Master Address Repository (MAR) Geocoder 5.1

User Guide

Office of the Chief Technology Officer

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Overview

Geocoding Defined

Geocoding is the process of assigning a location in the form of geographic coordinates (often expressed as latitude and longitude) to geographic data. This is done by comparing the descriptive geographic data to known geographic locations such as addresses, blocks, intersections or place names. For example, '2500 Q ST N.W.' is geocoded to the actual address of '2500 Q STREET NW' and assigned the XY coordinates of 395476.16, 138058.36.

The Master Address Repository

The Master Address Repository (MAR) is a database of building addresses, intersections, and other location identifiers in the District. Each address in the database has been assigned a unique Address Identification Number (AID), map coordinates, and other useful information.

The MAR acts as a local geographical index. It employs spell checking and lists of street names and street types "aliases" (e.g., MLK Ave) to make locating addresses as easy as possible. In addition to locating addresses, the MAR also helps users find intersections (4th Street NW and D Street NW), blocks (4th Street, NW between D Street and E Street, or the 400 block of 4th Street, NW), place names (One Judiciary Square, also known as 441 4th Street, NW), and condo/apartment units.

Master Address Repository Geocoder

The MAR Geocoder is a desktop application, built by OCTO GIS, that employs the District of Columbia's MAR Web Service (see: Additional Help and Resources). The web service has several built in quality control tools that review records presented and take advantage of several look-up tables for alternative names, abbreviations, misspellings, etc. This ensures that the resulting data adhere to the District's addressing standard. (see: Additional Help and Resources)

The MAR Geocoder is designed to geocode a large number of records stored in an existing Microsoft Access table (2003 or newer); or an Excel spreadsheet (2003 or newer). The MAR Geocoder is designed to accept location records containing a single address, intersection, block, or a place name. The MAR Geocoder matches address information to physical locations (latitude/longitude) locations in the District of Columbia's MAR database, via an internet connection. Since the MAR database includes only addresses, blocks, intersections, and place names located within the District of Columbia (Washington, DC), the geocoder tool will not geocode to locations outside of the District.

The geocoder works with following Windows versions: Windows 7, Windows 10.

Installation

MAR Geocoder Availability

The MAR Geocoder tool is available for download from the Master Address Repository web page and requires an internet connection to download and use.(see Additional Help and Resources) At this time the MAR Geocoder is only available for use on Windows computers. Macintosh users with a dual boot option may be able to successfully run the Geocoder under the windows virtual environment.

Installing the MAR Geocoder

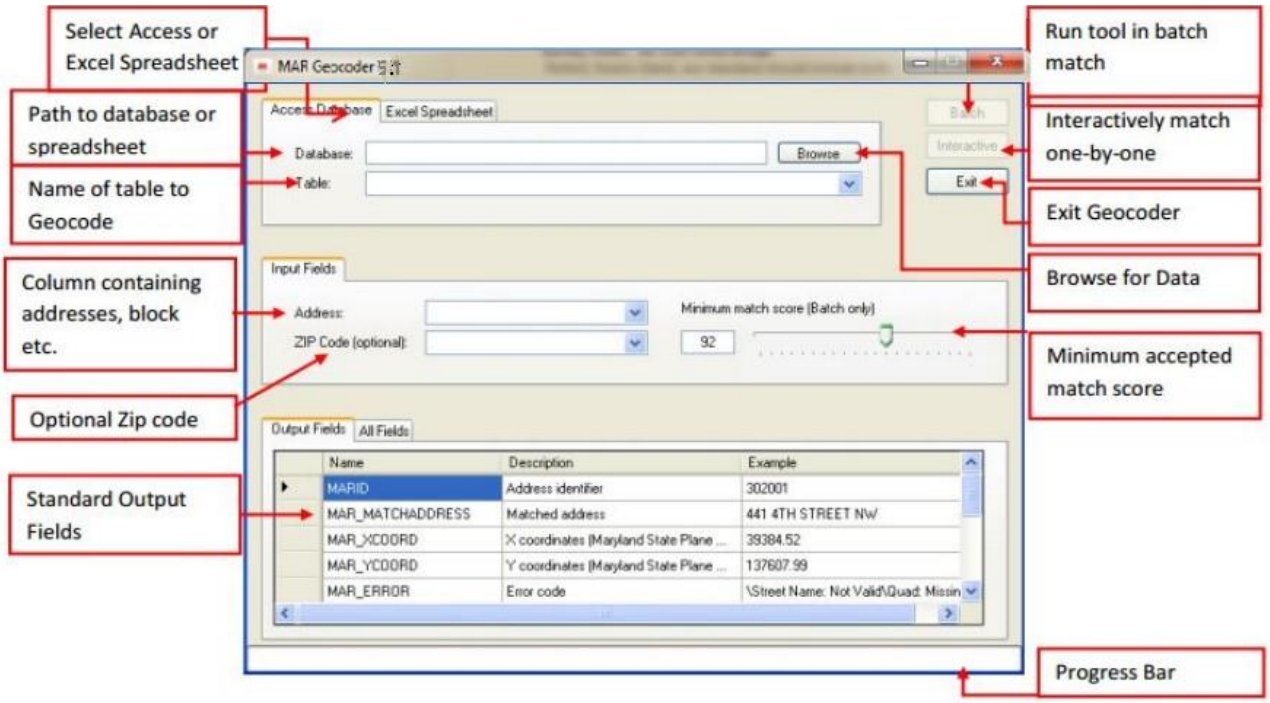
You must have administrative privileges to your machine to successfully complete the installation.

