

IMMUNIZATION INFORMATION SYSTEM (IIS) GUIDANCE

**IIS REINTEGRATION OF
CLEANSED ADDRESSES**

AND GEOCODES

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AIRA
AMERICAN IMMUNIZATION
REGISTRY ASSOCIATION

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INTRODUCTION

In 2015, AIRA convened the Joint Development and Implementation Advisory Workgroup (JDI Workgroup) to oversee and advise joint IIS development efforts.

The JDI Workgroup selected an address cleansing and geocoding project as the initial joint development concept to move forward due to its ability to positively impact a variety of data quality and assessment activities. Following extensive market research, interviews, and product demonstrations, SmartyStreets was selected as the preferred service provider to partner with AIRA.

Four workgroup members agreed to participate in an initial pilot with SmartyStreets to explore the service's address cleansing functionality and determine how IIS should best approach implementation. Experiences and lessons learned were compiled and evaluated, leading to the publication of the May 2017 *Immunization Information System (IIS) Implementation Guidance for a Shared Address Cleansing and Geocoding Service*.¹

The purpose of this document is to build upon the previous implementation guide and provide a more in-depth exploration of address cleansing for IIS programs. The document also provides guidance for reintegrating validated and standardized addresses and geocodes back into IIS.

Much of the content included in this document was assembled from interviews of jurisdictions that have already implemented SmartyStreets or are in the final stages of implementation planning. Lessons learned and best practices will continue to evolve as more IIS expand their use of SmartyStreets and reintegrate cleansed addresses and geocodes.

¹ IIS Shared Address Cleansing and Geocoding Service: http://repository.immregistries.org/files/resources/5942a1f3c8d86/address_cleansing_implementation_guidance_-_final_new_logo.pdf



“SmartyStreets works great. I’m really happy with the speed and their customer service.”

– Josh Hull, Software Developer, Kunz, Leigh and Associates, Michigan Care Improvement Registry (MCIR)

1 WHAT IS ADDRESS CLEANSING?

The process of address cleansing involves the standardization and validation of an address.

Address standardization is the process of changing an address to adhere to United States Postal Service (USPS) standards. Spelling, abbreviation, and other errors are corrected so that the address matches the format preferred by USPS.

The table below provides some examples of standardized addresses:

Table 1 | *Example Addresses Before and After Standardization*

INPUT	STANDARDIZED
121 jones street montgomrey, AL	121 Jones St Montgomery AL 36104-4945
12993 Johnson Wantagh New York state 11793	2993 Johnson Pl Wantagh NY 11793-2836
2701 phillips Ave., charlotte, N.C.	2701 Phillips Ave Charlotte NC 28208-7029
616 ivory rio rancho NM, 87124	616 Ivory Rd SE Rio Rancho NM 87124-3042

STANDARDIZATION

The process of changing an address to adhere to United States Postal Service (USPS) standards.

VALIDATION

The process of verifying that the address matches an address in the official USPS database.

Validation occurs after the address has been standardized. The process compares a mailing address against the official USPS database to verify that the address is real (i.e., that it matches an address in the database). If a match is found, it is marked as valid and sent back to the user in the corrected format along with some metadata about the address. Addresses that do not produce a match are marked as “invalid.” Invalid addresses either do not exist or are not registered with the USPS.

1.1 ACTORS INVOLVED IN ADDRESS CLEANSING

IIS programs vary significantly in terms of program structure, staffing, system architecture, and database configurations. As programs plan for and implement address cleansing, the scope of activities an IIS program performs itself will vary depending on the program and its structure. For example, for jurisdictions that utilize an IIS vendor or have separate support from a central information technology (IT) unit or department, the roles/workflow and timeline will be governed in large part by vendor/IT responsibilities and service level agreements.



2 BENEFITS OF ADDRESS CLEANSING AND GEOCODING

Address cleansing and geocoding are standard data quality interventions that can result in a number of benefits to both IIS and immunization program operations.

2.1 ADDRESS CLEANSING

Address cleansing can contribute to increasing childhood immunization rates by improving reminder/recall mailing success. By increasing the number of reminder/recall notices that reach their intended destination, jurisdictions can potentially increase patient response rates while also reducing the cost of wasted postage.

Standardized and validated addresses also improve or support several other IIS functions, including:

- Patient-level deduplication. One jurisdiction recently evaluated SmartyStreets against its existing deduplication engine. The program took a sample of patients with known duplicate addresses (i.e., identified by IIS staff manually) that its system had failed to identify on its own and ran the duplicates through SmartyStreets. The jurisdiction found that SmartyStreets positively identified 50% of them as duplicates. Improved patient-level deduplication allows for better reconciliation of the IIS patient denominator.
- The quality and accuracy of reports run by address and geographic parameters (e.g., AFIX and other coverage assessments).
- Household grouping functions to identify all family members associated with a particular address.
- Establishing automatic processes for data cleansing, thereby reducing the number of manual reviews required of IIS staff.

Utilization of an address cleansing service can also provide useful metrics that identify provider-level data quality issues. For example, providers can be assessed for total number of patients compared to the number of address changes made by SmartyStreets. A high rate of changes may indicate ongoing data entry errors or data quality issues and may be related to how data is captured and stored in the electronic health record (EHR).

All IIS are eligible to sign up for SmartyStreets at no cost, thanks to AIRA and the CDC, which sponsor the service. Visit <https://www.immregistries.org/address-cleansing> to get started.

“We have definitely benefited from address cleansing already through reduced returns on our reminder/recall postcards.”

– Josh Yates, Developer,
Alabama Immunization
Registry, ImmPRINT

2.2 GEOCODING

A geocode provides the global positioning system (GPS) coordinates (i.e., latitude and longitude) of a physical location. SmartyStreets provides geocodes as part of its address validation and cleansing service.

Geocodes can be leveraged by jurisdictions in a variety of ways that allow programs to view and utilize data differently. Benefits of geocoding may be particularly useful to immunization program staff such as epidemiologists and data analysts. Some of the ways geocoding can be leveraged by IIS and immunization programs include:

- Improved mapping capabilities that allow for the visualization of data geographically. This benefit can be utilized at both the patient and provider organization level to better target intervention strategies.
 - Patient: Immunization rates aggregated according to city, county, or ZIP code help identify gaps in coverage that put certain communities at greater risk of vaccine-preventable disease.
 - Provider Organization: Number and types of provider organizations can be mapped to identify pockets of need in underserved communities within a geographic area.
- Mapping of coverage rates during a vaccine-preventable disease outbreak or pandemic has the potential to improve preparedness, analysis, and response.
- Other special projects or inter-agency collaboration, such as data sharing across governmental departments, health system sectors, and other groups, can help to better identify pockets of need. Mapped coverage rates overlaid with sociodemographic data from the most recent census can provide a more comprehensive examination of a particular geographic area.



2.2.1 GEOCODE ACCURACY

When an IIS submits an address to SmartyStreets, the address is first standardized and then completed by adding missing information, such as the ZIP+4 postal code. This nine-digit code identifies a small geographical area, such as a block or cluster of houses, which is referred to as a delivery area.

