). Only choose "Yes" if BOTH of the following are true for all zones. *Note that the width is for a rectangle in the same projected coordinate system as the zone:*

At least 50 km for all zones with a topographic height range of 250 m or less.

At least 10 km for all zones with a topographic height range of more than 250 m.

Projection axis scale specified to 6 decimal places or less for all zones.

Latitude and longitude parameters specified to nearest whole arc-minute for all zones.

Longitude parameters are positive east (0° to 360°) for all zones.

Northing and easting coordinates are positive everywhere in all zones.

Standardized definitions for specific projection types (only choose "Yes" if ALL of the following are true for all projection definitions in this submittal):

LCC. 1-parallel definition where central parallel is also the latitude of grid origin.

TM. False northing is zero and grid origin latitude arc-minutes are evenly divisible by 3.

OM. "Local" ("center") definition where false northing and easting, scale, and skew axis azimuth are specified at the local (center) origin, and the skew azimuth is positive clockwise and given to nearest whole degree within the range of  $\pm(5^\circ \text{ to } 85^\circ)$ .

Zone names and abbreviations are unique in the state. Names do not exceed 50 characters, including spaces and special characters (but excluding the state name and the word "Zone"). Special characters are limited to hyphens or dashes (-) and underscores (\_). Abbreviations are 1-4 alphanumeric characters with no spaces or special characters.

7. If an answer of "No" was given for any of the above items, please provide the reason(s) for requesting an exception. *Note that exceptions are evaluated on a case-by-case basis and are not guaranteed.*



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8. Enter number of zones for each projection type:
- |                      |                               |                      |  |
|----------------------|-------------------------------|----------------------|--|
| <input type="text"/> | Lambert Conformal Conic (LCC) | <input type="text"/> | Oblique Mercator (OM)  |
| <input type="text"/> | Transverse Mercator (TM)      | <input type="text"/> | <b>Total number of zones</b> ( <i>automatically calculated</i> ) |

9. Enter zone parameters file name:

Microsoft *Excel* (\*.xlsx) format preferred, but can be any tabular format readable by *Excel*. The file should contain all parameters needed to fully identify and define the projection, as well as test values for computation validation. All values must be provided as exact or at sufficient numerical significance:

- Latitude and longitude in decimal degrees with repeating decimals to at least 12 decimal places.
- Computed test point northing and easting values to at least four decimal places (0.0001 meter).
- Computed test point linear distortion in parts per million (ppm) to at least three decimal places and computed using the geometric mean (Gaussian) radius of curvature.
- Computed projected coordinates and linear distortion must be based on the GRS 80 ellipsoid.

The following defining parameters and test values are required for every zone. All fields should be clearly identified with column headings or labels (see last page of this form for additional guidance).

- |   |   |
|---|---|
| 1. Zone number (sequential starting with 1)         | 9. False northing (meters)                      |
| 2. Zone name (50 characters maximum)                | 10. False easting (meters)                      |
| 3. Zone abbreviation (1-4 characters)               | 11. Test input latitude (decimal degrees)       |
| 4. Projection type (LCC, TM, or OM)                 | 12. Test input longitude (decimal degrees)      |
| 5. Origin latitude (deg-min and/or decimal deg)     | 13. Test input ellipsoid height (meters)        |
| 6. Origin longitude (deg-min and/or decimal deg)    | 14. Test output computed northing (meters)      |
| 7. Projection axis scale (6 decimal places or less) | 15. Test output computed easting (meters)       |
| 8. Skew axis azimuth (degrees), <i>for OM only</i>  | 16. Test point computed linear distortion (ppm) |

10. Enter zone extents file name:

Gives the geographic coverage area for the submitted zone design that can be a geometry file set compressed into a single zip file archive (\*.zip). Shapefile format is recommended, but KML/KMZ, and DXF/DWG are acceptable. Each zone may be in its own file set or merged into a single file set, but if merged there must be one record per zone that includes at least the zone number. Geometry files are preferred, but zones that can be adequately defined with a box can be submitted as a table or list of latitude and longitude bounds for each zone. See the last page of this form for additional guidance.

11. Please provide additional relevant characteristics or other information to accompany the submitted SPCS2022 zone designs, if any:

12. As the primary point of contact for the listed stakeholder groups, I affirm that this submittal accurately represents their wishes for the U.S. state, territory, or federal district identified herein.

Date:



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***Additional guidance on completing this form***

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Download and complete the form electronically using Adobe Reader (version 8 or later) or Acrobat (version 9 or later). Reader is available free of charge at <https://get.adobe.com/reader/otherversions/>.

**Deadline of March 31, 2021.** The deadline is for including submitted zone designs in the initial release of SPCS2022. After the deadline, submitted designs will be for *modifications* to SPCS2022, and this form will be updated to reflect that change.

**Items 1 and 2.** Assumed self-explanatory.

**Item 3.** The point of contact for long-term technical support is the person to whom NGS will redirect technical questions about the zone layer. Therefore it should be a position that will have at least one person assigned to it over the entire operational life of the zone design. Because of the long-term nature of this contact, ideally it is a permanent position within one of the stakeholder organizations for the state, preferably one that endorses the design as listed on this form.

**Items 4-8 and 11-12.** Assumed self-explanatory.

**Item 9.** For the zone parameters file, please note the following:

- Zone test points should be located within the zone. Computed zone centroids can be used, and the ellipsoid height should be accurate to  $\pm 5$  meters or better.
- For each zone test point, computed projected coordinates and linear distortion should be based on exactly the same values as provided for input latitude, longitude, and ellipsoid height. *Exact* input values at about 1 meter resolution are recommended (i.e., five decimal places in decimal degrees for latitude and longitude, with ellipsoid heights to the nearest meter).
- The test point projected coordinates and linear distortion must be computed using the GRS 80 ellipsoid directly from the latitude, longitude, and ellipsoid height values exactly as provided.
- Additional information can be provided in the file, as long as all required information is present (e.g., a list of county names included in a zone that consists of aggregated county boundaries).

**Item 10.** For the zone extents file, please note the following:

- Geometry files must be in geographic (latitude, longitude) coordinates in decimal degrees and the datum must be specified (they should *not* be projected). Preference is for any realization of the North American Datum of 1983 (NAD 83), but any version of International Terrestrial Reference Frame (ITRF) or World Geodetic System of 1984 (WGS 84) will suffice. Each zone must be defined by a single closed polygon that cannot overlap any other zone polygons, but there can be gaps between polygons. Holes within polygons are permitted, but their use should be minimized. NGS may edit the geometry to ensure it fits within the overall SPCS2022 scheme, but the intended extents will be honored.
- If a table or list of zone boundaries is used rather than geometry files, it must give minimum and maximum latitude and longitude for each zone to at least the nearest arc-second or  $0.001^\circ$ . The bounding box must include the entire zone extents but cannot overlap any other zones.

Examples of completed forms are available at <ftp://www.ngs.noaa.gov/pub/SPCS/ExampleForms/>.

*If you have questions about completing this form, please contact [NGS.SPCS@noaa.gov](mailto:NGS.SPCS@noaa.gov).*