Working with Virginia Geographic Information Network (VGIN) GIS Services

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Introduction

Services are a growing technology for sharing, accessing, using, and even extracting spatial data. Map, image, and feature services allow you to add data hosted on someone else's GIS server resources into your web map or desktop map. As functionality changes are made in geospatial data storage and sharing, there can be a bit of a learning curve. Using services and downloading data from feature services can be different from how many people learned GIS, where the emphasis was on "downloading the data" and working with it locally.

The purpose of this document is to smooth out these learning curves by providing an overview of terms, technical tips for accessing VGIN data, and documenting the steps of connecting to services and copying features out of feature services in both ArcGIS Pro and ArcGIS Desktop ArcMap.

Overview of GIS Web Services

For several years the Virginia Geographic Information Network (VGIN) Virginia GIS Clearinghouse (https://vgin.maps.arcgis.com/home/index.html) has made available data not only as downloads, but also as services. There are several types of services, map services, image services, feature services, and geoprocessing services. Each of these serves a different purpose and is a different online data type. Regardless of the source or type, as you pull data from map, image, or feature services into your maps or analyses, they stay up-to-date as the host makes changes to the dataset.

Map services, like traditional cached basemaps and imagery, only allow you to access and view spatial data. This allows the creator to control the data & symbology while sharing it publicly with others. This data can be helpful to the end user to provide context in their own maps without having to recreate a wheel. Raster or basemap versions of these services are often cached to display at certain pre-set scales. A VGIN example is the Most Recent Imagery service.

Image services allow users to not only view imagery, but filter, symbolize, and analyze hosted raster data. Image services involve a server extension and are not as common, but are a powerful way to make the full capability of imagery widely available. Esri's Living Atlas (https://livingatlas.arcgis.com/en/home/) contains services of this type.

Feature services, depending on security and options set when they are published, can allow you to query or perform analysis on the data and symbolize it to work with your other map layers or your own data. VGIN generally makes their feature services open access, however you can't edit the data on our servers. Using "copy feature layers" geoprocessing functionality, feature services offer a way to make local copies of data that may change frequently. VGIN examples include address points, road centerlines, and much of the NG9-1-1 data.

Geoprocessing services are GIS tools that are built and published as services. Some of these are part of the standard ArcGIS Server installation, such as geometry and print services. However the possibilities are endless for what tools you can publish and make available. A VGIN example is the geocoding service.

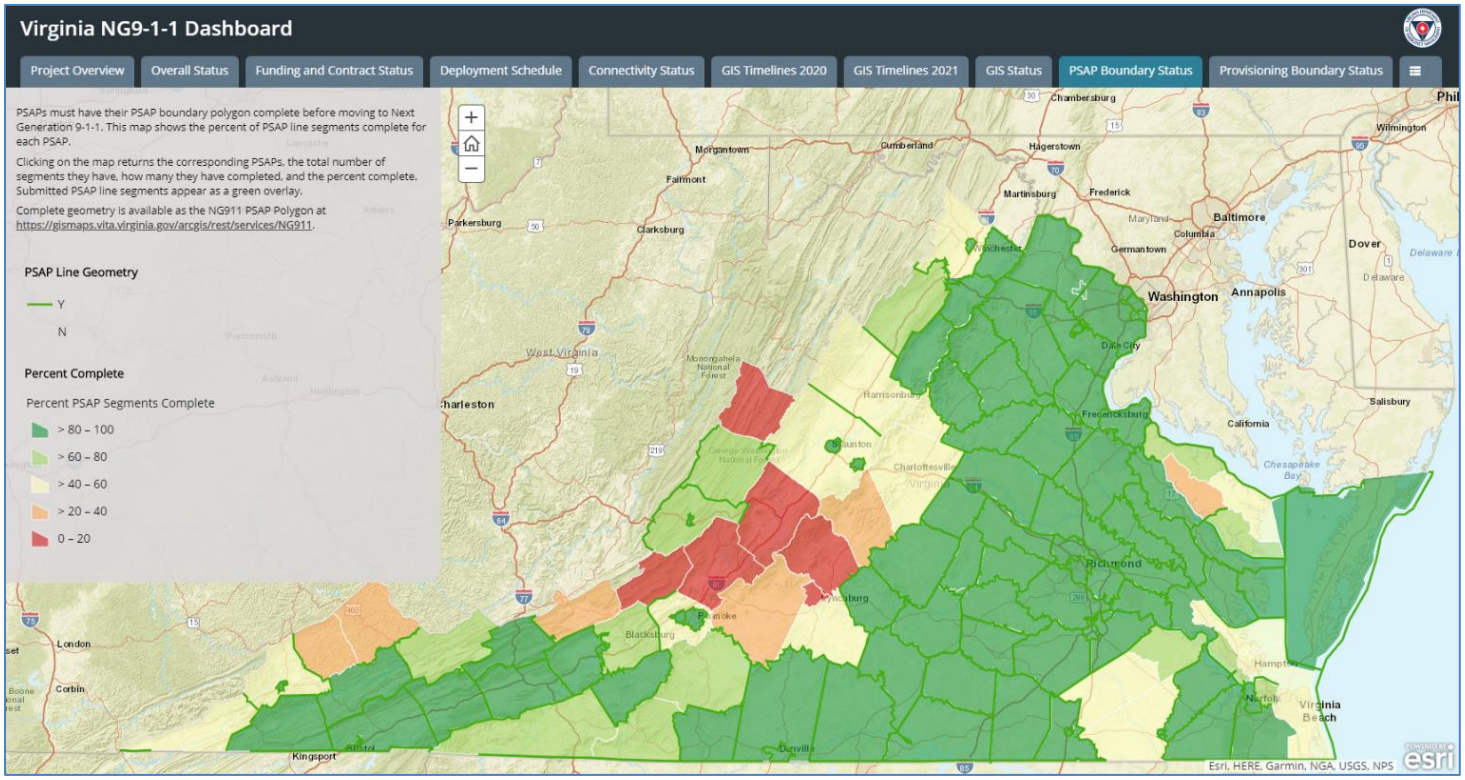
Beyond traditional ArcGIS servers, you can also host, publish, and access many of these types of services from ArcGIS Online.

VGIN's Clearinghouse Services page (https://vgin.maps.arcgis.com/apps/PublicGallery/index.html?appid=222ccae285054a47a0ea5610eca4e54d) describes the services available, linking to the services on VGIN's ArcGIS Server (https://gismaps.vita.virginia.gov/arcgis/rest/services).

Feature Services and NG9-1-1 (An Example)

The examples describe feature services related to Virginia's NG9-1-1 deployment, but the steps apply to connecting to any GIS publishing services and copying features from feature services which have this functionality enabled.

As part of the NG9-1-1 Deployment, VGIN receives line segment data from 9-1-1 Public Safety Answering Points (PSAPs) and localities across the commonwealth. These data reflect mutual agreement with neighbors about boundaries for geospatial call routing to PSAPs and boundaries for "provisioning" GIS data into the NG9-1-1 spatial interface. VGIN reviews these lines for mutual agreement, attribution, geometry, and fit within lines received from others. These are updated weekly and are used to create the PSAP polygon and provisioning polygons for Virginia, the same geometry you see on the Virginia NG9-1-1 Dashboard. The example below shows the completed PSAP line geometry from a feature service as a green line. This development method insures PSAP and GIS coverage will be complete with no gaps or overlaps.



NG9-1-1 PSAP and provisioning boundary data sometimes changes quickly and frequently as Virginia moves towards Commonwealth-wide NG9-1-1 deployment. In an effort to quickly and efficiently distribute one version of the data, VGIN shares these NG9-1-1 layers as feature services from an ArcGIS Server. The full listing of Virginia NG9-1-1 services is shown in the image below.