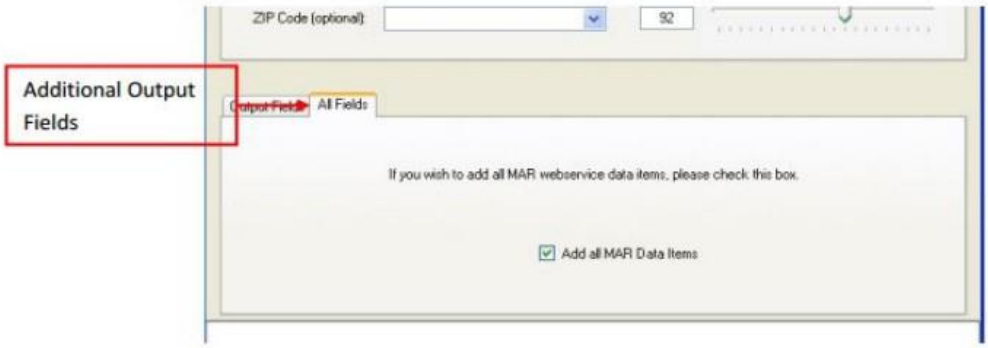
1. Download the installation file from the MAR website and install the application on your local machine.
2. Double-click the compressed file and extract the executable file to your local machine. Once the application has been extracted, double-click the executable file to launch the installation and follow the installation wizard instructions.

Once installed, you will have a new icon on your desktop and folder in your *Windows Start* menu named *MAR Geocoder*. From this shortcut you can view the documentation, launch the software or uninstall the program from your system.

The MAR Geocoder Interface

Interface Description Launching the MAR Geocoder brings up the following dialog box:





Functionality Matrix

Description	Purpose
Select Access or Excel Spreadsheet	Users may choose to geocode a Microsoft Access database or Excel Spreadsheet.
Browse for Data	Navigate to your database or spreadsheet; it will populate the, "path to database or spreadsheet."
Name of table to Geocode	Select from the drop down menu to choose the table within the database or spreadsheet that contains your locations to geocode.
Field/Column containing addresses	The column within your table that has the locations string (addresses, blocks, intersections, or place names).
Zip code	Select the column containing zip code data (optional). The column type must be "string."
Minimum accepted match score	The match score is the relative accuracy of the point found based on the information given. Recommended to maintain a score of 92% or greater.
Output Fields (Standard)	The following listed fields will be automatically added to your new geocoded table. See descriptions in the tool for each new field.
Additional MAR Fields	Checking this option will append additional field from the MAR such as PSAs, Census Tracts Numbers and Roadway Segment ID Numbers.
Run tool in Batch Mode	To Geocode all records together; click to start the process.
Interactive Match	Once Batch Mode is complete, the interactive tool allows you to see the potential locations for each unmatched location. Choose the correct location manually.
Exit	Exit the MAR Geocoder application
Progress Bar	Approximates completion for Batch Match process.

Data Preparation for Input

The geocode requires address data to be stored in either a Microsoft Access Table or as a worksheet in an Excel Spreadsheet. The addresses for geocoding will also need to be in a single column. You should name the column something to indicate that it contains address information and avoid using keywords, SQL reserved words, spaces or special characters. The information in the "address" or "location" column should meet DC Addressing Standards. See page 18 for more information about reserved words and addressing standards.

