



CalOES NG9-1-1 GIS Data Quality Control Plan

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Contents

| | |
|---|---|
| Contents | 1 |
| References | 2 |
| ECRF, LVF and GIS-derived MSAG Error Categorization | 2 |
| Ingest Failure Errors: GIS data issues resulting in ingest failures (no provisioning) | 3 |
| Tier 1 Critical Errors: Impact on initial 9-1-1 call routing and discrepancy reporting (no provisioning)..... | 3 |
| Tier 2 Critical Errors: Transition to GIS derived MSAG | 5 |
| Tier 3 Warning-level errors: Impact on routing of call transfers | 7 |
| Tier 4 Other errors: Impact on PSAP mapping and CAD systems | 8 |
| Version tracking | 8 |

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References

| Document | Link |
|---|---|
| NENA Detailed Functional and Interface Standards for the NENA i3 Solution (NENA-STA-010.2-2016) | https://cdn.ymaws.com/www.nena.org/resource/resmgr/standards/NENA-STA-010.2_i3_Architectu.pdf |
| NENA Standards for the Provisioning and Maintenance of GIS data to ECRFs and LVFs (NENA-STA-005.1.1-2017) | https://cdn.ymaws.com/www.nena.org/resource/resmgr/standards/NENA-STA-005.1.1-2017_ECRF-L.pdf |
| NENA STA-006 NENA Standard for NG9-1-1 GIS Data Model | https://cdn.ymaws.com/www.nena.org/resource/resmgr/standards/nena-sta-006_ng9-1-1_gis_dat.pdf |
| NENA NG9-1-1 US Civic Location Data Exchange Format (CLDXF) Standard (NENA-STA-004.1.1-2014) | https://cdn.ymaws.com/www.nena.org/resource/resmgr/Standards/NENA-STA-004.1.1-2014_CLDXF.pdf |
| NENA Street Name Pre Types and Street Name Post Types registry reference | http://technet.nena.org/nrs/registry/StreetNamePreTypesAndStreetNamePostTypes.xml |
| CalOES NG9-1-1 CLDXF (Civic Location Data Exchange Format) street name parsing guidance spreadsheet | Provided via e-mail. Please reach out to CalOESTeam@geo-comm.com with questions. |

ECRF, LVF and GIS-derived MSAG Error Categorization

GIS quality control checks are intended to identify issues in the source data that may impact a variety of 9-1-1 end use systems.

The primary goal of the initial CalOES NG9-1-1 implementation is to facilitate 9-1-1 call routing. The secondary goal is to use the data for telephone record validation through the LVF and the GIS-derived MSAG.

With these goals in mind, the GIS QC checks, and the impact of errors found by them are categorized as follows in this document:

1. Provisioning Failure Errors: GIS data issues resulting in ingest failures (results in no provisioning of one or more layers)
2. Tier 1 Critical errors: Impact on initial 9-1-1 call routing and discrepancy reporting
3. Tier 2 Critical errors: Transition to GIS derived MSAG
4. Tier 3 Warning-level errors: Impact on routing of call transfers
5. Tier 4 Other errors: Impact on PSAP mapping and CAD systems

GIS Data Hub is configurable to stop GIS data that exceeds certain quality control check error thresholds from provisioning to the SI (Spatial Interface) and ultimately to the ECRFs, LVFs and the GIS derived MSAG.

Notes: This document may continue to evolve based on feedback from regional vendors and work with the GIS Task force and CalOES teams. Document change tracking is included at the end of the document.

Ingest Failure Errors: GIS data issues resulting in ingest failures (no provisioning)

Specific GIS data issues can result in ingest failures, resulting in a hold on provisioning data to the ECRF and LVF, and GIS derived MSAG. GIS data submitters will be notified immediately, so that corrective action can be taken, and new data uploaded as soon as possible if an ingest failure occurs.

| Issue | Effect on provisioning of GIS data to ECRF and LVF | QC Check Result Name |
|--|--|---|
| Corrupt data in a file geodatabase | Causes ingestion failure and no GIS data will proceed to quality control process or provisioning to ECRF and LVF. | This is not a QC check, but halts processing of data if any corruption is detected. User will be notified via email if corruption is detected, and another dataset will need to be uploaded. |
| Data schema changes without prior notification | Causes ingestion failure and no GIS data for the affected layer will proceed to quality control process or provisioning to ECRF and LVF. Schema changes require a "Pause" of processing and a notification to the GeoComm team to make needed field mapping changes. | This is not a QC check, but halts processing of data if a schema change is detected without prior notification. User will be notified via email if this is detected, and another dataset may need to be uploaded. |

Tier 1 Critical Errors: Impact on initial 9-1-1 call routing and discrepancy reporting (no provisioning)

Failure of these quality control checks will halt provisioning to the ECRF. A threshold is configured to control provisioning of data with any errors in this tier.