The address is then verified as a real location that currently receives mail. Once verified, SmartyStreets provides the longitude and latitude coordinates for the address based on the centroid (or geographical center point) of the delivery area using US Census Bureau data. The type of Census data used is called topologically integrated geographic encoding and referencing (TIGER) data. There is a small proportion of delivery areas for which USPS has not yet released a geocode. In this instance, SmartyStreets uses the coordinates of nearby delivery areas with known geocodes to approximate the address coordinates.

The Precision field included in SmartyStreets' response file indicates the accuracy level of the geocodes returned for each address, and the majority are returned to indicate a block or cluster of houses. While rooftop-level geocodes are not available from SmartyStreets at this time, SmartyStreets is working toward this functionality. The timeline for these changes has not yet been released.

“Geocodes give our epidemiologists a whole new playground to have fun with.”

– Kevin Allen,
Manager, Texas
Immunization
Registry, ImmTrac2

To learn more about
SmartyStreets' geocodes
and their accuracy, visit:

- <https://smartystreets.com/articles/what-are-geocodes>
- <https://smartystreets.com/docs/geocoding-accuracy>

3 EVALUATING RETURNED DATA

The response from SmartyStreets includes dozens of fields associated with each address cleansed. These returned data points form the crux of decision making for incorporating cleansed addresses and geocodes back into the IIS.

Note: A complete list of the SmartyStreets response codes can be found in [Appendix B-D](#) of this document.

IIS programs should perform several activities in preparation for the reintegration of cleansed address data.



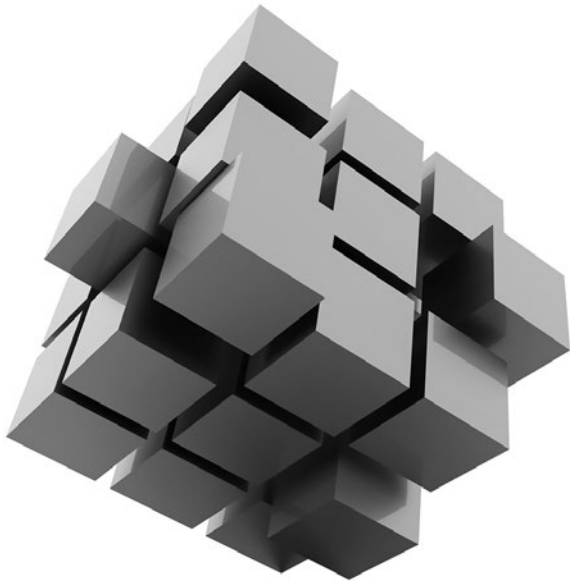
STEP 1

ESTABLISH PURPOSE

Determine the purpose of address cleansing in the IIS early in the planning phase. This should happen prior to the initial SmartyStreets implementation, in conjunction with the jurisdiction's exploration and testing of the address cleansing service.

Start by asking, what will we do with the cleansed data? If the data will be used to aggregate immunization rates by geographic area (e.g., mapping), jurisdictions may elect to reintegrate all standardized non-PO Box addresses and geocodes. However, if address data will be used for mailing purposes (e.g., reminder/recall), programs will want to ensure that reintegrated addresses are also deliverable.

Jurisdictions may ultimately have multiple address cleansing projects running concurrently. In this case, the program may choose to apply different business rules to the respective address subsets based on each project's purpose.

**STEP
2****GET TO KNOW THE CODES**

Users should become familiar with SmartyStreets' response codes in order to establish business rules for whether to accept and reintegrate or reject an address. As stated in Step One, this will depend in large part on the purpose of address cleansing.

Every address submitted will return dozens of fields of data (see Appendix B-D). These response codes provide detailed information about the location, delivery point validation (DPV), and whether the address is missing critical information that prevents a match. The codes allow users to automate processes for cleansing and reintegration, reducing the amount of manual reviews required by IIS staff.

The response codes are also useful for problem solving invalid addresses. For example, an address that returns as "no match" with a "dpv_footnote" code of "A1" informs users that the city, state, and ZIP code do not match. Users may elect to dedicate some amount of staffing resources to reviewing and possibly even correcting these errors when possible.

Response fields are categorized according to the type of information provided back to the user.

- **METADATA FIELDS** provide additional detailed information about the address, such as geographic coordinates, county name, precision level of latitude and longitude values, and whether the address is a PO Box or standard mailing address.
- **ANALYSIS** fields provide a deeper breakdown on address deliverability, such as whether an address is active or vacant and how that determination was made. These codes also detail how SmartyStreets altered the address to make it valid and standardized (e.g., fixed city/state spelling).


**STEP
3**
SELECT ESSENTIAL FIELDS

IIS must determine which response fields are most relevant to capture and store. Current SmartyStreets users identified several fields that they have found particularly useful (see Table 2 below). A more extensive list of SmartyStreets metadata and analysis codes can be found in **Appendix B-C** of this document.

Table 2 | SmartyStreets High-Priority Fields

Summary	Shows no match, match-mailable, match-vacant, match-inactive, and PO Box.
Footnotes	Additional information about the address; indicates how the address was altered.
Latitude/longitude	Geographic positioning; useful for mapping addresses of patients and providers.
Precision	Indicates the precision of the latitude and longitude values; ZIP levels 5-9; the higher the ZIP level, the higher the precision.
Dpv_footnotes	Indicates why address was given its delivery point validation (dpv) value; provides additional granularity to determine whether or not to accept a suggested address change.
Dpv_match_code	Indicates whether USPS delivers mail to the address.
Dpv_vacant	Indicates the address was deliverable in the past but is currently vacant.
Notes	Corresponds with Footnotes codes to explain how an address was standardized and validated plus other useful information (e.g., missing secondary info, confirmed entire address, etc.).

STEP 4

ESTABLISH BUSINESS RULES

Business rules represent specific recommendations and describe decision-making logic for IIS processes and operations. They should be documented and saved to a central repository for access by appropriate IIS program staff.

Note: While documentation of business rules should be standard practice for IIS programs, it may be particularly useful during this initial period of SmartyStreets implementation for programs to share their documentation within the broader IIS community. Business rules and lessons learned can be used to help the community identify and develop best practices for implementation. AIRA's Address Cleansing and Geocoding User Group² provides an ideal platform for sharing this information.

Example business rule categories IIS programs may want to consider include:

- **Accept/reject** decisions that allow for the acceptance and reintegration of addresses meeting specified criteria. SmartyStreets response codes can be utilized to identify addresses that meet the selection criteria. For example, an IIS would likely accept all addresses with the `dpv_match_code` of "Y," indicating the entire address was confirmed as deliverable. For comparison, a `dpv_match_code` of "D" would indicate that the address was confirmed but is missing secondary address information (apartment, suite, etc.).
- **Address precision level**, such as Zip9. As described in the Benefits of Address Cleansing and Geocoding section of this document, the higher the precision level of the longitude and latitude coordinates returned by SmartyStreets (Zip9 currently being the highest), the more precise the coordinates.
- **Unique identifiers** to ensure that addresses returned from SmartyStreets are matched back to the correct patient address when they are brought back into the IIS. This is particularly important when batching multiple address records in one request.
- **Different address types**, including physical addresses and PO Boxes as well as addresses for patient, parent/guardian, schools, and immunization provider organizations. It is recommended that IIS use SmartyStreets to validate and standardize all addresses submitted to the registry. There may be different business rules established based on the type of address.