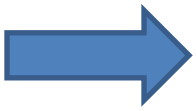
1. Identify the names of the field(s) in your table that contain address information. If your table has a single field that contains fully qualified addresses, proceed to Step 2. A fully qualified address

looks like this: 625 Indiana Avenue NW. You do not need to include city and state, as the geocoder will only match DC addresses. If your addresses are maintained in multiple fields, you must create a new field that contains a fully qualified address. This can be done in Excel or Access.

2. Confirm that your data do not contain Post Office Boxes or addresses outside of the District. You may want to move these addresses to a separate table to reduce processing time.

Single Address:

Address				
Number	Suffix	Name	Type	Quadrant
615		3rd	St	NE

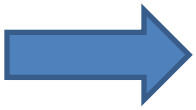


Fully Qualified Address

615 3rd STREET NE

Intersection:

Address_Intersection						
Name	Type	Quad	&	Name	Type	Quad
F	St	NE	&	3rd	St	NE

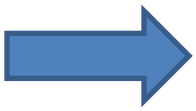


Address Intersection

F STREET NE AND 3rd STREET NE

Block of:

Address_Block_Of				
Hundred Blk	Block of	Name	Type	Quad
400	Block of	4th	St	NE



Address: Block Of

400 BLOCK of 4th STREET NE

Block between:

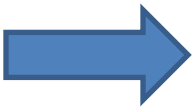
Address_Block_Between										
Name	Type	Quad	between	Name	Type	Quad	&	Name	Type	Quad
F	St	NE	between	3rd	St	NE	&	4th	St	NE

Address: Block Between

F STREET NE BETWEEN 3RD STREET NE AND 4TH STREET

Place Name

Alias Name
Alias Name
Washington Monument



Place Name

Washington Monument

The cleaner the address is prior to the geocoding process, the more efficient the geocoding results will be. The tool is designed to handle imperfections, but there are some limitations and considerations. Some of these are highlighted below.

Data Preparation Considerations

The tool may **not** handle and skip the following format issues:

Hyphens: Globally remove all hyphens from address data.

123–124 Sample Street NW

1234 – Sample Street NW

Spaces in ordinal number: Globally replace the space before the exact phrases 'th', 'rd', 'nd.'

123 4 th Street NW

123 2 nd Street NW

Quoted Street "LETTER:" Globally remove all quotation marks.

123 "H" Street NW

The tool **will** handle pound "#" signs:

#123 Sample Street NW

Using the Geocoder

Batch Geocode

In almost every case, the Batch Geocode process should be performed before starting the Interactive Geocode. After setting up all the input criteria (see page 5), click Batch. The Batch Geocode will begin and the records in your table will automatically be geocoded to the MAR. Use the progress bar to monitor progress. Once complete, a summary of the results of the Batch Geocode will be presented. The process is as follows:

1. Load your table for Geocoding
2. Click Browse to locate your data.
3. Navigate to your Access database or Excel spreadsheet.
4. Select the desired database and click Open.
5. Select the desired table from dropdown menu.
6. Select the address field from your table in the Address dropdown.
7. Zip code is an optional field, but to be available as an option, the underlying data must be stored as a text/string field.
8. Leave Minimum Match Score value at default value.

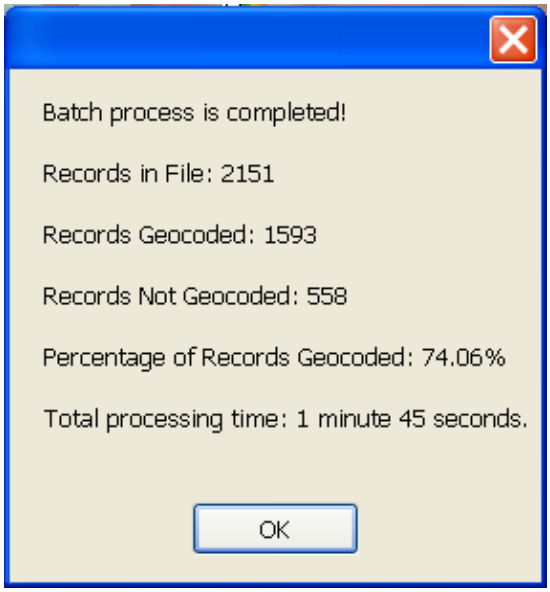
You may want to refer to the interface diagram on page 5.