As each county passes all tier 1 critical error checks, the data for that county will be updated in the statewide dataset that is provisioned to the ECRFs. Regular county road centerline data submissions are expected to continue to pass all tier 1 error checks. Introduction of new tier 1 critical errors will not allow new data to be provisioned to the ECRF. These errors need to be resolved as quickly as possible for updates to continue to be provisioned.

| Issue | Effect on call routing or discrepancy reporting | QC Check Result Name |
|---|---|----------------------|
| Complex geometry on road centerlines layer features | Nonstandard geometry (self-intersecting, curve, surface, multcurve, multi-surface) is simplified in the ingest process, which may introduce alignment issues between boundaries and road centerlines that are not visible in the source data. | ComplexGeometryGp |

| Issue | Effect on call routing or discrepancy reporting | QC Check Result Name |
|---|--|---|
| Features containing a vertex count higher than 1,000,000 per feature | Causes ingestion failure and no GIS data for the affected layer will proceed to quality control process or provisioning to ECRF and LVF. | ComplexGeometry |
| NG9-1-1 Unique ID (NGUID) population in every layer | Unique IDs should be unique throughout entire dataset. This allows for a full reporting feedback loop using unique ID for reference back to the GIS data submitter. For data ingestion, the minimum requirement is a unique identifier within each layer. Recommended naming conventions can be found in the NENA Data Model (referenced above). These include domains and layer names to ensure the ID is unique in the statewide dataset. | Null Value in Field (ColumnNotEmptyGp) |
| Invalid geometry in any layers | Causes ingestion failure and no GIS data for the affected layer will proceed to quality control process or provisioning to ECRF and LVF. | EmptyGeometryGP |
| Multi Part RCL | The check identifies multipart features in the road centerline layer, which are generally not intentional and are therefore not accepted into ECRF and LVF applications. | Multipart Geometry Summary |
| Missing CLDXF compliant attributes in the road centerline layer | Mandatory 100% CLDXF compliant attribute population in the road centerlines. All fields identified as mandatory in the CLDXF standard are required to be populated. The OSP records are entered with legacy street names, then matched to the CLDXF street names utilizing the GIS data which are in turn utilized to populate the Location Database (LDB) where the Originating Service Provider (OSP) telephone records are stored for use during a 9-1-1 call. | Null Value in Field (St_Name) |
| Missing attributes in the legacy street name component field of the road centerline layer | Mandatory 100% populated in the road centerlines. The OSP records are entered with legacy street names, then matched to the CLDXF street names utilizing the GIS data which are in turn utilized to populate the Location Database (LDB) where the Originating Service Provider (OSP) telephone records are stored for use during a 9-1-1 call. | Null Value in Field (LSt_Name) |
| Acceptable values in CLDXF street name components of the road centerline layer (St_PreMod, St_PreDir, St_PreTyp, St_PreSep, | The attributes in these fields follow the NENA Standard for NG9-1-1 GIS Data Model NENA-STA-006.1.1-2020, which is CLDXF compliant. A CLDXF guidance document was created by the CalOES NG9-1-1 task force. | Acceptable Values – see CalOES NG9-1-1 CLDXF street name parsing guidance spreadsheet |

| Issue | Effect on call routing or discrepancy reporting | QC Check Result Name |
|--|--|---|
| St_Name, St_PosTyp, St_PosDir, St_PosMod) | | |
| Road centerlines not broken at PSAP boundary polygons | Addresses found in road centerline ranges at the beginning or end of a road segment that crosses the PSAP boundary may route to the incorrect PSAP. GeoComm will make the PSAP boundary layer available to each county to use for reference, and to receive feedback on change needed. | FeatureNotBrokenAtPoly |
| <i>Invalid or missing ServiceURN attribute in PSAP boundary layer polygons</i> | <i>Area covered by this feature cannot be identified as a service boundary to which a 9-1-1 call can be routed.</i> | <i>GeoComm responsibility to attribute and provision the PSAP Boundary layer.</i> |
| <i>Invalid or missing ServiceURI attribute in PSAP boundary layer polygons</i> | <i>Area covered by this feature cannot be used to route a call to a PSAP, and the call will be routed based on default policy routing rules.</i> | <i>GeoComm responsibility to attribute and provision the PSAP Boundary layer.</i> |
| <i>Gaps / Overlaps in the provisioning boundary layer polygons</i> | <i>Quality control checks confirm that the Provisioning boundary has no overlaps or unintentional gaps and ensure no features in the road centerline and Site/Structure address point layers fall outside the individual GIS data submitter's provisioning boundary.</i> | <i>GeoComm responsibility to attribute the Provisioning Boundary layer.</i> |
| <i>Unintentional overlaps or gaps in PSAP boundary layer polygons</i> | <i>The PSAP boundaries must create a seamless coverage of the State's NG9-1-1 coverage area. Overlaps or gaps in the PSAP layer will cause any call located within that overlap or gap to default route to a PSAP specified in the policy routing rules.</i> | <i>GeoComm responsibility to attribute and provision the PSAP Boundary layer.</i> |