ArcGIS REST Services Directory

Home > services > NG911

JSON | SOAP

Folder: NG911

Current Version: 10.21

View Footprints In: ArcGIS.com Map

Services:

- NG911/NG911_Deployment (FeatureServer)
- NG911/NG911_Deployment (MapServer)
- NG911/NG911_Provisioning_Line_Geometry (FeatureServer)
- NG911/NG911_Provisioning_Line_Geometry (MapServer)
- NG911/NG911_Provisioning_Line_Junction (FeatureServer)
- NG911/NG911_Provisioning_Line_Junction (MapServer)
- NG911/NG911_PSAP_Line_Geometry (FeatureServer)
- NG911/NG911_PSAP_Line_Geometry (MapServer)
- NG911/NG911_PSAP_Line_Junction (FeatureServer)
- NG911/NG911_PSAP_Line_Junction (MapServer)
- NG911/NG911_PSAP_Telco (MapServer)
- NG911/NG911_VA_StatePlaneNorth_NAD83_Provisioning_Polygon (FeatureServer)
- NG911/NG911_VA_StatePlaneNorth_NAD83_Provisioning_Polygon (MapServer)
- NG911/NG911_VA_StatePlaneNorth_NAD83_PSAP_Polygon (FeatureServer)
- NG911/NG911_VA_StatePlaneNorth_NAD83_PSAP_Polygon (MapServer)
- NG911/NG911_VA_StatePlaneNorth_NAD83_RCLSnapToPoint (FeatureServer)
- NG911/NG911_VA_StatePlaneNorth_NAD83_RCLSnapToPoint (MapServer)
- NG911/NG911_VA_StatePlaneSouth_NAD83_Provisioning_Polygon (FeatureServer)
- NG911/NG911_VA_StatePlaneSouth_NAD83_Provisioning_Polygon (MapServer)
- NG911/NG911_VA_StatePlaneSouth_NAD83_PSAP_Polygon (FeatureServer)
- NG911/NG911_VA_StatePlaneSouth_NAD83_PSAP_Polygon (MapServer)
- NG911/NG911_VA_StatePlaneSouth_NAD83_RCLSnapToPoint (FeatureServer)
- NG911/NG911_VA_StatePlaneSouth_NAD83_RCLSnapToPoint (MapServer)
- NG911/NG911_VITA_ISP_Locality_Profile (FeatureServer)
- NG911/NG911_VITA_ISP_Locality_Profile (MapServer)

Supported Interfaces: REST SOAP Sitemap Geo Sitemap

This guide uses the NG911 project as an example of how to connect to VGIN's ArcGIS Server (https://gismaps.vita.virginia.gov/arcgis/rest/services) and download copies of these data to your local environment in ArcGIS Desktop and ArcGIS Pro.

Virginia's 9-1-1 & Geospatial Services Bureau recommends uploading your required NG9-1-1 GIS data layers stack in your local coordinate system (projection and datum). As such, polygon features are available in:

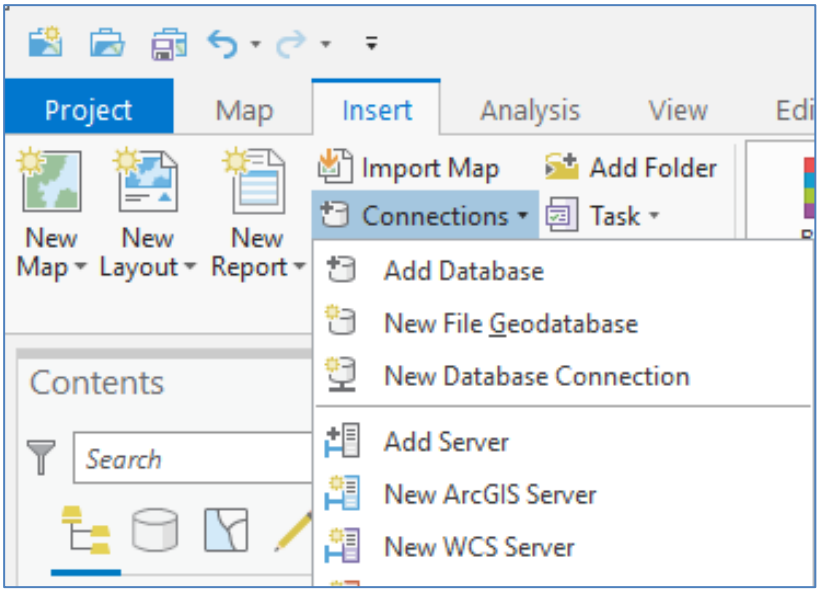
- Virginia State Plane North NAD 1983 (WKID 2283; EPSG) FIPS 4501 Feet
- Virginia State Plane South NAD 1983 (WKID 2284; EPSG) FIPS 4502 Feet

NG9-1-1 systems require all of the GIS data layers you upload to be submitted in the same coordinate system and will transform it to match the WGS 1984 required by NG9-1-1 systems.

(Note to Data Uploaders for NG911: If you locally use a datum other than NAD 1983, such as NAD 1983 (2011) or NAD 1983 HARN, please let us know by contacting us at: NG911GIS@vdem.virginia.gov.)

As the VGIN-hosted provisioning boundary is built from the submitted and mutually agreed to lines from all Virginia localities, your best point of departure for your provisioning boundary polygon when uploading to a NG9-1-1 spatial interface, such as EGDMS, is the polygon from the appropriate coordinate system feature service. You should use this polygon as the cookie cutter to clip the PSAP polygons that fall within your provisioning boundary. See the discussion in part 2 of the GIS Recommendations document for more detail and discussion of these workflows. Contact NG911GIS@vdem.virginia.gov for assistance or support.

Connecting to Services in ArcGIS Pro



1. Open ArcGIS Pro and begin a project.

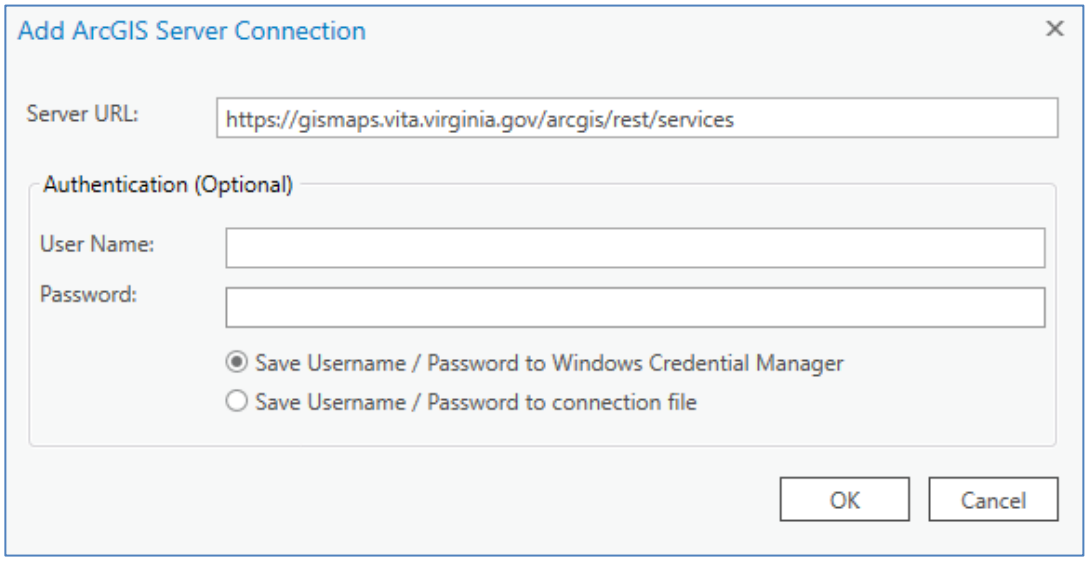
2. On the Insert tab, select the Connections drop-down and select New ArcGIS Server.