If you set the minimum match score to 100, only exact matches will geocoded. The lower the score value threshold, the more chance of an incorrect match. 85 is about as low as you want to go, although there are times you may need to use a lower threshold. OCTO GIS generally recommends using the default "92."

9. Click Batch Match button.

This may take a while, as each record takes approximately 2 seconds to geocode.

Once the program is finished Geocoding your table, the following dialog box will be presented. Click OK to confirm that the batch matching process has completed.

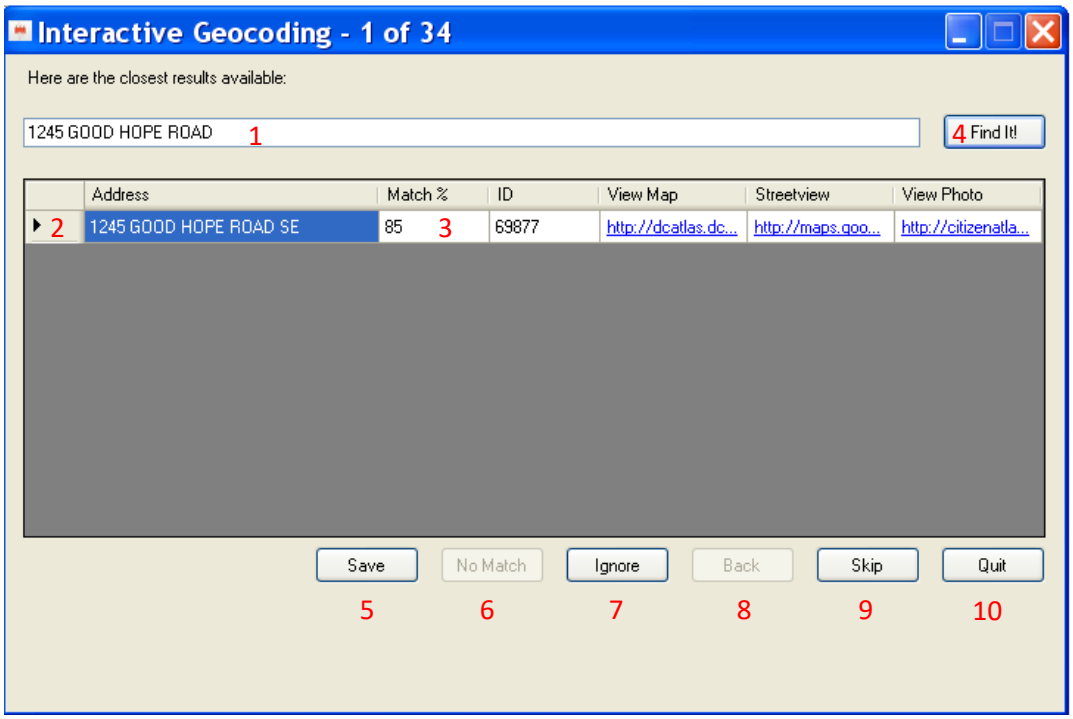


By checking the option of 'If you wish to add all MAR Web service data items, please check this box,' the geocoding will be significantly slower. Large files over 150,000 records often fail to geocode due to their large size. If your data file is larger than 150,000 records, it is recommended to break up the file into multiple tables/worksheets of 50,000-75,000 records.

Interactive Geocode

Once the batch process is complete, examine the results by sorting the records (in Access or Excel) that have not been geocoded (the records that have not been geocoded do not have an X or Y coordinate value). Use the Interactive Geocode function in the MAR Geocoder to continue geocoding records individually.

The Interactive Geocode button will allow users to manually look at each unmatched record with all potential locations. Users can then determine the correct match. If the number of unmatched records seems high, exit out of the geocoder and return to the spreadsheet and investigate. The records that did not geocode, may reveal problem addresses that can be resolved as a group.



Using the Interactive Geocode Dialog Box

Item (1) Is the original address from your table.

Item (2) Is the corrected/matching address. If the match score (3) is lower than 85, there is probably something wrong with the address you provided.

