

Boundary and Annexation Survey (BAS) Processing and Updates

Agenda

- BAS Overview and Schedule
- BAS Product Creation and Mail-out
 - Universe and address extracts
 - GUPS, shapefiles, paper maps, data extracts
- Preprocessing
- Processing and Verification
 - File review
 - Legal change and geographic relationship change documentation
- Digitizing and Initial QA
 - BAS Updates in MAF/TIGER
 - BAS Quality Assurance
 - Geographic Area Checks
- Final QC
- Closeout
 - Data Archiving and Lessons Learned

What is BAS?

- Annual, voluntary survey to collect legal status and boundary updates for tribal, state, and local governments.
- Boundary updates submitted as part of the BAS must be legally in effect on or before January 1st of each BAS year.
- Boundary updates submitted by March 1st are reflected in the ACS and PEP data.
- Boundary updates submitted by May 31st are reflected in the following year's BAS materials (digital files and paper maps).

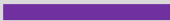

Why Conduct BAS?

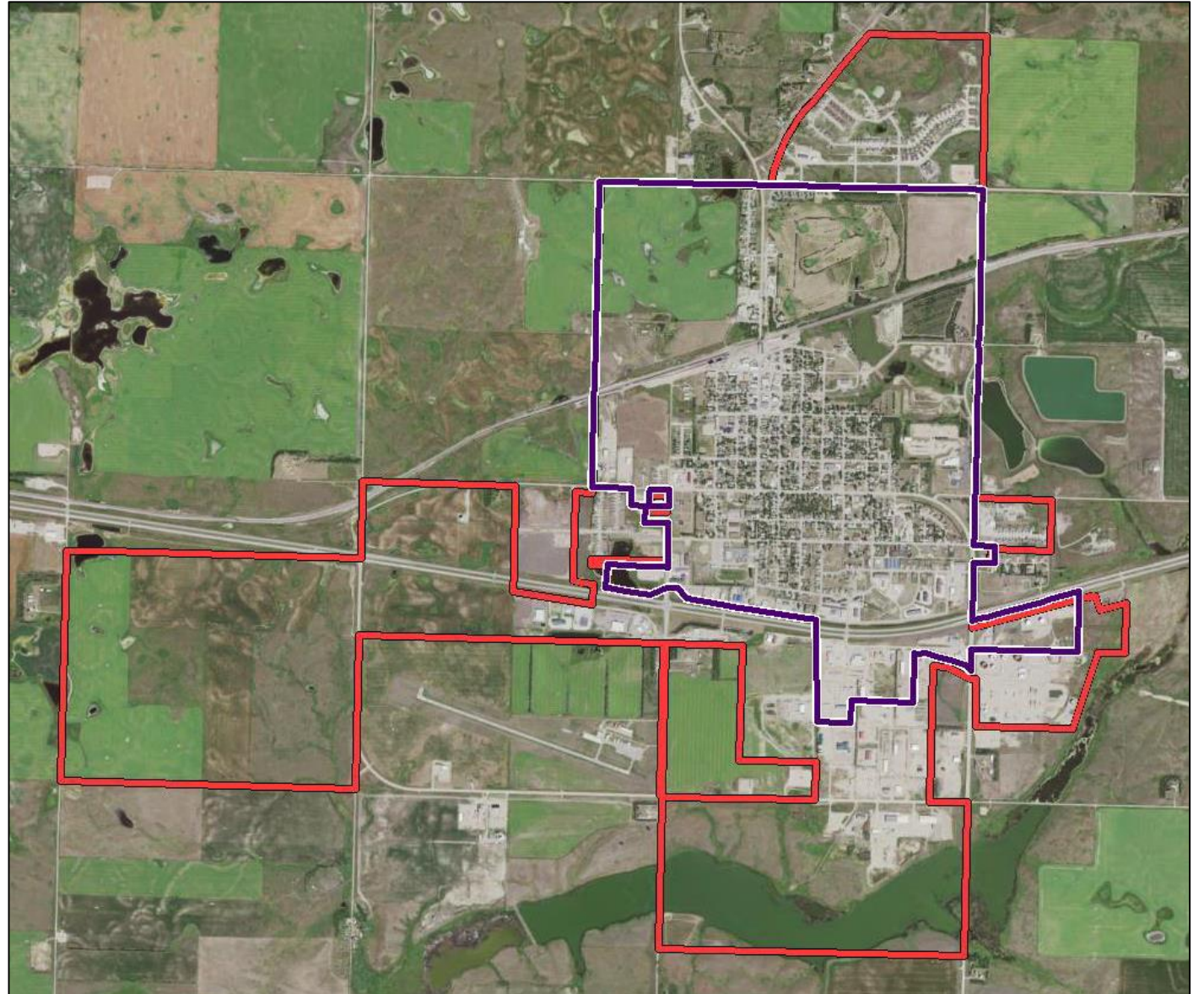
- Support the Office of Management and Budget (OMB) Circular No. A-16:
 - Collecting and maintaining boundaries for legal areas.
 - Geo.data.gov.
 - The National Map <http://nationalmap.gov/>
- Accurate boundaries collected through the BAS improve:
 - ACS data estimates.
 - PEP data estimates.
 - Decennial census data estimates.
- Helps determine how more than \$675 billion in federal funds are distributed each year.
- These data estimates provide important information for community planning and decision-making:
 - Education
 - Housing
 - Health care services
 - Services for the elderly