3. In the next box, enter/copy and paste in the VGIN rest services url for Server

URL: https://gismaps.vita.virginia.gov/arcgis/rest/services

As this is a public-facing server, no authentication is needed.

Click Ok



Open the Catalog pane and expand the new Servers folder that is now in your project. The new connection will show as an ArcGIS server with the path name and you can expand and navigate the services offered.

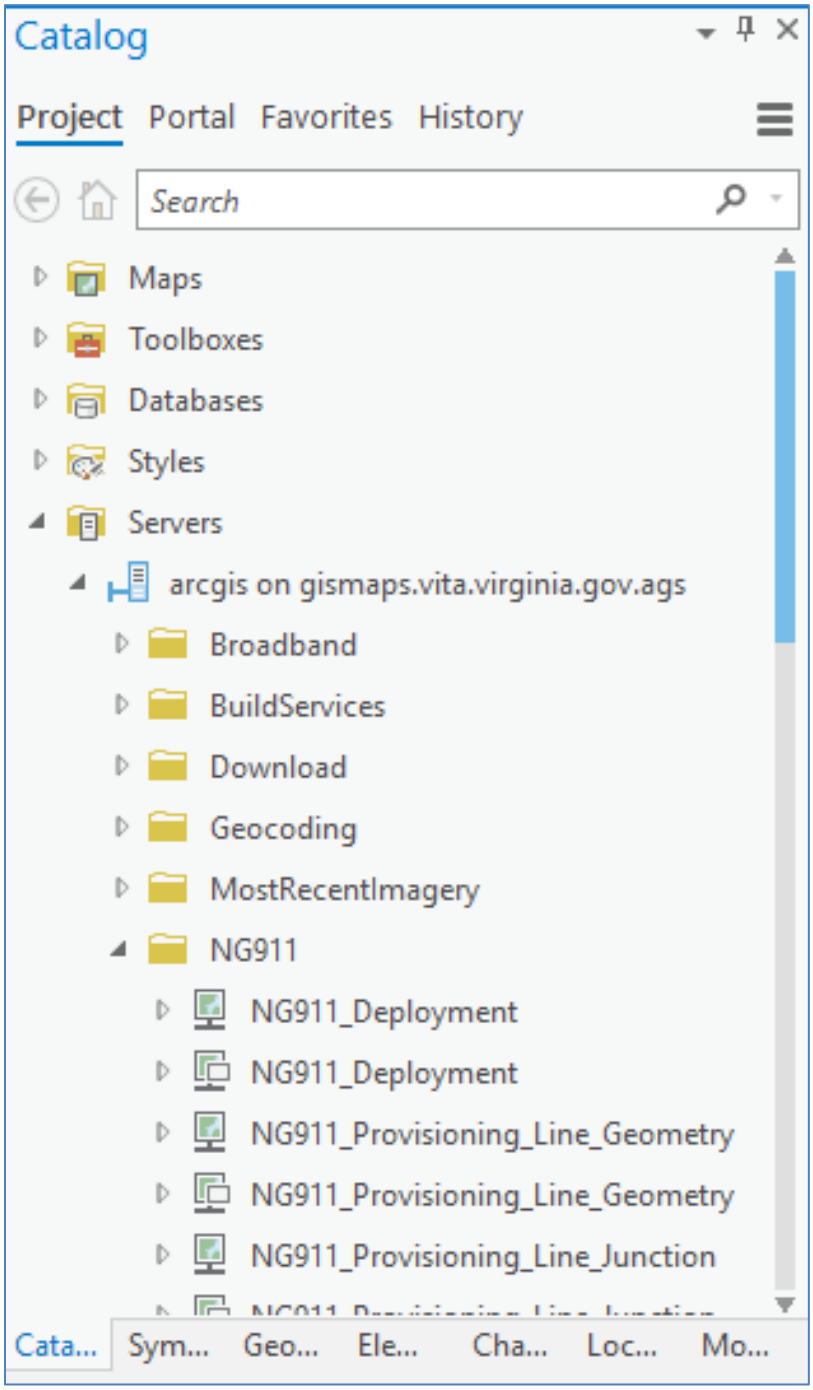
Let's examine the NG911 folder.

The "feature services" are denoted in the contents section under file type or if you click on one in the catalog tree you will see in the Contents pane the file type of "Feature Service." This means that you can select them, add them to your map, use them in geoprocessing tools, and change how they appear through symbology.

Often a matching "Map service" also appears in the Catalog Tree or Contents. Map services tend to load more quickly into desktop environments. However, you cannot select map service elements, use them in tools, or change how they appear.

Once you are connected, you can drag and drop services into your map, or add them through Map → Add Data.

You can also right click and either select to "Add to new projects" or "Favorite" this server connection so that it may be quickly added to other Projects in ArcGIS Pro without having to repeat the steps above.