² Address Cleansing and Geocoding User Group: <https://www.immregistries.org/address-cleansing-and-geocoding-user-group>

- **Historical addresses** within the IIS. Jurisdictions may want to consider storing all previous addresses for historical reference.
- **Status flags** to indicate whether further action should or should not be taken, such as for uncleansed or invalid addresses, or to indicate a subgroup of addresses that warrant re-cleansing prior to a reminder/recall mailing.

It should be noted that some scenarios may require address changes by IIS program staff on the back end, such as if the returned address includes a known error from the USPS database or if an invalid address contains a misspelling that SmartyStreets was unable to identify and correct. IIS programs should consider documenting and tracking these exceptions for future reference.

3.1 RECORD CONSOLIDATION

The Modeling of Immunization Registry Operations Workgroup (MIROW) issued best practice recommendations for consolidating demographic and vaccination records. This document may be useful to IIS programs as they consider the best way to implement SmartyStreets, specifically with regard to patient matching and deduplication. Some specific business rules from the MIROW document that IIS programs may wish to consider include:

- **BR204** (pg. 50): **Retain past values.** IIS should make accessible past values for data groups, including address data.
- **BR401** (pg. 52): **Compare data elements of the same type.** For example, compare a street address to a street address, but do not compare a street address to a PO Box.
- **BR702** (pg. 56): **Retain all unique values from data elements with multiple values.** There may be multiple patient home addresses if a child lives at more than one home.
- **BR801** (pg. 57): **Use more complete information over less complete information.** For example, an address with an apartment number is more complete than one without.
- **BR902** (pg. 58): **Use information that has the most recent submission date.** There would likely be exceptions to this rule to prevent invalid or incomplete address data from a less reliable or timely source from replacing an older, more accurate address.
- **BR1002** (pg. 59): **Prevent overwriting validated data.** For example, if the address cleansing results in a new standardized and validated address, the IIS may choose to flag or lock the address in case the data source submits the same “bad” address.

These example business rules may require additional discussion and consideration as to their relevancy to address cleansing and reintegration for each jurisdiction.

³ Consolidating Demographic Records and Vaccination Event Records: http://repository.immregistries.org/files/resources/59d677eb1b908/aira_mrow_consolidating_demographic_records_full_guide_-_final.pdf

⁴ For more information about the business rules listed here, see pages 48-59 in Consolidating Demographic Records and Vaccination Event Records, issued August 21, 2017.

4 IMPLEMENTATION AND REINTEGRATION

4.1 SMARTYSTREETS CONNECTION METHODS

AIRA's first guidance document, *IIS Implementation Guidance for a Shared Address Cleansing and Geocoding Service*, provided detailed explanations⁵ of the four primary methods used for connecting to SmartyStreets. A brief description of each method is provided below along with considerations for each option that IIS programs should discuss when planning for implementation.

⁵ IIS Shared Address Cleansing and Geocoding Service: http://www.immregistries.org/assets/docs/Address_Cleansing/Address%20Cleansing%20Implementation%20Guidance.pdf

“The manual batch process is fast, easy, and reliable.”

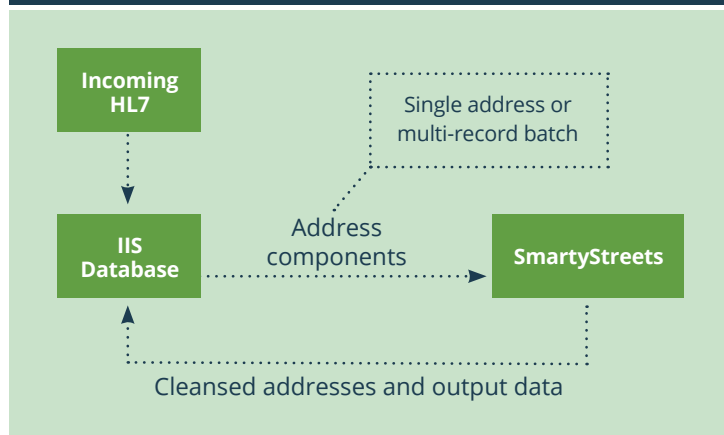
– Mike Dougherty, Business Analyst, Texas Immunization Registry, ImmTrac2

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Consider the following when planning to use automated batch processing:

- Automated batches can be sent as a single record request or a multi-record request using the HTTPS POST protocol.
 - If multiple records are included in the same request, IIS should include an address ID that will match the returned addresses to the original addresses that were submitted.
 - If the real-time HL7 solution is not being utilized to cleanse addresses before they enter the IIS database, the incoming HL7 messages will be staged and processed using standard IIS protocols. These messages can then be batched out to SmartyStreets according to the automated batch process (e.g., all new addresses are sent with the HTTPS POST protocol hourly, nightly, or weekly, etc.).
 - Rather than waiting for a periodic (e.g., hourly, nightly, or weekly) auto-batch process, an IIS may choose to send each address to SmartyStreets as a single record immediately after it enters the IIS database. Several IIS have selected this option for implementation. (See also the following section, *Single Record vs. Multiple Records*.)
 - The downside of batching out new addresses—whether right after they enter the IIS or as part of a larger automated batch—is that IIS miss a critical opportunity to use cleansed addresses for record matching and deduplication on the front end, before they enter the database.
- **HL7 Real-Time Solution** – The SmartyStreets API can be leveraged in real time as the HL7 message is presented to the IIS for pre-processing *before* it gets recorded to the IIS database. In this scenario, the address components are extracted and sent to SmartyStreets as a single record request using the HTTPS POST protocol. The cleansed address and metadata returned by SmartyStreets then become part of the official HL7 submission that gets processed and recorded in the IIS.

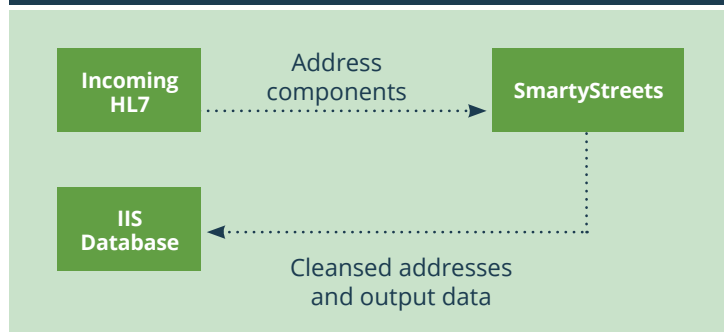
Diagram 1: Automated Batch Process



Consider the following when planning to use real-time HL7 processing:

- Real-time HL7 processing results in the most efficient introduction of address data to the IIS by allowing the deduplication rules to apply and compare a standardized address against a previously standardized address. If the address data is allowed to enter the IIS as submitted by the message source (i.e., pre-standardization and validation), it increases the likelihood that the record will not be properly matched or deduplicated until a secondary deduplication process is applied.
- To date, IIS that have implemented SmartyStreets are utilizing the HTTPS POST protocol by batching out the address components after they enter the IIS. While this process works fine in terms of cleansing addresses, it would be more efficient for jurisdictions to cleanse the addresses before they get introduced as IIS production data.
- There have been some concerns from jurisdictions that a real-time HL7 solution could potentially impact processing times. While the SmartyStreets response is purported to be extremely fast, IIS network infrastructure and other unknown factors could result in latency. As jurisdictions begin testing and implementing the real-time HL7 solution, there will be lessons learned and more guidance to share across the IIS community.
- **User Interface API** – The SmartyStreets API can also be integrated directly into the IIS address fields used for direct data entry in the user interface. It can be implemented in one of two ways. The first option is to validate the entire address after it has been entered and saved to the record by leveraging the HTTPS POST, single-message protocol. The second option is to have the address validated in real time. In this scenario, the API will provide immediate feedback to the user with real-time address correction and suggestions for auto completion as the user keys the address on the page.