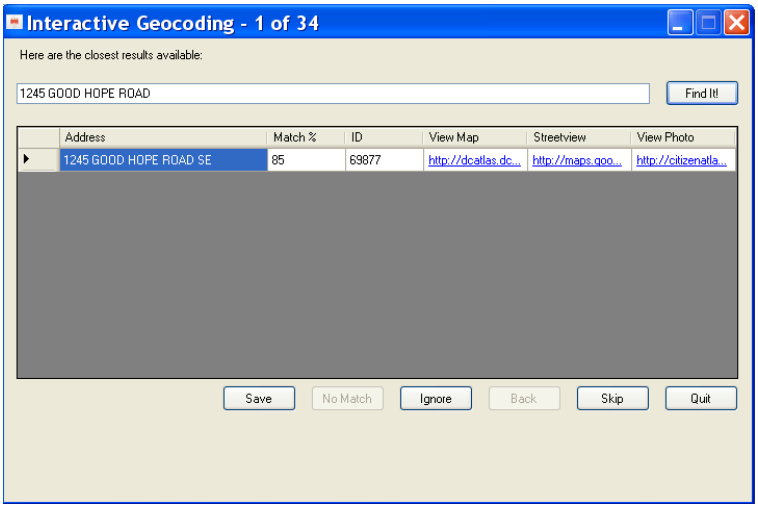
1. Edit the original address (1) as necessary (you can type in the box that contains the address) and then click "Find It!"(4) to attempt to search for the correct address and obtain a new list of candidates. In this example, you could add the quadrant to find a better match.Click Save (5) if the highlighted address is correct. This will match the selected location to the record in your table and advance the geocoder to the next record.
2. If the original location is valid, however not verified, select No Match (6) to launch the MAR *Address Submission Sequence* form (see page 13).
3. If neither the highlighted address nor any other listed address is correct, click Ignore (7) or Skip (9).

Ignore: I don't want to try to geocode this record again, ever.Skip: I just want to skip this record for now.If you want to go back to the previous record, use the Back button (8). Click Quit (10) to save and exit the interactive geocoding process. You can return to the interactive geocoder at any timePlease note that some addresses or intersections may have two 100% exact matches and multiple correct answers that are lower than 100%. This is due to the nature of the street fabric in DC. An example of this situation is the intersection of Florida Avenue NW and U Street NW. The two streets legally intersect twice in the same quadrant. In order to determine which option is correct, you will need to attempt some additional research.

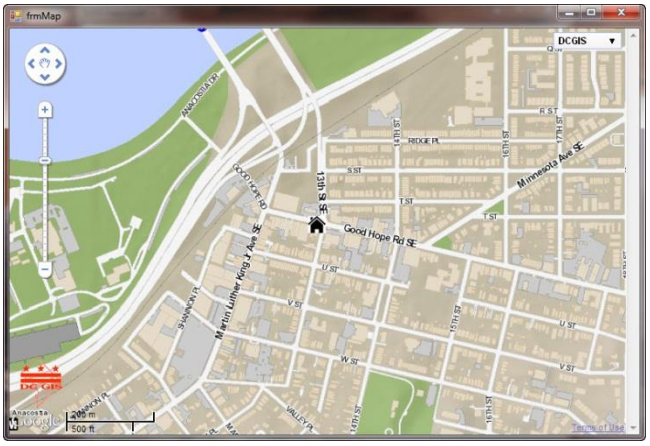
Map and Photography Display

The interactive match tool provides users with the ability to view maps and photography for any potential match candidates. Scroll over to the right of the table and click to view a map, photography from Google Street View or a frontage photo from the Office of Tax and Revenue. Street frontage photos are only available for property addresses and not available for blocks, intersections or place names. The displays use map web services and have basic navigation tools available including zoom in, zoom out and pan.

Click on the appropriate link to observe the different options:

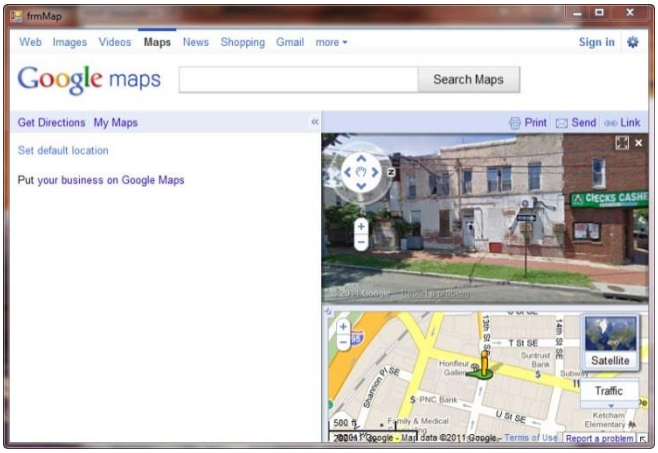


View Map (OCTO):



The View Map option displays use map web services and have basic navigation tools available including zoom in, zoom out and pan.