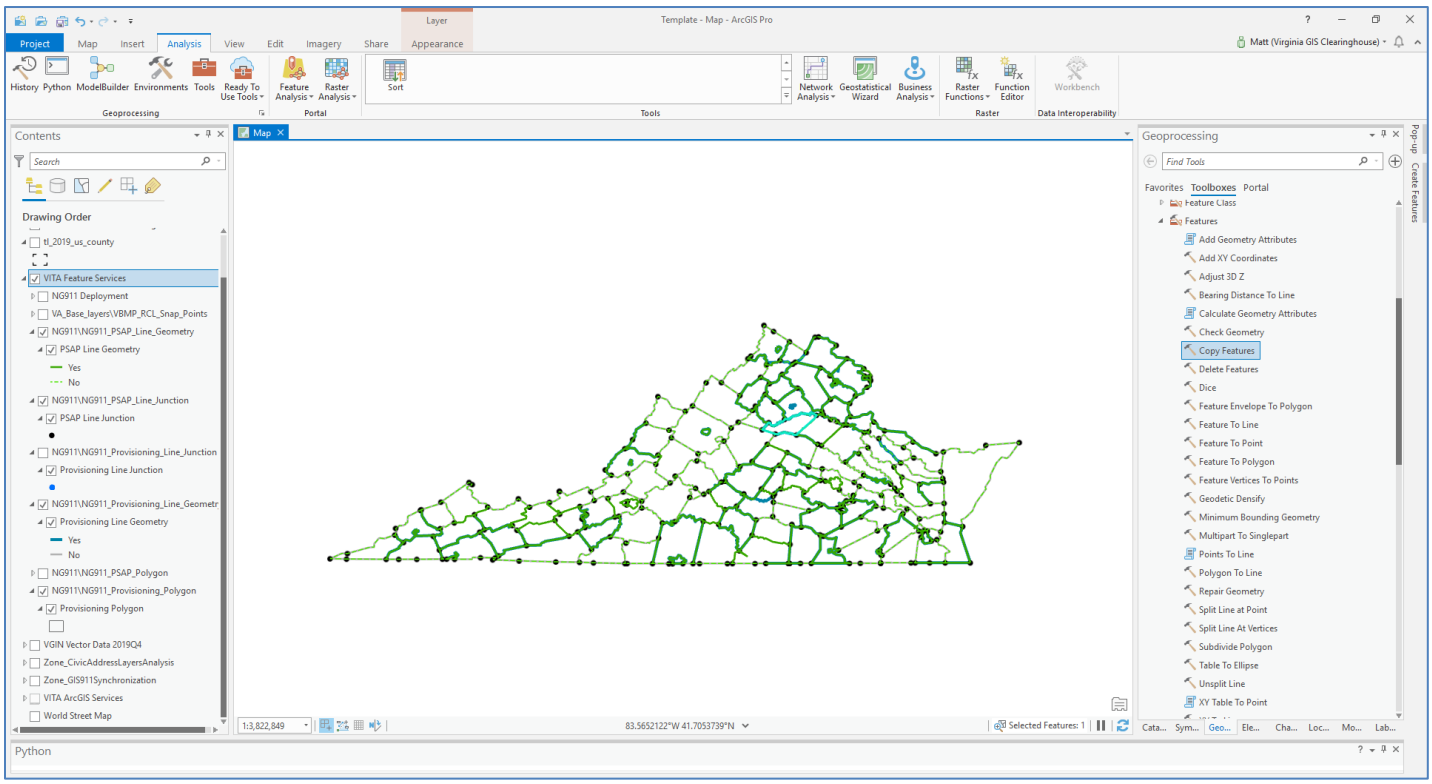


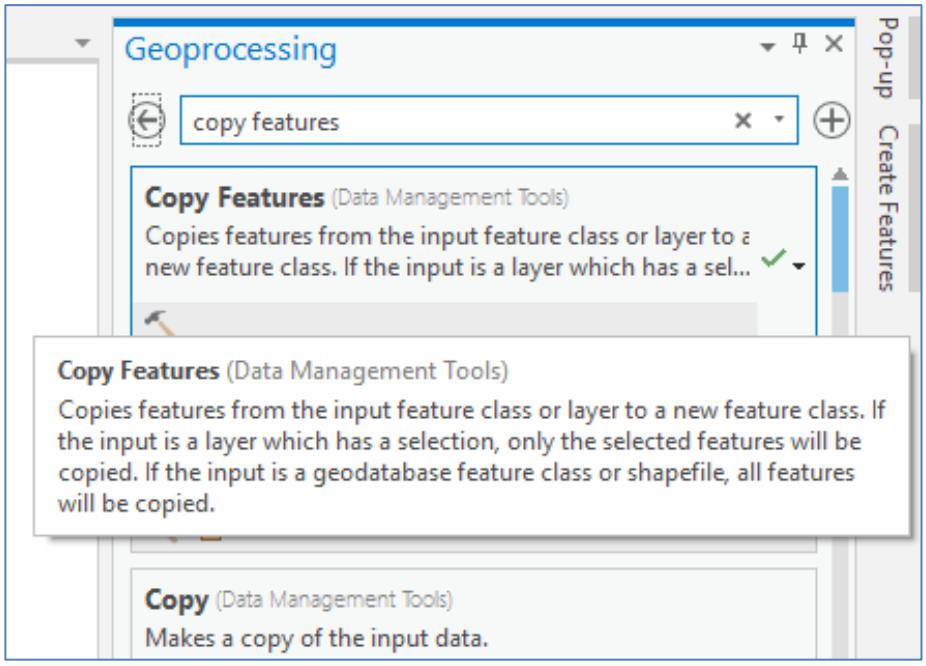
Copying Data from a Feature Services using ArcGIS Pro

Using geoprocessing tools is the primary way to turn feature services in to a locally stored feature class in a file geodatabase or shapefile copy on your C:\ drive or network drive using ArcGIS Pro, as the "right-click → Data → Export Data" method is not supported for Feature services.

The following tool works best if you copy the entire dataset, then only work with the features that you need (i.e. select and export the ones you want to work with). It may work if you select one feature of interest interactively in the map, then run the tool to export only that feature to a local copy. Try it both ways and see what you are most comfortable with.

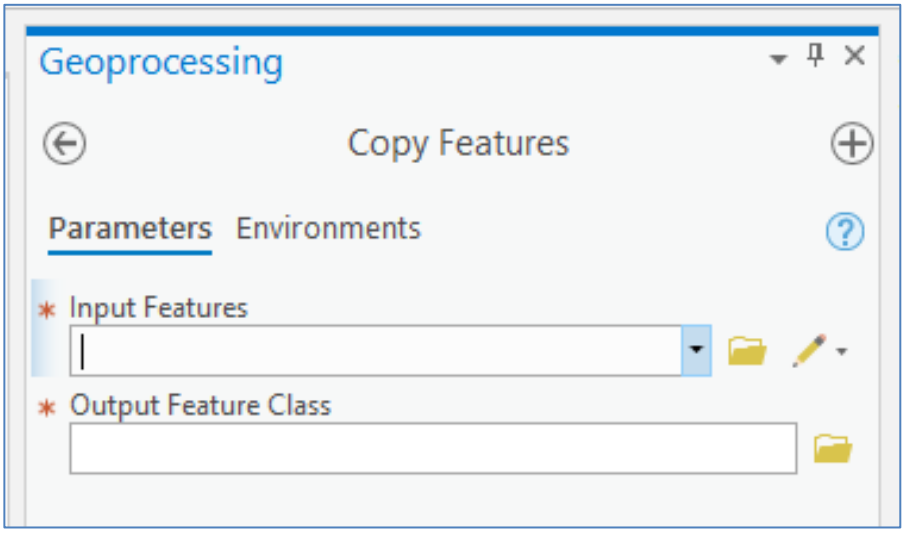
There are two ways to access the Copy Features geoprocessing tool. First, you can go to the Analysis tab and select Tools to open your Geoprocessing Toolboxes. Then, you search for "Copy Features".



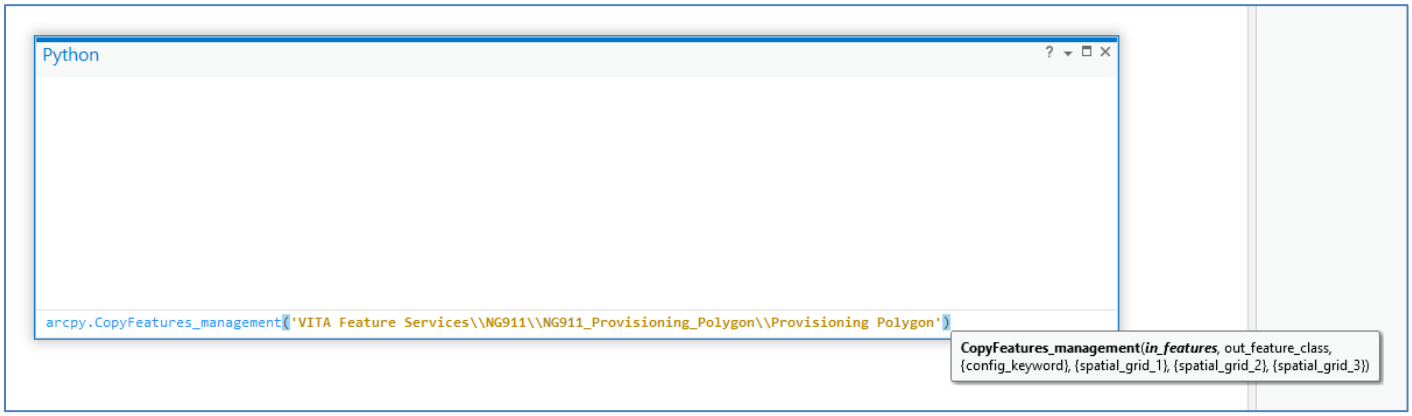


If your Toolbox Pane is already open, you can select Toolboxes, then navigate to Data Management → Features → Copy Features.

Either way, select the tool to open the dialog box. Then, select your input, specify your output, and run the tool.