Diagram 2: Real-Time HL7 Solution



Consider the following when planning to implement the user interface API:

- Jurisdictions that have tested both user interface options have reported that, rarely, anomalies within the USPS database that SmartyStreets references result in inaccurate city/state responses when validating in real time.
- To avoid the occasional auto-complete mismatch, IIS actively implementing SmartyStreets recommend performing address validation after the user has entered and submitted the full address. To the end-user, the address validation appears to occur in real time, just without auto-complete suggestions offered while the user is typing. As more jurisdictions test and implement the user interface API, there will be additional guidance to share with the IIS community.

The method(s) adopted by an IIS program depends on how the cleansed addresses will be used and where in the workflow the data cleansing will occur.

4.1.1 SINGLE RECORD VS. MULTIPLE RECORDS

Users can package their address cleansing requests to SmartyStreets as a single record request or multi-record batch request. The network setup and request/response time for sending a request is the same whether the message contains one record or many. Each IIS must decide which option best fits its business needs and technical infrastructure.

There are important considerations for either approach. A single record request provides immediate feedback for the submitted record and is a good option for implementing the HL7 real-time and user interface solutions. A multi-record batch is useful for routine cleansing if point-of-entry solutions have not been implemented or if technical issues prevent addresses from being cleansed in real time (e.g., network latency or software limitations). When using a multi-record batch, each address must include a unique address ID to match the batch addresses' backup with the correct patient addresses originally submitted.

Some IIS have opted to implement a single record request for all routine cleansing in place of a multi-record batch. This option provides more control for individual record cleansing and reintegration but also results in significantly increased network traffic with a much higher volume of calls and responses.

Multi-record batches should include a unique address ID to ensure addresses are matched back to the correct patient record.

With the exception of manual batch processing that leverages the Command-Line Tool or the auto-complete option for the user interface API, all remaining address cleansing methods leverage the HTTPS POST protocol, regardless of whether a single address is submitted or a batch of up to 100 records is submitted. Jurisdictions have the option to write their own code or utilize the SmartyStreets Software Developer Kits⁷ (SDKs) created for JavaScript and other programming languages. The SDKs are well tested, open-source packages that are available to download and use at no charge. IIS are encouraged to leverage these existing SDKs.

When planning for SmartyStreets implementation and the reintegration of cleansed addresses and geocodes, jurisdictions should consider factors pertaining to both their desired connection method(s) as well as the request size they want to send to SmartyStreets with each call (e.g., single record vs. multi record).

⁷ SmartyStreets Software Developer Kits: <https://smartystreets.com/docs/sdk>

For Further Consideration... Leveraging a Proxy Service

Some IIS programs may want to consider establishing an address cleansing proxy service to improve IIS address processing performance and consistency. This model involves writing a web service to encapsulate the code used for evaluating and processing cleansed addresses. This allows the IIS to call this internal service (housed on IIS servers) first to assess whether the address has previously been evaluated through SmartyStreets during a prior cleansing. If it hasn't been, the IIS initiates an external call to SmartyStreets.

Although the proxy introduces an additional step to the process, there are a number of worthwhile benefits to this approach:

- Code logic and evaluation are localized.
- Address cleansing results and metadata are cached in a single place for reuse.
- Known address processing errors can be permanently resolved.
- Local code sets can be applied more uniformly.

4.2 PREPARING THE IIS FOR REINTEGRATION

After reviewing the SmartyStreets response codes and establishing business rules for cleansing and reintegration, IIS programs should prepare their database to accept the changed addresses, geocodes, and other fields they have deemed essential to capture and store.

4.2.1 NEW FIELDS AND TABLES

Consider adding the following fields, if they do not exist already, even if they might not be utilized immediately:

FIELD	DESCRIPTION
Latitude / Longitude	Geographic coordinates that correspond to a physical location and can be used to map addresses.
Precision Level	Indicates the precision of the latitude and longitude values. The higher the ZIP level, the higher the accuracy of the coordinates.
Address Change	Indicates whether the address has been sent to SmartyStreets, updated based on SmartyStreets' results, or rejected due to established business rules, etc.

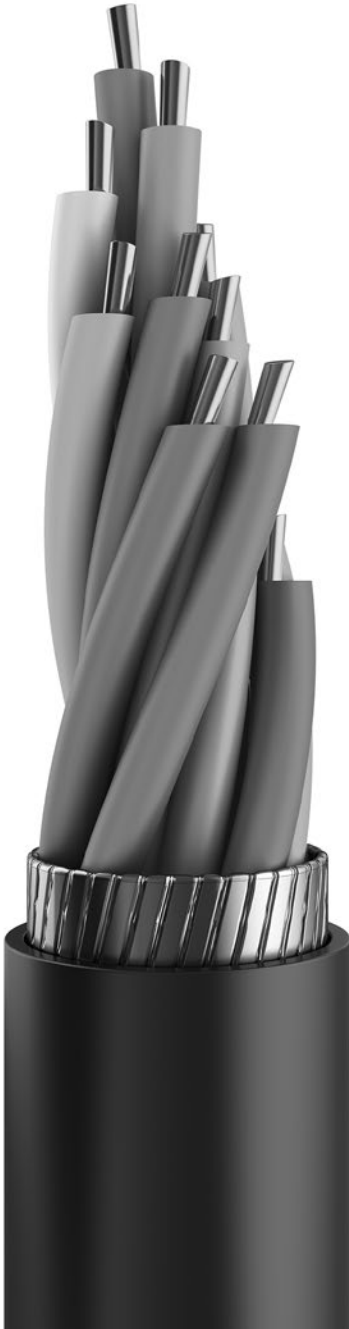
A staging table may be useful for batches that are actively being cleansed. This table acts as a “holding pen” for the batch of addresses pulled from the IIS. The addresses are put into this table and submitted to SmartyStreets, then matched up through a unique identifier with the returned cleansed version. Addresses are then reintegrated into the IIS based on the business rules established for accepting or rejecting an address.

IIS should also consider modifications to existing tables, such as an audit table, or the creation of new tables, to include:

- Whether the address changed from the format in which it was originally submitted to the IIS.
- An historic reference to the address that indicates how it was changed through address cleansing. These codes are found in the returned SmartyStreets Footnotes field.
- A time stamp indicating when the address was altered. IIS may also want to consider adding a field to capture the date when the address was last cleansed.
- A table to store the exact response from SmartyStreets so that, if an IIS program chooses to utilize additional SmartyStreets data in the future, the program can avoid sending a new request to retrieve the additional field(s).