Tier 2 Critical Errors: Transition to GIS derived MSAG

Any failure of tier 2 critical error quality control checks will delay the GIS derived MSAG creation and transition from the tabular MSAG maintained by the County Coordinators in WebDBMS.

On a monthly basis, county GIS departments will need to work with their County Coordinator to receive their county's ALI database. Once received, the county GIS department will need to do a few things with the database to ensure successful synchronization checks are run against the GIS data, and a GIS derived MSAG can be created.

1. This ALI database needs to be included with the GIS data submission to GIS Data Hub to receive ALI to GIS data synchronization results. The ALI database table needs to be imported into the file geodatabase that is then zipped up and submitted to GIS Data Hub.
2. The ALI database synchronization with the road centerline layer needs to reach above 98% and critical errors need to be zero for a county's GIS data to be considered ready for the transition from a tabular MSAG to a GIS derived MSAG.

3. Planning discussions for this transition will begin once a county reaches the required synchronization, zero critical errors and regularly submits GIS data to GIS Data Hub.

As each county passes critical error checks, the data for that county will be updated in the statewide dataset (tier 1) and will be used to create a GIS derived MSAG (tier 2).

After the transition to a GIS derived MSAG, the regular submissions need to remain free of critical errors in all layers. It is particularly important that the road centerlines are updated and submitted frequently as road changes occur to ensure no ALI database records are orphaned. Introduction of new tier 1 or tier 2 critical errors will stop the MSAG delta creation process until all tier 1 and tier 2 errors are resolved again.

After the initial transition, all tier 1 and tier 2 errors need to be resolved within 24-hours after a county receives notification of critical errors, to allow for ongoing GIS derived MSAG maintenance.

County Coordinators will receive MSAG change (MSAG delta) notifications via WebDBMS on a daily basis. This information should be used to communicate to the county GIS department any needed GIS data changes to maintain MSAG and GIS data synchronization during the transition period when both tabular MSAG and GIS derived MSAGs will need to be maintained. The GIS data updates and subsequent upload to GIS Data Hub will ensure that a GIS derived MSAG delta can be generated to match the County Coordinator create MSAG change request.

Following the transition to full use of a GIS derived MSAG, the tabular MSAG will no longer need to be maintained separately by the County Coordinator. If a needed GIS derived MSAG change is not received within 24 hours through the GIS Data Hub submission process, then 911 Datamaster will add a non-spatially generated placeholder record into the MSAG database until the road centerlines are updated by and uploaded to GIS Data Hub by the county GIS department.

| Issue | Effect on reporting or map display | QC Check Result Name |
|-------------|--|-----------------------------|
| MSAG to RCL | <p>The MSAG to RCL Synchronization quality control check is needed to more easily identify areas that are covered in the MSAG but are not covered in the RCL. This in turn impacts the creation of a GIS-derived MSAG.</p> <p>QC Fallout:</p> <ul style="list-style-type: none"> • Low and High range of the MSAG record not matching road centerlines attributes, including street names, range, and MSAG community and ESN refining attributes. • Street name elements in the MSAG record (Prefix Directional, Street Name, Street Suffix, Post Directional) not matching road centerlines Legacy street name fields (Legacy Sreet Name Pre Directional, Legacy Street Name, Legacy Street Name Type, Legacy Street Name Post Directional) | MSAG to RCL Synchronization |
| ALI to RCL | <p>Compares the list of ALI database addresses against the road centerlines and reports if any addresses do not match a unique road name, range, ESN and MSAG community. The goal is to check if all the addresses are covered in the roads to ensure that 9-1-</p> | ALI to RCL Synchronization |