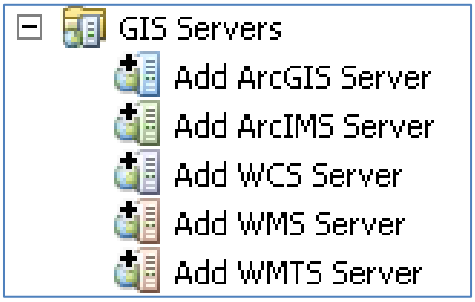
For those who prefer Python, from the Python window, start with arcpy.CopyFeatures_management.



The Python method works best if you have already loaded the feature services into your ArcGIS Pro map.

Connecting to Services in ArcCatalog

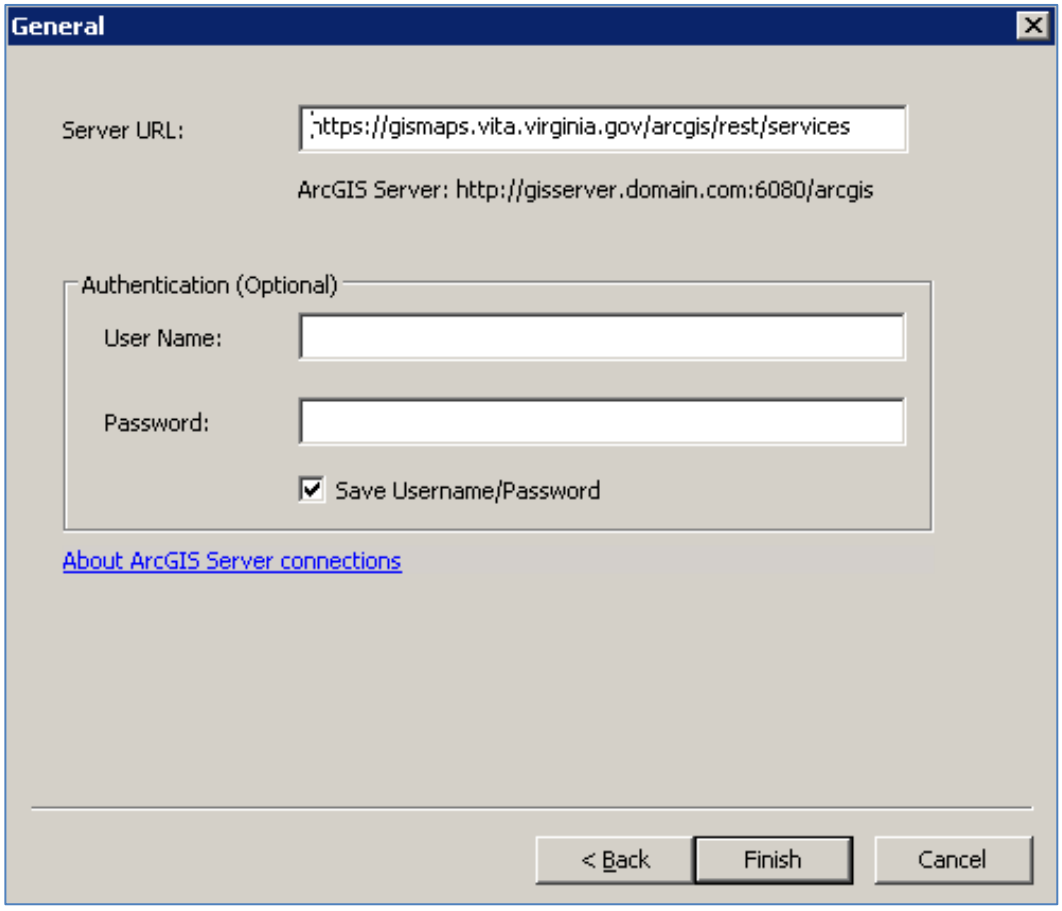
1. Open ArcCatalog and go to the GIS Servers section of the Catalog Tree:



2. Double-click "Add ArcGIS Server"

3. In the new box, leave the option on "Use GIS Services" and click Next

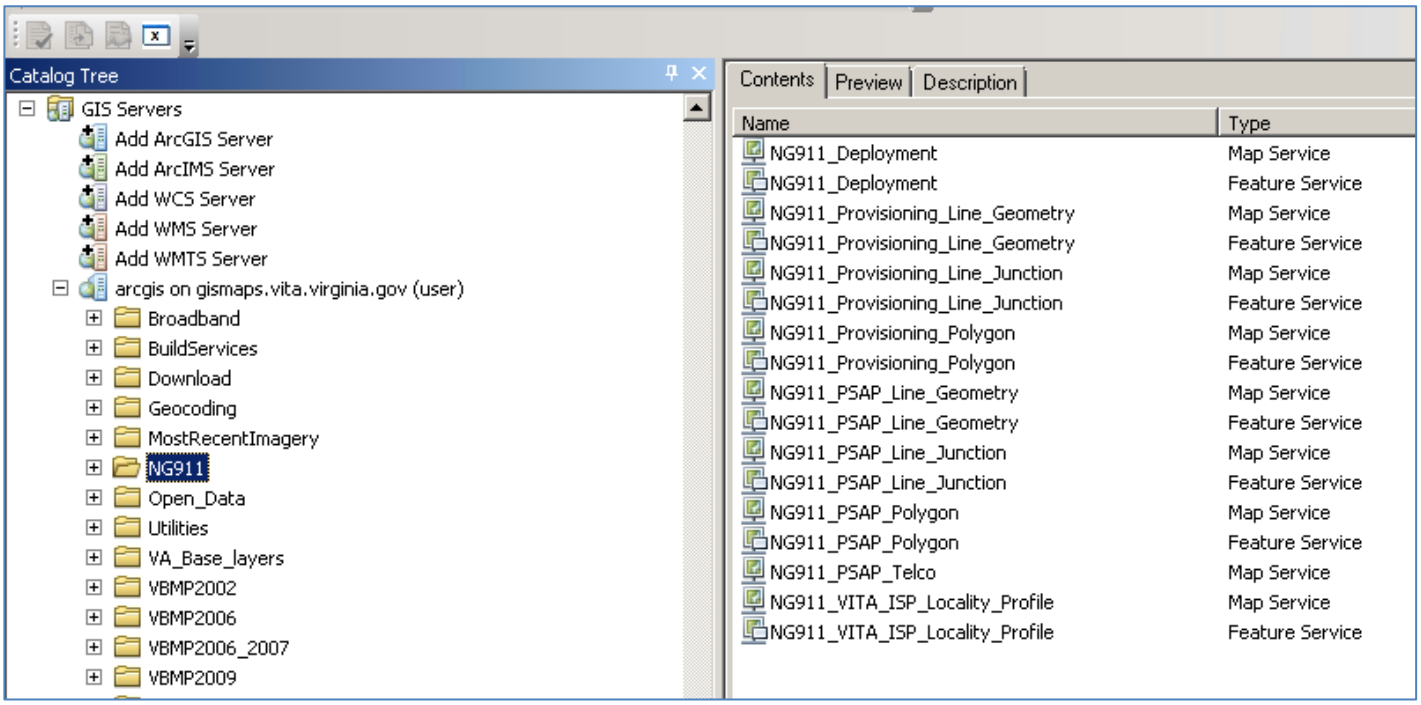
4. In the next box, enter/copy and paste in this url for Server URL: https://gismaps.vita.virginia.gov/arcgis/rest/services



As this is a public-facing server, no authentication is needed.

5. Click Finish. The new connection will now be added to your Catalog Tree. You can expand and navigate the services offered.

Let's examine the NG911 folder. The "feature services" are denoted in the contents section under file type or if you click on one in the catalog tree you will see in the Contents pane the file type of "Feature Service". This means that you can select them, add them to your map, use them in geoprocessing tools, and change how they appear through symbology. Often a matching "Map service" also appears in the Catalog Tree or Contents. Map services tend to load more quickly into desktop environments. However, you cannot select map service elements, use them in tools, or change how they appear.