“SmartyStreets documentation is solid, the implementation is reasonably straightforward, and the data you get back is very usable.”

– Steve Murchie, CEO,
Envision Technology Partners



4.3 REINTEGRATION

Cleansed addresses and geocodes will be reintegrated into the IIS according to the selection criteria established in the business rules. As this information enters the production database, IIS programs should consider implementation of methodologies and processes to monitor and evaluate the quality of this new address data. Considerations may include:

- Reviewing status flags that indicate city/street misspellings or other data entry errors to help determine whether further action should be taken (e.g., manually correcting the addresses and resubmitting to SmartyStreets).
- Ensuring that the unique ID sent with each record in multi-batch files is linking back to the correct patient.
- Ongoing data cleanup considerations, such as matching and deduplication, and whether household grouping functions are also improved through address cleansing.
- Reviewing addresses that have been flagged as invalid due to missing data elements to see if a disproportionate number of flags are associated with a particular provider organization or site. If so, this could indicate ongoing data entry errors or problems with how addresses are stored in the EHR and/or sent to the IIS.

Need support? AIRA's SmartyStreets subscription includes access to technical assistance for participating IIS. SmartyStreets customer service is quick, reliable, and knowledgeable. (877) 216-8883; <https://smartystreets.com/contact>

Follow SmartyStreets on social media, blog posts, and web pages to learn about widespread operational changes. To subscribe to updates, visit the [SmartyStreets Status Page](#) and click on "SUBSCRIBE TO UPDATES."

5 EXAMPLE USES OF ADDRESS CLEANSING AND GEOCODING

This section highlights how some IIS are using or planning to use SmartyStreets to support their IIS and other immunization program activities. IIS programs may find it useful to reach out to experienced jurisdictions when planning for SmartyStreets implementation.



MICHIGAN

Michigan has established an automated batch process that sends new addresses daily. The call to SmartyStreets sends one address at a time, with each address queued up and sent sequentially. Michigan has future plans to develop an HL7 interface with SmartyStreets to process new HL7 messages in real time.

Michigan also utilizes the user interface API. Users enter the full address and click “submit.” Upon submission, the request is sent to the Michigan server, which sends it to SmartyStreets over HTTPS POST (using the SmartyStreets SDK). The response returns to the Michigan server, is evaluated, and then is returned to the user interface. The user receives an immediate response and has the option to accept or reject the results.





CALIFORNIA

California has implemented the SmartyStreets real-time user interface API in conjunction with its CA Immunization Registry (CAIR) organization accounts and Vaccines for Children (VFC) provider accounts. Organizations/providers utilize the API when submitting provider enrollment forms, recertification accounts, and account updates. As the user begins typing the address, SmartyStreets immediately and simultaneously validates and standardizes the address, including whether it is a mailable address recognized by USPS. Users have the option to accept or reject the SmartyStreets response.



CONNECTICUT

Connecticut is migrating from its existing IIS platform to Envision's WebIZ platform. Connecticut is the first IIS to use SmartyStreets for address cleansing during a data migration process. Its vendor, Envision Technology Partners, sent Connecticut's addresses through SmartyStreets, which returned standardized and validated addresses and geocodes. The results showed 92% of over 800,000 submitted addresses were standardized and confirmed as deliverable as part of the migration process.



OREGON

A research analyst in Oregon utilized the SmartyStreets Command-Line Tool to map immunization rates by county. To ensure a reasonable level of confidence that addresses were mapped to the correct area, he sorted the SmartyStreets response fields by Precision and Notes and accepted ZIP7 and greater after filtering out the PO Box addresses.

It took SmartyStreets one minute and 42 seconds to review 171,040 addresses and resulted in 98% of addresses returned with a county name. Two percent were assigned only latitude and longitude. The addresses returned without counties but with latitude and longitude were geocoded at the ZIP5 precision level. The remaining 304 addresses (0.2%) returned neither county nor coordinates because the original address was missing critical elements, such as city, state, ZIP code, or street address or they were entered as international addresses.





RHODE ISLAND

Rhode Island KIDSNET is currently developing several solutions that deploy SmartyStreets. In evaluating SmartyStreets against their existing

deduplication engine, the KIDSNET team took a sample of patients with known duplicate addresses that their system had failed to identify on its own (i.e., duplicate addresses that a human could spot but that KIDSNET's existing deduplication process had been unable to eliminate). They ran these duplicates through SmartyStreets and found that SmartyStreets positively identified 50% of them as duplicates. As a result, the team modified its deduplication process to utilize SmartyStreets.

Second, while KIDSNET stakeholders want to have the benefit of SmartyStreets-cleansed addresses in the registry, USPS city names on which SmartyStreets addresses are based do not always reflect the actual Rhode Island city in which an address legally resides. To address this issue, the KIDSNET team is developing a tool to use SmartyStreets' geocoding output in combination with the state's E-911 database to calculate and display the official Rhode Island city name, in addition to SmartyStreets' postal city. This is important for being able to map children to school districts, among other things. Once this item is in place, the KIDSNET team also plans to implement a batch SmartyStreets cleanup process for existing addresses in the registry and use the SmartyStreets user interface for assisted web-based data entry.

6 LIMITATIONS

Address cleansing and geocoding provide a number of benefits to both IIS and broader immunization programs as well as end users and providers; however, as with any service, there are some minor limitations that IIS programs should be aware of when planning for implementation.

In general, all systems that rely on data entry will encounter some level of data quality issues. While SmartyStreets is able to accept and correct the most common data entry errors, the system is unable to anticipate or account for all user-generated errors. It is also important to note that SmartyStreets does not provide person-level validation. Address cleansing services validate that an address exists and is mailable, but typically they have no knowledge as to whether the intended person lives at the specified address.

6.1 CITY/STATE MISMATCH

Because it relies on USPS standards and workflows, SmartyStreets will return the same errors and inconsistencies contained in the USPS database, whereas state or local jurisdictions may have more knowledge of local differences. For example, the city name in USPS addresses might not always match the legal city in which an address resides. While typically outliers, these limitations may require IIS to code appropriate solutions for working around these issues as they are identified.

One example shared by a user is an address that returns as valid and mailable but with an incorrect city attached. In this circumstance:

- The address was submitted with the city/state of Maple Glen, PA.
- The town of Maple Glen, PA, does not exist according to the USPS, even though the property deed legally lists the town of Maple Glen.
- SmartyStreets returns the address city as Ambler, PA, matching the USPS database.

One possible solution in this instance and others like it may be for the IIS to hard code around the incorrect return so that Maple Glen, PA, is not overwritten with Ambler, PA, when submitted to SmartyStreets.

6.2 DIFFERENCES WITH OTHER SOFTWARE METHODOLOGIES

While not a limitation per se, there are differences between SmartyStreets methodologies and other commonly used mapping services. Understanding the SmartyStreets methodology⁸ helps jurisdictions recognize where differences with other services can lead to confusion regarding SmartyStreets functionality. For example, in the comparison of SmartyStreets vs. Google Maps:

- An address that SmartyStreets returned as invalid is pinpointed in Google Maps. This discrepancy is a result of Google Maps' methodology to drop a pin where an address would fall between a certain set of street numbers even if that particular address does not exist (i.e., there is no actual house there). By validating all addresses against the USPS database, SmartyStreets recognizes that no house exists with that address and returns it to the user as invalid.