| Issue | Effect on reporting or map display | QC Check Result Name |
|---|---|------------------------|
| | <p>1 calls from a landline will find a match and route to the designated PSAP. ESN and MSAG community information are used for refinement purposes. An above 98% synchronization between ALI database records and road centerlines is required to transition a county to the GIS derived MSAG.</p> <p>QC Fallout:</p> <ul style="list-style-type: none"> • Specific failure information – criteria causing ALI record to fail, such as street names not matching, ALI record house number not found in centerline ranges, or addresses matching in different ESNs or MSAG communities. | |
| Missing ESN and/or MSAG community values in road centerlines | Populate mandatory values: ESN, MSAG community Needed for GIS derived MSAG and for MSAG Conversion Service data reference | Null Value in Field |
| Address range overlaps on features in the road centerline layer | Address range overlaps may result in a landline telephone record finding a match in two different locations. It would also generate overlapping GIS derived MSAG ranges, which are not acceptable. | Address Ranges Overlap |

Tier 3 Warning-level errors: Impact on routing of call transfers

| Issue | Effect on call transfer | QC Check Result Name |
|--|--|-------------------------------|
| Duplicate address attributes on features in the Site/Structure Address Point layer | Duplicate address attributes on different point features found in the same MSAG community and ESN causes ambiguity in exact location of an address. This can affect a call transfer if the addresses fall within different emergency service boundary polygons. | DuplicateRecords |
| Road centerline features not broken at emergency service boundary layer polygons. | Addresses found in road centerline ranges at the beginning or end of a road segment where it crosses an emergency service boundary may affect a call transfer to the incorrect emergency service responder or secondary PSAP. | FeatureNotBrokenAtPoly |
| Missing CLDXF compliant attributes in the Site/Structure address point layer | <p>Mandatory 100% CLDXF compliant attribute population in the Site/Structure address point layers. All fields identified as mandatory in the CLDXF standard are required to be populated.</p> <p>The OSP records are entered with legacy street names, then matched to the CLDXF street names utilizing the GIS data which are in turn utilized to</p> | Null Value in Field (St_Name) |

| Issue | Effect on call transfer | QC Check Result Name |
|--|---|---|
| | populate the Location Database (LDB) where the Originating Service Provider (OSP) telephone records are stored for use during a 9-1-1 call. | |
| Missing attributes in the legacy street name component field of the Site/Structure address point layer | Mandatory 100% populated in the Site/Structure address point layers for call routing use. | Null Value in Field (LSt_Name) |
| Acceptable values in CLDXF street name components of the Site/Structure address point layer (St_PreMod, St_PreDir, St_PreTyp, St_PreSep, St_Name, St_PosTyp, St_PosDir, St_PosMod) | The attributes in these fields follow the NENA Standard for NG9-1-1 GIS Data Model NENA-STA-006.1.1-2020, which is CLDXF compliant. A CLDXF guidance document was created by the CalOES NG9-1-1 task force. | Acceptable Values – see CalOES NG9-1-1 CLDXF street name parsing guidance spreadsheet |
| <i>Invalid or missing ServiceURN attribute in emergency service boundary layer polygons</i> | <i>Areas covered by this feature cannot be identified as a service boundary for a specific response type.</i> | <i>GeoComm responsibility to attribute and provision the Secondary PSAP Boundary layer.</i> |
| <i>Invalid or missing ServiceURI attribute in emergency service boundary layer polygons</i> | <i>Areas covered by this feature cannot be used to determine a transfer route of a call to a specific responder, and the call will be routed based on responder default policy routing rules.</i> | <i>GeoComm responsibility to attribute and provision the Secondary PSAP Boundary layer.</i> |

Tier 4 Other errors: Impact on PSAP mapping and CAD systems

These types of errors may impact the error reporting loop, CAD or PSAP mapping.

| Issue | Effect reporting or map display | QC Check Result Name |
|--------------------------|--|----------------------|
| Road centerline topology | Road centerlines not broken and snapped at true intersections will affect vehicle routing. | RCL_TopologySnapping |

Version tracking

| Change made | Date changed | Owner |
|---|--------------|--|
| Original document | 2/12/2020 | Jessica Beierman with input from Lisa Henderson and Deb Rozeboom |
| First revision and initial distribution version to CalOES | 11/16/2020 | CalOES GIS team |

| Change made | Date changed | Owner |
|--|--------------|-----------------|
| Second revision for initial distribution to all GIS Task Force members | 3/2/2021 | CalOES GIS team |

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