Street View (Google):



View Photo (OCFO Tax and Revenue):

Photographs in the "View Photo" option are from 2004.

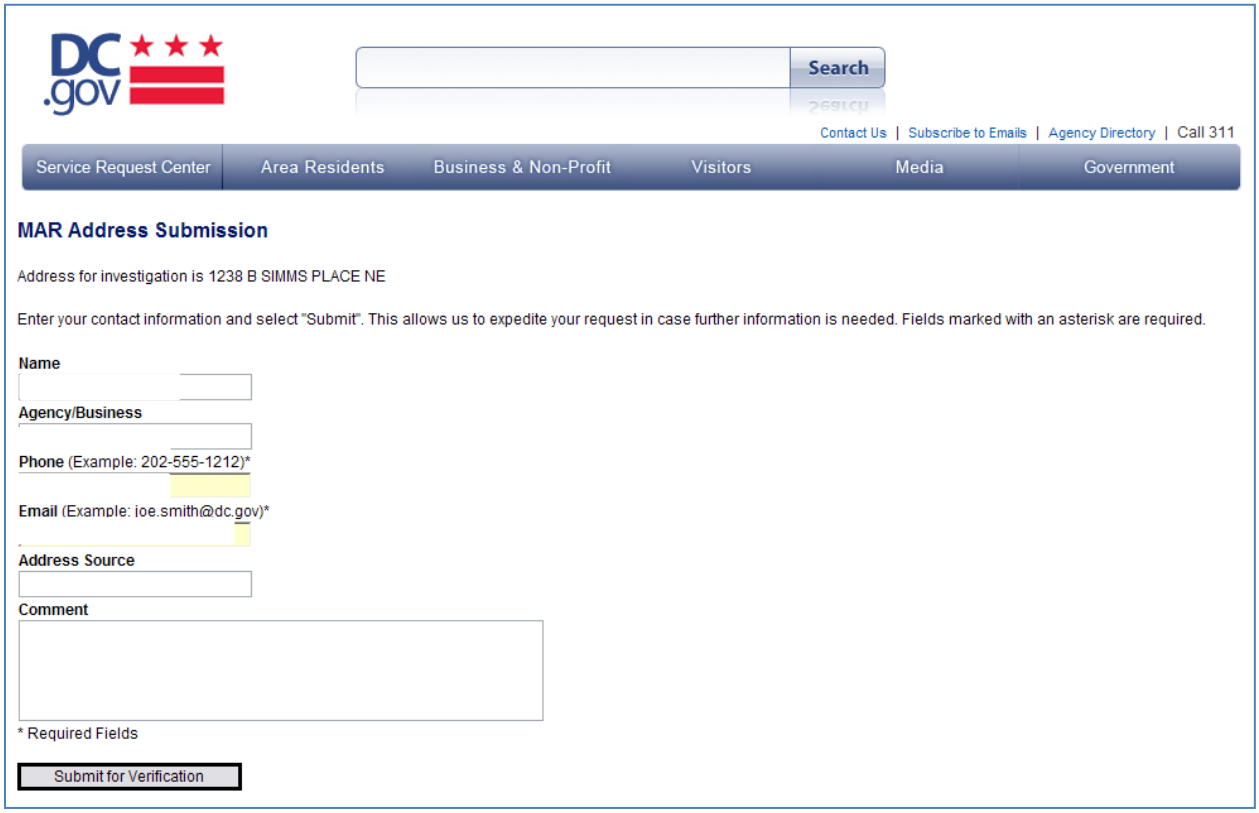
Address Submission Sequence (No Match button)

There will be occasions where users find address records not currently in the Master Address Repository. The *No Match* button will be enabled automatically if an address record in the table is valid with no available match, and the address is not yet verified. (A valid address follows the District's Address Standard containing all the elements of an address and is within a valid address range (see p7; Data Preparation for Input)).

1. Select *No Match* on the Geocoder Interactive dialog box to launch the *Address Submission Sequence* form in a new web browser window.
2. Enter contact information into the appropriate boxes.
3. Provide an explanation of why the address should be added to the MAR database in the Comment box.

4. Click “Submit for Verification”.

The District’s Master Address Repository team will review the submission to confirm that the address should be added to the MAR database. You will typically receive reply within two business days.