⁸ SmartyStreets Methodology: <https://smartystreets.com/docs/methodology>



7 ADDITIONAL CONSIDERATIONS

■ There are some additional considerations IIS should discuss during planning.

- While access to SmartyStreets is being provided to all IIS by AIRA as a no-cost benefit, jurisdictions should consider potential costs associated with design and implementation of new IIS functionality.
- IIS programs should consider whether to develop a mechanism to exclude invalid addresses from mailing efforts.
- Some jurisdictions may elect to notify providers about the new address cleansing tool and even send cleansed addresses back to the original source.
- Automated batch processing may need to be set to run during off-peak hours so that address cleansing and reintegration are not competing with daily loads when there may be a large influx of HL7 messages.
- A single address could have multiple variations stored “behind the scenes” in the IIS, with the most recent standardized and validated address showing publicly. There is a diversity of IIS architectures for how many and which addresses to maintain. Jurisdictions should consider different options as part of their solution.
- IIS programs should anticipate and plan for unexpected downtime with any external service. Downtime can happen because of network issues, severed fiber optic cables, dropped packets, or other uncontrollable reasons. IIS should discuss and determine how downtime will be handled. For example, a second attempt can be made after a certain period of time, or the record could be flagged and resubmitted with a future batch process.

IIS should also consider establishing a process for re-cleansing address data.⁹ This can occur on a regular schedule or as needed to:

- Capture new data points for addresses that were already cleansed (i.e., new SmartyStreets fields or existing fields not previously captured)
- Identify changes in address status on previously cleansed addresses
- Correct identified errors in the IIS process for collecting and storing the data
- Ensure addresses are still deliverable prior to reminder/recall mailings or another special project

The quickest method for re-cleansing is to utilize the Command-Line Tool to pull the identified subset and submit it to SmartyStreets in a large batch. Depending on the size of the file, the records should process within a few seconds and be reintegrated into the IIS.

⁹ SmartyStreets recommends performing address cleansing at least every 90 days. For more information, visit: <https://smartystreets.com/articles/how-often-should-i-re-verify-addresses>

8 CONCLUSION

Address cleansing and geocoding are standard data quality interventions that provide a number of benefits to IIS programs.

Standardized and validated addresses allow for improved patient-level deduplication and household grouping functions as well as the potential for improved mailing success for reminder/recall notices. Geocodes can also be leveraged in a variety of ways that allow programs to view and utilize data differently.

IIS jurisdictions are encouraged to take advantage of the SmartyStreets address cleansing service offered through AIRA with no service costs. Users can also participate in monthly meetings with the Address Cleansing User Group to compare experiences with testing and implementation and to receive support and assistance in troubleshooting challenges as they arise.

Lessons learned and best practices will continue to evolve and be shared as more IIS programs expand their use of SmartyStreets and begin to reintegrate cleansed addresses and geocodes.



“I would tell new jurisdictions not to be afraid to get started. Like anything else, challenges will pop up along the way, but it is all fixable, and there is a lot of support for implementation.”

– Josh Hull, Software Developer,
Kunz, Leigh and Associates,
Michigan Care Improvement
Registry (MCIR)

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APPENDIX A CHECKLIST

The checklist below is intended to provide assistance to IIS programs in discussing the steps involved to implement address cleansing. Given the variations in IIS program structures and staffing, as well as network architecture, the order of these steps may vary. There may also be additional or alternate steps for jurisdictions to consider.

- ☐ Establish the purpose(s) for address cleansing. Does the IIS program wish to:
 - Standardize addresses
 - Confirm addresses as deliverable
 - Create and store geocodes to map patient or provider organization data
 - Other: _____
- ☐ Sign the **Partner Agreement** and receive a token for access from AIRA staff.
- ☐ Notify the IIS vendor or IT support of plans and the timeline for address cleansing implementation, if applicable.
- ☐ Read and follow SmartyStreets documentation to set up testing and plan for implementation and reintegration.
- ☐ Test SmartyStreets to become familiar with functionality, connection methods, and response codes.¹⁰
- ☐ Review IIS infrastructure for how addresses are currently processed and stored.
- ☐ Select the connection method for sending address data to SmartyStreets.



¹⁰ SmartyStreets demo page: <https://smarystreets.com/#buyer-type-section>

- ☐ Establish business rules to operationalize the address cleansing decisions made by the IIS program, to include:
 - What unique identifier the IIS will use or generate to match the cleansed address back to the correct patient when multi-record batches are sent to SmartyStreets
 - Under what condition(s) the IIS accepts or rejects the cleansed address
 - The SmartyStreets response codes the IIS will capture and store
 - The process to flag uncleansed or inactive addresses in the database
 - The schedule and process for address data submission and reintegration
 - Decisions that assist with the consolidation of patient records, borrowed from the **MIROW document** and referenced in the Consolidate Records section of this document
- ☐ Prepare the IIS to accept cleansed addresses, geocodes, and other fields from SmartyStreets that the jurisdiction has deemed essential to capture and store.
- ☐ Include response fields that might not be utilized immediately, such as longitude and latitude.
- ☐ Follow SmartyStreets on social media, blog posts, and web pages to learn about widespread operational changes. To subscribe to updates, visit the SmartyStreets Status Page¹¹ and click on "SUBSCRIBE TO UPDATES."
- ☐ Participate in the Address Cleansing and Geocoding User Group to share lessons learned and hear from other jurisdictions that are using SmartyStreets.

¹¹ SmartyStreets status page: <http://status.smartystreets.com/>



APPENDIX B SMARTYSTREETS METADATA

Metadata fields provide additional detailed information about the address. Visit the SmartyStreets website for more information about address metadata and other response fields.¹²

	SMARTYSTREETS FIELD NAME	DEFINITION
Address Record Type	record_type	<p>Indicates the type of record that was matched. Given only if a DPV match is made.</p> <ul style="list-style-type: none"> • F – Firm; the finest level of match available for an address. • G – General Delivery; for mail to be held at local post offices. • H – High-rise; address contains apartment or building sub-units. • P – Post Office Box; address is a PO Box record type. • R – Rural Route or Highway Contract; may have box number ranges. • S – Street; address contains a valid primary number range. • [blank] – No record type because address did not make a valid DPV match.
ZIP Code Type	ZIP_type	<p>Indicates the type of ZIP code for the address that was matched. Given only if a 5-digit match is made.</p> <ul style="list-style-type: none"> • Unique – The ZIP code consists of a single delivery point, pertaining to a USPS customer (like a large business or government agency) that routes all of its own mail internally. • Military – The ZIP code pertains to military units and diplomatic organizations, often in foreign locations. • POBox – The ZIP code is assigned to a collection of Post Office Boxes. • Standard – The ZIP code does not pertain to any of the above categories.
County FIPS Code	county_fips	The 5-digit county Federal Information Processing Standards (FIPS) code. It is a combination of a 2-digit state FIPS code and a 3-digit county code assigned by the National Institute of Standards and Technology (NIST).
County Name	county_name	Name of the county in which the address is located.
Carrier Route	carrier_route	The postal carrier route for the address.
Congressional District	congressional_district	The congressional district to which the address belongs. Output will be two digits, 01-53, or "AL." "AL" means the entire state (or territory) is covered by a single congressional district.