Once you are connected, you can drag and drop services into your map, or add them through the add data button.

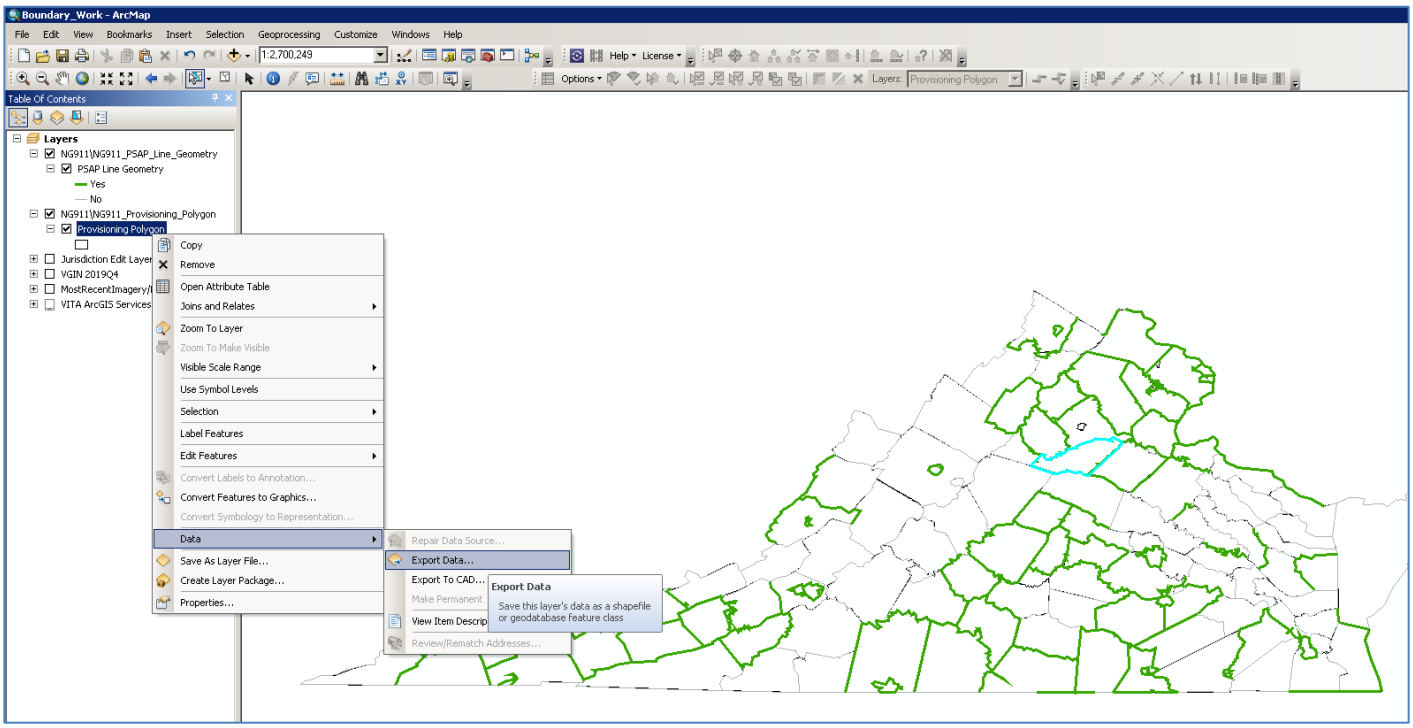
Copying Data from a Feature Service using ArcMap

Using ArcMap, there are two main ways to turn feature services in to a locally stored feature class in a file geodatabase or a shapefile copy on your C:\ drive or network drive.

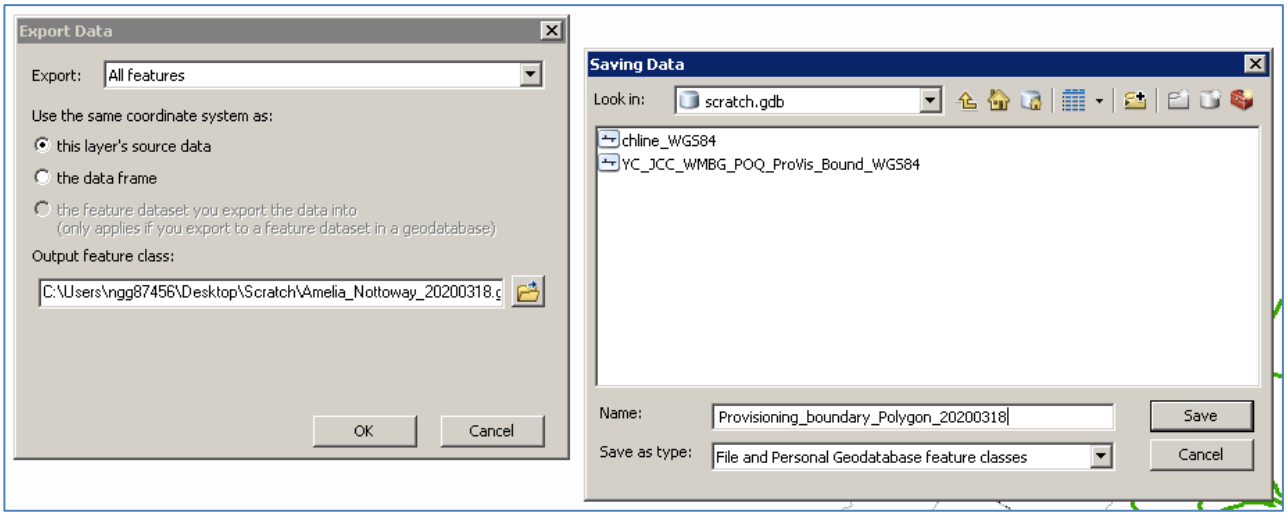
1. The first choice you have is if you want to extract the whole dataset, or only a selection of the dataset. If you want the whole dataset, skip to step 2.

   If you only want a few features, select them interactively, select by attribute, or select by query or select based on another feature (selected features show up in bright blue on the map & in the table). When you move to the next steps, only these features will be copied.

2. For ArcMap users, the easiest way to make the copy locally may be the right-click on the feature service → Data → Select the Export Data option.