The potential address is pre-populated on the form. Depending on a user’s internet browser settings, contact information will also be pre-populated. Otherwise users must enter the required information.

Results for Geocoding

The tool will append new fields within the geocoded table or spreadsheet. These fields are automatically populated by the tool based on the set minimum match score. Set the minimum match score to 100 to ensure that the addresses matched are the absolute correct ones. However, by default the tool is set to a minimum match score of 92 in order to return the maximum correct matches. Below are the standard output fields that will be appended to the table or spreadsheet:

Field Name	Description
MAR_MATCHADDRESS	Matched Address in MAR
MAR_XCOORD	X Coordinates (Maryland State Plane Meters)
MAR_YCOORD	Y Coordinates (Maryland State Plane Meters)
MAR_LATITUDE	Latitude (decimal degrees)
MAR_LONGITUDE	Longitude (decimal degrees)
MAR_WARD	Ward
MAR_CENSUS_TRACT	Census Tract (Current Decennial Year)
MAR_ZIPCODE	Zipcode
MAR_ID	MAR Unique Identifier
MAR_ERROR	Error message describing why the address won't geocode.
MAR_SCORE	Confidence Level of Geocoding
MAR_SOURCEOPERATION	Table Source for Joining
MAR_IGNORE	Determines if record should be interactively geocoded again

If the option 'Add all MAR Data Items' is checked, additional fields will be added in separate tables (worksheet). The 'Add all MAR Data Items' is located on the 'All Fields' tab which is located on the main MAR Geocoder screen.

Table Name	Matched Based On	Following Fields Added From
MAR_ADDRESS	Full Address	Address Table
MAR_INTERSECTION	Intersection Name	Intersection Table
MAR_BLOCK	Hundred Block or Block Description	Block Table
MAR_AID	Address Identifier	Address Table
MAR_PLACE_NAME	Place Name (Alias Name)	Address Table & Alias Name (MAR Place name)

The additional tables contain extra information not found in the standard output such as additional areas (geographies) and more detailed information about blocks and intersections.

Address Table – Additional Fields

Field Name	Description
ADDRNUM	Address Number
ADDRNUMSUFFIX	Address Number Suffix
STNAME	Street Name
STREET_TYPE	Street Type
QUADRANT	Quadrant
CITY	City
STATE	State
SSL	Square, Suffix, Lot (Property Identifier)
ANC	Advisory Neighborhood Commission
PSA	Police Service Area
NBHD_ACTION	Neighborhood Action
CLUSTER_	Neighborhood Cluster
POLDIST	Police District
ROC	No Longer In Use
VOTE_PRCNT	Voter Precinct
SMD	Single Member District
NATIONALGIRD	National Grid Coordinates
ROADWAYSEGID	Roadway Segment Identifier
FOCUS_IMPROVEMENT_AREA	Focus Improvement Area
HAS_ALIAS	Has Alias Name
HAS_CONDO	Has Condo Unit(s)

HAS_RES_UNIT	Has Residential Unit(s)
HAS_SSL	Has Square Suffix Lot
STREETVIEWURL	Google Street View URL
WARD_2002	Ward 2002
WARD_2012	Ward 2012
SMD_2002	Single Member District 2002
SMD_2012	Single Member District 2012
ANC_2002	Advisory Neighborhood Commission 2002
ANC_2012	Advisory Neighborhood Commission 2012
IMAGEURL	Image URL
IMAGEDIR	Image Directory
IMAGENAME	Image Name

Intersection Table – Additional Fields

Field Name	Description
INTERSECTIONID	Intersection Identifier
STREET1ID	Street 1 Identifier
STREET2ID	Street 2 Identifier
ST1NAME	Street 1 Name
ST1TYPE	Street 1 Type
ST1QUAD	Street 1 Quadrant
FULLSTREET1DISPLAY	Full Street 1 Display Name
ST2NAME	Street 2 Name
ST2TYPE	Street 2 Type
ST2QUAD	Street 2 Quadrant
FULLSTREET2DISPLAY	Full Street 2 Display Name
FULLINTERSECTIO	Full Intersection
REFX	Reference X (same as XCOORD)
REFY	Reference Y (same as YCOORD)
NATIONALGRID	National Grid Coordinates
CONFIDENCE_LEVEL	Confidence Level (Same as MAR_SCORE)