¹² <https://smartystreets.com/docs/cloud/us-street-api#metadata>

	SMARTYSTREETS FIELD NAME	DEFINITION
Building Default Indicator	building_default_indicator	Indicates whether the address is the “default” address for a building; for example, the main lobby. <ul style="list-style-type: none"> • Y – Yes • N – No
Residential Delivery Indicator	rdi	Residential Delivery Indicator (residential or commercial) <ul style="list-style-type: none"> • Residential – The address is a residential address. • Commercial – The address is a commercial address. • [blank] – This happens when the address is invalid or SmartyStreets does not have enough information to ascertain RDI status. The SmartyList tools translate a [blank] RDI value to “Unknown.” Note: PO Boxes are always marked as “Residential.”
Enhanced Line of Travel (eLOT) Sequence	elot_sequence	The 4-digit eLOT sequence number.
eLOT Sort	elot_sort	eLOT was developed to allow mailers the ability to sort their mailings by line of travel sequence. <ul style="list-style-type: none"> • A – Ascending • D – Descending • [blank] – Address not submitted for eLOT
Latitude	latitude	The horizontal component used for geographic positioning. It is the angle between 0° (the equator) and ±90° (north or south) at the poles. It is the first value in an ordered pair of (latitude, longitude).
Longitude	longitude	The vertical component used for geographic positioning. It is the angle between 0° (the Prime Meridian) and ±180° (westward or eastward). It is the second number in an ordered pair of (latitude, longitude).
Precision	precision	Indicates the precision of the latitude and longitude values. <ul style="list-style-type: none"> • Unknown – Coordinates not known, possibly because address is invalid. • None – Coordinates are not provided for this address. Military addresses such as APO, FPO, and DPO do not provide coordinates. • State – Reserved for future use. • SolutionArea – Reserved for future use. • City – Reserved for future use. • ZIP5 – Accurate to a 5-digit ZIP code level (least precise). • ZIP6 – Accurate to a 6-digit ZIP code level. • ZIP7 – Accurate to a 7-digit ZIP code level. • ZIP8 – Accurate to an 8-digit ZIP code level. • ZIP9 – Accurate to a 9-digit ZIP code level (most precise but NOT rooftop level). • Structure – Reserved for future use.

	SMARTYSTREETS FIELD NAME	DEFINITION
Time Zone	time_zone	Indicates the common name of the time zone associated with the address. Valid Responses: <ul style="list-style-type: none"> Alaska, Atlantic, Central, Eastern, Hawaii, Mountain, None, Pacific, Samoa, UTC+9, UTC+10, UTC+11, UTC+12
Universal Time Coordinated (UTC) Offset	utc_offset	Indicates the number of hours the time zone is offset from Universal Time Coordinated (UTC), the international time standard, also known as Greenwich Mean Time (GMT). Valid Responses: <ul style="list-style-type: none"> -11, -10, -9, -8, -7, -6, -5, -4, 0, 9, 10, 11, 12
Daylight Saving Time Observation	dst	Indicates if the time zone “obeys,” or, in other words, adjusts its clocks forward and back with the seasons. This information is particularly useful to determine time in other time zones with areas that may or may not use daylight saving time—for example, Arizona, Hawaii, and Indiana. <ul style="list-style-type: none"> true – Time zone observes daylight saving time. If dst is absent from the response, then the time zone does not observe daylight saving time.



APPENDIX C SMARTYSTREETS ANALYSIS CODES

Analysis fields provide a deeper breakdown on address deliverability, such as whether an address is active or vacant and how that determination was made.

These codes also detail how SmartyStreets altered the address to make it valid and standardized (e.g., fixed city/state spelling). Visit the SmartyStreets website for additional information about the analysis codes and other response fields.¹³

	SMARTYSTREETS FIELD NAME	DEFINITION
Delivery Point Validation (DPV)	dpv_match_code	<p>Status of the Delivery Point Validation (DPV). This lets you know if the USPS delivers mail to the address.</p> <ul style="list-style-type: none"> • Y – Confirmed; entire address was DPV confirmed deliverable (e.g., 1600 Amphitheatre Pkwy Mountain View, CA) • N – Not Confirmed; address could not be DPV confirmed as deliverable. • S – Confirmed by dropping secondary; address was DPV confirmed by dropping secondary info (apartment, suite, etc.). • D – Confirmed - Missing secondary info; the address was DPV confirmed, but it is missing secondary information (apartment, suite, etc.). • [blank] – The address was not submitted for DPV. This is usually because the address does not have a ZIP code and a +4 add-on code or the address has already been determined to be Not Deliverable (returned only as part of the XML response).
Footnotes	dpv_footnotes	<p>Indicates why the address was given its DPV value and potentially the type of ZIP code that was matched. All these footnotes have a length of 2 characters, and there may be up to 14 footnotes.</p> <ul style="list-style-type: none"> • AA – City/state/ZIP + street are all valid. • A1 – ZIP+4 not matched; address is invalid. • BB – ZIP+4 matched; confirmed entire address; address is valid. • CC – Confirmed address by dropping secondary information (apartment, suite, etc.). • F1 – Matched to military or diplomatic address.

¹³ <https://smartystreets.com/docs/cloud/us-street-api#analysis>

	SMARTYSTREETS FIELD NAME	DEFINITION
Footnotes	dpv_footnotes	<ul style="list-style-type: none"> • G1 – Matched to general delivery address. • M1 – Primary number (e.g., house number) is missing. • M3 – Primary number (e.g., house number) is invalid. • N1 – Confirmed with missing secondary information; address is valid, but it also needs a secondary number (apartment, suite, etc.). • PB – Confirmed as a PO Box street-style address. • P1 – PO, RR, or HC box number is missing. • P3 – PO, RR, or HC box number is invalid. • RR – Confirmed address with private mailbox info. • R1 – Confirmed address without private mailbox info. • R7 – Confirmed as a valid address that doesn't currently receive US Postal Service street delivery. • U1 – Matched a unique ZIP code.
Commercial Mail Receiving Agency (CMRA)	dpv_cmra	<p>Indicates whether the address is associated with a Commercial Mail Receiving Agency (CMRA), also known as a private mailbox (PMB) operator. A CMRA is a business through which USPS mail may be sent or received, for example the UPS Store and Mailboxes Etc.</p> <ul style="list-style-type: none"> • Y – Address is associated with a valid CMRA. • N – Address is not associated with a valid CMRA. • [blank] – Address was not submitted for CMRA verification.
Vacant	dpv_vacant	<p>Indicates that a delivery point was active in the past but is currently vacant (in most cases, unoccupied over 90 days) and is not receiving deliveries. This status is often obtained when mail receptacles aren't being emptied and are filling up, so mail is held at the post office for a certain number of days before the delivery point is marked vacant.</p> <ul style="list-style-type: none"> • Y – Address is vacant. • N – Address is not vacant. • [blank] – Address was not submitted for vacancy verification.
Active Address	active	<p>Indicates whether the address is active, or "in-service," according to the USPS. Examples: New developments may have addresses but will be "inactive" until somebody moves in. Or, after Hurricane Katrina, addresses in the affected area were marked as inactive for a time. Residents may also mark their own mailboxes as inactive for privacy and other reasons.</p> <ul style="list-style-type: none"> • Y – Address is active. • N – Address is inactive. • [blank] – Activity status is not known by the USPS.