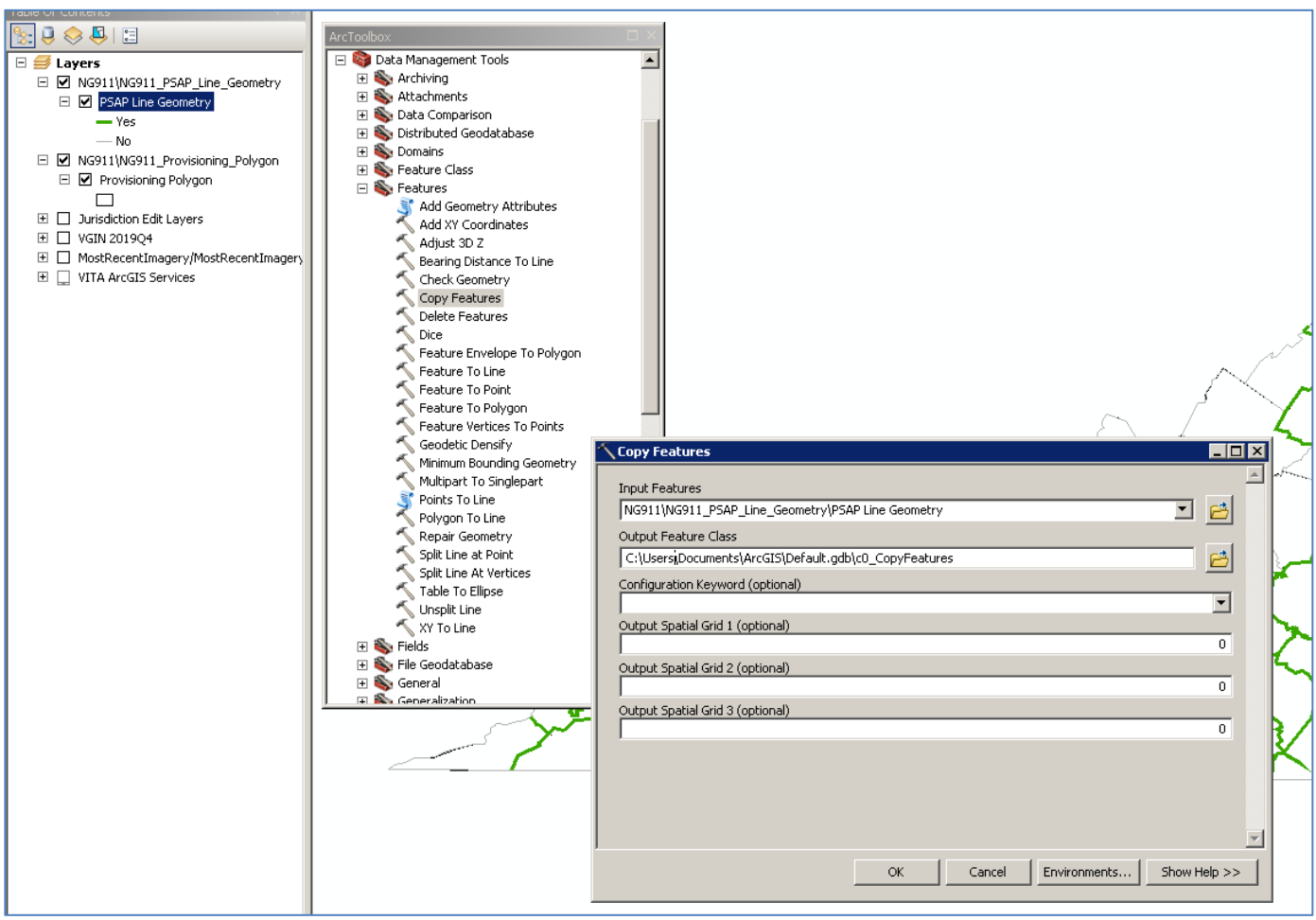


3. Then use the dialog box to choose to save selected or all features and specify the output file location and name.

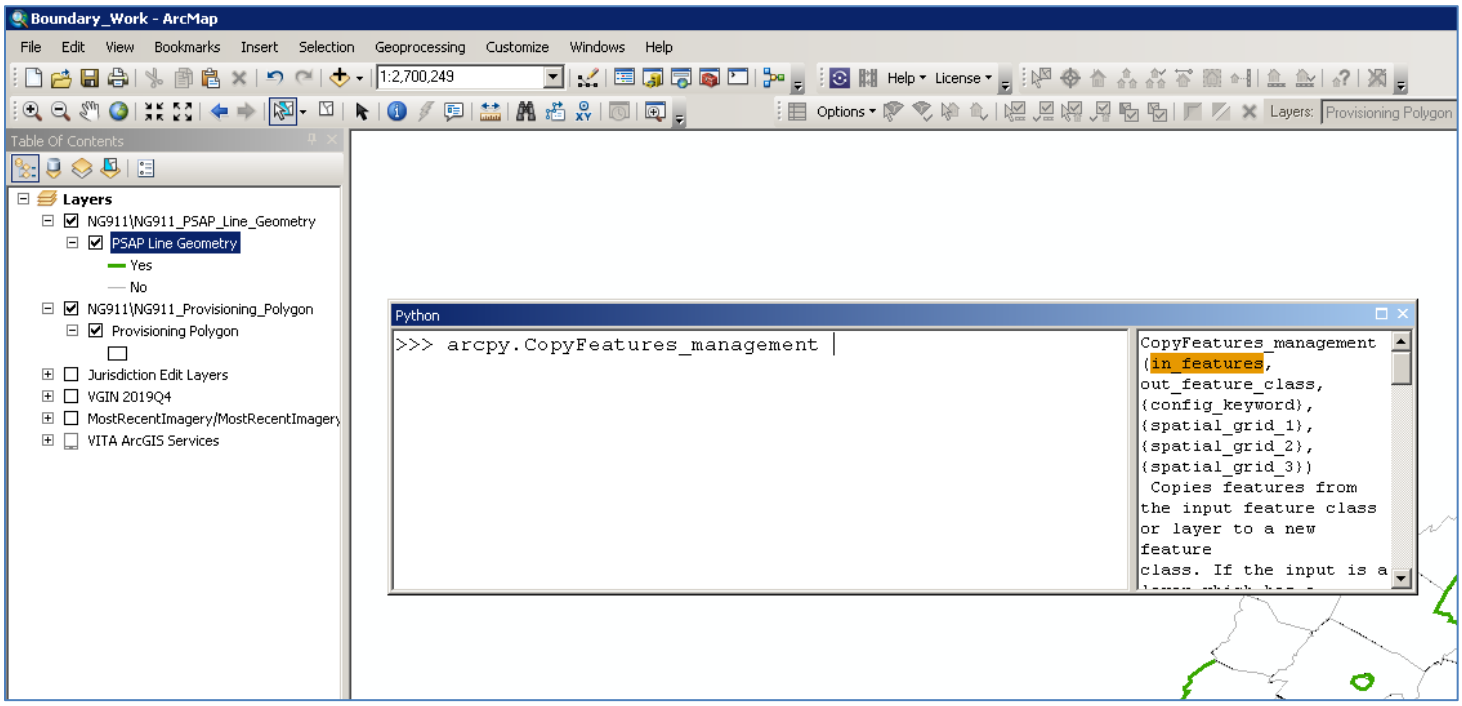


Another option is to use the CopyFeatures geoprocessing tool to make a local copy of the data from the Feature service.

In ArcToolbox, look under Data Management → Features → Copy Features. Run this tool like in the example above by selecting your input, specifying your output, and executing the tool.



For those users who use or want to improve their Python skills, from the Python window, start with arcpy.CopyFeatures_management.