Block Table – Additional Fields

Field Name	Description
LOWER_RANGE	Low Theoretical Address Range
HIGHER_RANGE	High Theoretical Address Range
STREETSEGID	Street Segment Identifier
INTERSECTION1ID	Intersection 1 Identifier
INTERSECTION2ID	Intersection 2 Identifier
ONSTREETID	On Street Identifier
FROMSTREETID	From Street Identifier
TOSTREETID	To Street Identifier
THEORANGELL	Theoretical Address Range Left Lower Value
THEORANGELH	Theoretical Address Range Left Higher Value
THEORANGERL	Theoretical Address Range Right Lower Value
THEORANGERH	Theoretical Address Range Right Higher Value
ACTUALRANGERL	Actual Range Left Lower Value

ACTUALRANGERH	Actual Range Right Higher Value
ACTUALRANGELL	Actual Range Left Lower Value
ACTUALRANGELH	Actual Range Left Higher Value
FULLBLOCK	Full Block Name with From and To Street Name
BLOCKNAME	Block Name with Address Range
ONSTNAME	On Street Name
ONSTTYPE	On Street Type
ONSTQUAD	On Street Quadrant
FROMSTNAME	From Street Name
FROMSTTYPE	From Street Type
FROMSTQUAD	To Street Quadrant
TOSTNAME	To Street Name
TOSTTYPE	To Street Type
TOSTQUAD	To Street Quadrant
CENTROIDX	Centroid X (Same a XCOORD)
CENTROIDY	Centroid Y (Same a YCOORD)
EXTENTMINX	Extent Minimum X Coordinates
EXTENTMINY	Extent Minimum Y Coordinates
EXTENTMAXX	Extent Maximum X Coordinates
EXTENTMAXY	Extent Maximum Y Coordinates
CONFIDENCELVE	Confidence Level (Same as MAR_SCORE)

Generating a GIS Layer from Geocoding Results

After successfully geocoding the address table or spreadsheet using the MAR Batch Geocoder, these data can be added to a map. The following instructions are designed for the ESRI ArcGIS Desktop suite, but may be relevant for other software applications like QGIS, etc.

Users will need to have local GIS software installed.

Creating an Event Theme in ArcGIS 10.X

1. Add the table or worksheet to ArcMap. It will appear in the Layers table of contents.
2. **Right-click** on the file and choose to Display X,Y Data.

The next window will have the X and Y fields automatically chosen. If not, select the correct fields for X and Y (MAR_XCOORD and MAR_YCOORD).

3. For *Spatial Reference of Input Coordinates* click the **Edit** button.
4. Click Select and navigate to → *Projected Coordinate Systems* → *State Plane* → *NAD 1983* and choose the following: NAD 1983 State Plane Maryland FIPS 1900

This will produce a new event layer in the ArcMap table of contents. Each visible point represents a geocoded (matched) address. This event layer is only available in the current map document, but can be exported to a new data layer by right-clicking and accessing the export option.

Additional Help and Resources

Resource	WebURL	Category
DC Location Search	http://dcatlas.dcgis.dc.gov/mar/	MAR
MAR Website	https://octo.dc.gov/node/715602	MAR
MAR Data Dictionary	https://octo.dc.gov/node/1249166	MAR
Download MAR Geocoder	https://octo.dc.gov/node/1161947	MAR
Learn How to Use GIS Web Services	https://octo.dc.gov/page/how-guides-gis-web-services	OCTO Data
Frequently Asked Questions of MAR	https://octo.dc.gov/node/1249176	MAR
DC Address Standards	https://octo.dc.gov/node/1249161	MAR
DC Government Employee GIS Training	http://octo.in.dc.gov/node/164692	OCTO Data
ArcGIS Resource Center	http://desktop.arcgis.com/en/support/	ESRI
ESRI Virtual Campus	https://www.esri.com/training/	ESRI
ESRI Online Support Center	https://support.esri.com/en/	ESRI

Although the tool was tested among common datasets successfully, other limitations and errors may exist. If users identify consistent errors and limitations, please contact dcgis@dc.gov so they can be documented and resolved. Support for the MAR Geocoder 5.1 tool is available to District agencies and their contractors. Limited support is available for the general public.

Authors: Alexandre D. Santos - May 2011; Updated by David Jackson - October 2012, August 2013, May 2014. Eva Stern/David Jackson, June 2014 , David Jackson - August 2015, David Jackson - October 2017, David Jackson June 2018