	SMARTYSTREETS FIELD NAME	DEFINITION
Early Warning System Flag	ews_match	<p>Early warning system flag; a positive result indicates the street of the address is not yet ready for mail delivery and that the address will soon be added to the master ZIP+4 file in the coming weeks or months. This commonly occurs for new streets or streets undergoing a name change.</p> <ul style="list-style-type: none"> • true – The address was flagged by EWS, preventing a ZIP+4 match. • [blank] – Address was not flagged by EWS.
Footnotes	footnotes	Indicates which changes were made to the input address. Footnotes are delimited by a # character. See the footnotes table below for details.
LACSLink Reason	lacslink_code	<p>The reason for the LACSLink indication that was given (below).</p> <ul style="list-style-type: none"> • A – Match: Address provided. LACSLink record match was found, and a converted address was provided. • 00 – No Match. No converted address. • 09 – Match: No new address. LACSLink matched an input address to an old address, which is a "high-rise default" address; no new address was provided. • 14 – Match: No conversion. Found a LACSLink record but couldn't convert the data to a deliverable address. • 92 – Match: Dropped secondary number. LACSLink record was matched after dropping the secondary number from input. • [blank] – No LACSLink lookup attempted.
LACSLink Indicator	lacslink_indicator	<p>Indicates whether there is an address match in the LACSLink database.</p> <ul style="list-style-type: none"> • Y – LACS record match; a new address could be furnished because the input record matched a record in the master file. • S – LACS record - secondary number dropped; the record is a ZIP+4 street level or high-rise match. The input record matched a master file record, but the input address had a secondary number and the master file record did not. • N – No match; a new address could not be furnished; the input record could not be matched to a record in the master file. • F – False positive; a false positive record was detected. • [blank] – No LACSLink lookup attempted.
SuiteLink	suitelink_match	<p>Indicates a match (or not) to the USPS SuiteLink data. SuiteLink attempts to provide secondary information such as "suite" or "apartment" whenever there is a match based on address and Firm Name (Company) input.</p> <ul style="list-style-type: none"> • true – There was a SuiteLink match, and the result is provided. • false – There was no SuiteLink match.

APPENDIX D SMARTYSTREETS FOOTNOTES CODES

This table describes possible values in the footnotes field. In some instances, the definition below has been shortened for space considerations. Visit the SmartyStreets website for more information about footnotes and other response fields.¹⁴

	SMARTYSTREETS FIELD NAME	DEFINITION
A#	Corrected ZIP Code	The address was found to have a different 5-digit ZIP code than given in the submitted list. The correct ZIP code is shown in the ZIP code field.
B#	Fixed city/state spelling	The spelling of the city name and/or state abbreviation in the submitted address was found to be different from the standard spelling. The standard spelling of the city name and state abbreviation is shown in the City and State fields.
C#	Invalid city/state/ZIP	The ZIP code in the submitted address could not be found because neither a valid city and state nor valid 5-digit ZIP code was present.
D#	No ZIP+4 assigned	This is a record listed by the USPS as a non-deliverable location.
E#	Same ZIP for multiple	Multiple records were returned, but each shares the same 5-digit ZIP code.
F#	Address not found	The address, exactly as submitted, could not be found in the city, state, or ZIP code provided. Many factors contribute to this; either the primary number is missing, the street is missing, or the street is too misspelled for SmartyStreets to understand.
G#	Used firm data	Information in the firm line was determined to be a part of the address. It was moved out of the firm line and incorporated into the address line.
H#	Missing secondary number	ZIP+4 information indicates that this address is a building. The address as submitted does not contain a secondary (apartment, suite, etc.) number.
I#	Insufficient/incorrect address data	More than one ZIP+4 code was found to satisfy the address as submitted. The submitted address did not contain sufficiently complete or correct data to determine a single ZIP+4 code.
J#	Dual address	The input contained two addresses. For example: 123 MAIN ST PO BOX 99.
K#	Cardinal rule match	Although the address as submitted is not valid, we were able to find a match by changing the cardinal direction (north, south, east, west). The cardinal direction used to find a match is found in the components.

¹⁴ <https://smartystreets.com/docs/cloud/us-street-api#footnotes>

	SMARTYSTREETS FIELD NAME	DEFINITION
L#	Changed address component	An address component (i.e., directional or suffix only) was added, changed, or deleted in order to achieve a match.
LL# or LI#	Flagged address for LACSLink	The input address matched a record that was LACS-indicated, that was submitted to LACSLink for processing. This does not mean that the address was converted; it means only that the address was submitted to LACSLink because the input address had the LACS indicator set.
M#	Fixed street spelling	The spelling of the street name was changed in order to achieve a match.
N#	Fixed abbreviations	The delivery address was standardized. For example, if STREET was in the delivery address, SmartyStreets will return ST as its standard spelling.
O#	Multiple ZIP+4; lowest used	More than one ZIP+4 code was found to satisfy the address as submitted. The lowest ZIP+4 add-on may be used to break the tie between the records.
P#	Better address exists	The delivery address is matchable, but it is known by another (preferred) name. For example, in New York, NY, AVENUE OF THE AMERICAS is also known as 6TH AVE. An inquiry using a delivery address of 39 6th Avenue would be flagged with Footnote P.
Q#	Unique ZIP match	Match to an address with a unique ZIP code .
R#	No match; EWS: Match soon	The delivery address is not yet matchable, but the Early Warning System file indicates that an exact match will be available soon.
S#	Bad secondary address	The secondary information (apartment, suite, etc.) does not match that on the national ZIP+4 file. The secondary information, although present on the input address, was not valid in the range found on the national ZIP+4 file.
T#	Multiple response due to magnet street syndrome	The search resulted in a single response; however, the record matched was flagged as having magnet street syndrome, and the input street name components (pre-directional, primary street name, post-directional, and suffix) did not exactly match those of the record.
U#	Unofficial post office name	The city or post office name in the submitted address is not recognized by the USPS as an official last line name (preferred city name) and is not acceptable as an alternate name. The preferred city name is included in the City field.
V#	Unverifiable city / state	The city and state in the submitted address could not be verified as corresponding to the given 5-digit ZIP code.
W#	Invalid delivery address	The input address record contains a delivery address other than a PO Box, General Delivery, or Postmaster 5-digit ZIP code that is identified as a "small town default." The USPS does not provide street delivery service for this ZIP code. The USPS requires the use of a PO Box, General Delivery, or Postmaster for delivery within this ZIP code.
X#	Unique ZIP Code	Default match inside a unique ZIP code .
Y#	Military match	Match made to a record with a military or diplomatic ZIP code.
Z#	Matched with ZIPMOVE	The ZIPMOVE product shows which ZIP+4 records have moved from one ZIP code to another. If an input address matches a ZIP+4 record that the ZIPMOVE product indicates has moved, the search is performed again in the new ZIP code.

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