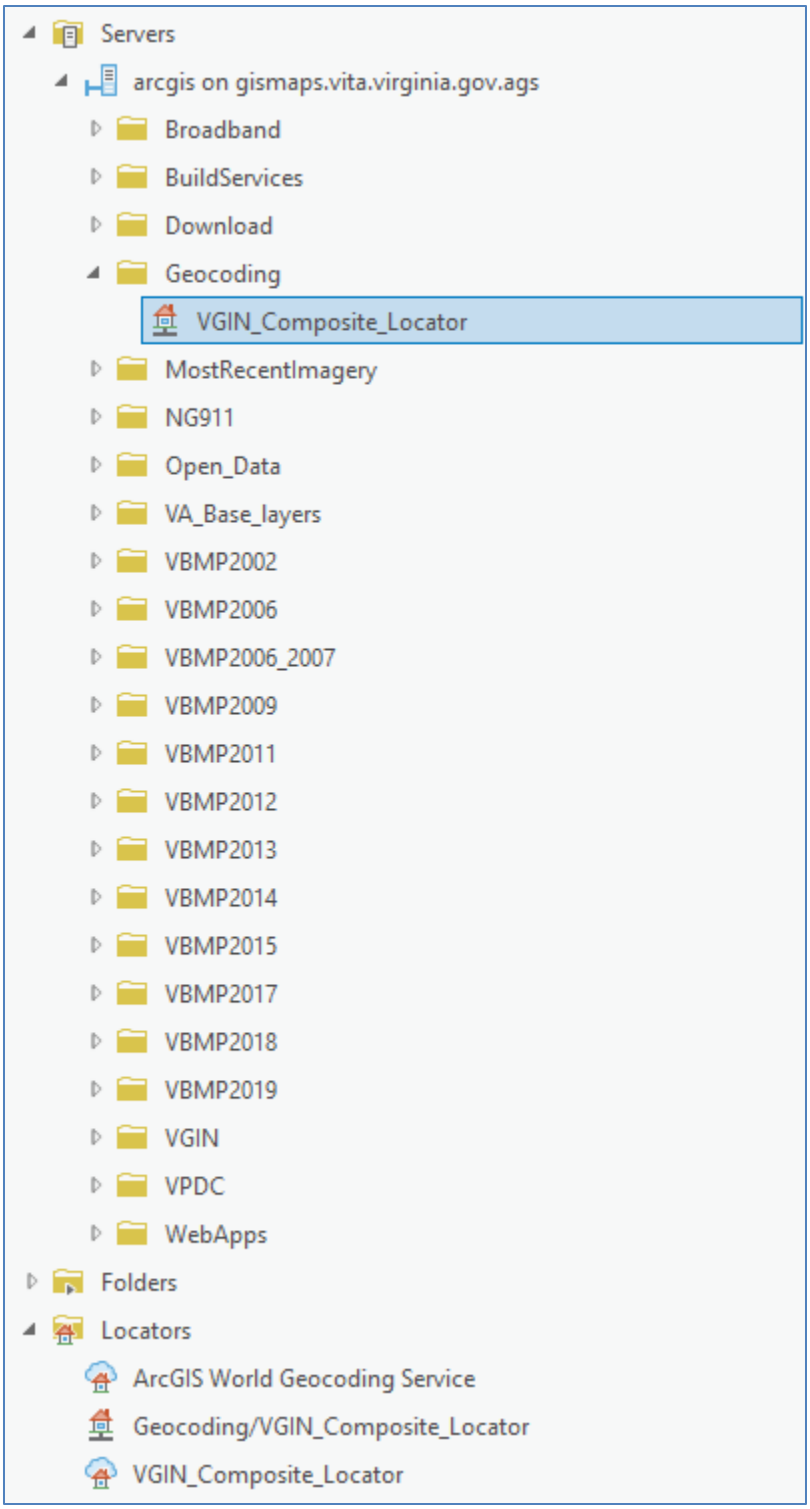


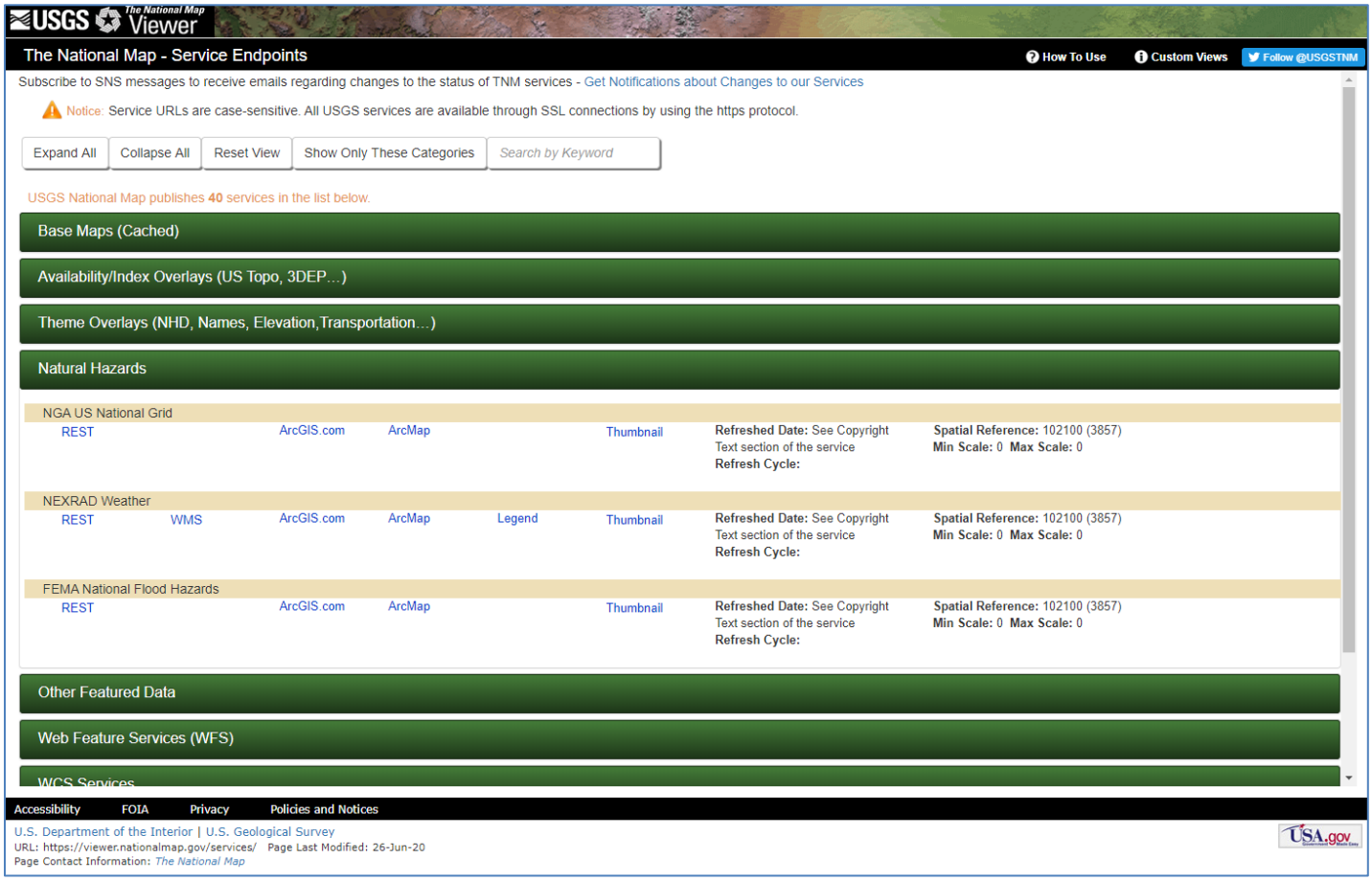
About the VGIN Geocoding Service

As VGIN processes its quarterly releases of road centerline and address point data with updates sourced from Virginia localities, it also updates the Geocoding Service available through the VGIN ArcGIS Server. Unlike the Esri World Geocoder or other geocoding services, this is relatively up to date for the Commonwealth as a whole to a known point it time. If you are geocoding Virginia addresses, this is a good resource to be aware of.

More details on the configuration and use of the geocoding service in ArcMap are available here: https://ftp.vgingis.com/Download/Documentation/VGIN_Geocoding_Service_Overview_and_Access_Instructions.pdf.

Once you connect to the VGIN ArcGIS Server in Arc Pro, you will be able to see and interact with the geocoding service.



Next Steps for Working with Services

Many local, state, federal, and non-governmental agencies and organizations make vector and raster GIS data and tools available as map, feature, image, or geoprocessing services. As datasets get larger, like shaded relief models and imagery, or data changes quickly, like weather radar or hurricane forecast tracks, consider searching for and using data services to keep your storage needs low and data currency up. One of the best documented sites is the USGS National Map at https://viewer.nationalmap.gov/services/.