Boundary Discrepancies

Entity's Participation Status:

2017 BAS: No Changes
2016 BAS: No Response
2015 BAS: No Response

 Census Bureau's TIGER data
 Partner source data



State Agreements

- Available to states that enforce laws requiring local governments to report boundary changes to a state level agency.
- Two agreement types:
 - Reports boundary changes to the annual BAS for all entities within its jurisdiction.
 - State provides Census Bureau with list of local governments that reported changes to the state.
- State participation improves the BAS process:
 - Reduces duplication of effort in collecting information.
 - Reduces the burden and cost on local governments.
 - Improves the completeness of boundary data collected.

Consolidated BAS (CBAS) Agreements

- The county government responds to the BAS for the governmental units within their jurisdiction.
- County agreement does not require every entity to sign up.
- County participation improves the BAS process by:
 - Reduces duplication of effort in collecting information.
 - Reduces the burden and cost on local governments.
 - Improves the completeness of boundary data collected.

State Certification

- Governor-appointed State Certifying Official (SCO) reviews information that local governments reported during previous BAS years.
 - Legal boundary changes (annexations and deannexations).
 - Functional status of governments.
 - Legal names of governmental units.
- Depending on state laws, SCOs can certify or reverse reported legal boundary changes.
- Local government officials are informed of all reversals and encouraged to resolve with the SCO and Census through the BAS.

Legal Disputes

- If it comes to our attention that an area of land is in dispute between two or more jurisdictions, we will not make boundary changes until the parties come to a written agreement, or there is a documented final court decision regarding the matter/dispute.

BAS Website

United States Census Bureau

U.S. Department of Commerce | Blogs | Index A-Z | Glossary | FAQs

Search

Topics: Population, Economy | Geography: Maps, Products | Library: Infographics, Publications | Data: Tools, Developers | Surveys/Programs: Respond, Survey Data | Newsroom: News, Blogs | About Us: Our Research

Census.gov > Our Surveys & Programs > Boundary and Annexation Survey (BAS)

Boundary and Annexation Survey (BAS)

About this Survey: The U.S. Census Bureau conducts the Boundary and Annexation Survey (BAS) annually to collect information about selected legally defined geographic areas. The BAS is used to update information about the legal boundaries and names of all governments.

Information for Respondents

Events: Read More

Geographies

Guidance for Geography Users

Library

News & Updates

Technical Documentation

What is BAS? | How to Get Started | BAS Schedule

Latest

Methodology | Geographies | Mapping Tools | Updates

BAS Annual Response: Boundary and Annexation Survey Annual Response Information.

Feb 15, 2017 21:31 UTC (Eastern+5)

United States | World

U.S. Population: 324,546,161

COMPONENTS OF POPULATION CHANGE

One birth every 8 seconds

2019 BAS Schedule

Activity	Date(s)
CBAS Outreach	July-September 2018
Annual Response Emails and Letters	January 2019
Non-Response Follow-up Emails	February 15, 2019
BAS submission deadline for inclusion in ACS and PEP	March 1, 2019
State Data Center and National Processing Center non-response follow up	March-April 2019
BAS submission deadline for inclusion in 2019 BAS materials	May 31, 2019

2019 BAS – What's New?

- BAS partner toolbox for ArcGIS
- Additional Consolidated BAS (CBAS) agreements
- Integration with VTD-Verification
- Workshops and webinars
- 2020 BAS
 - Boundary validation program (BVP)
 - Initial and Final Phases
 - GUPS BVP module

BAS Product Creation

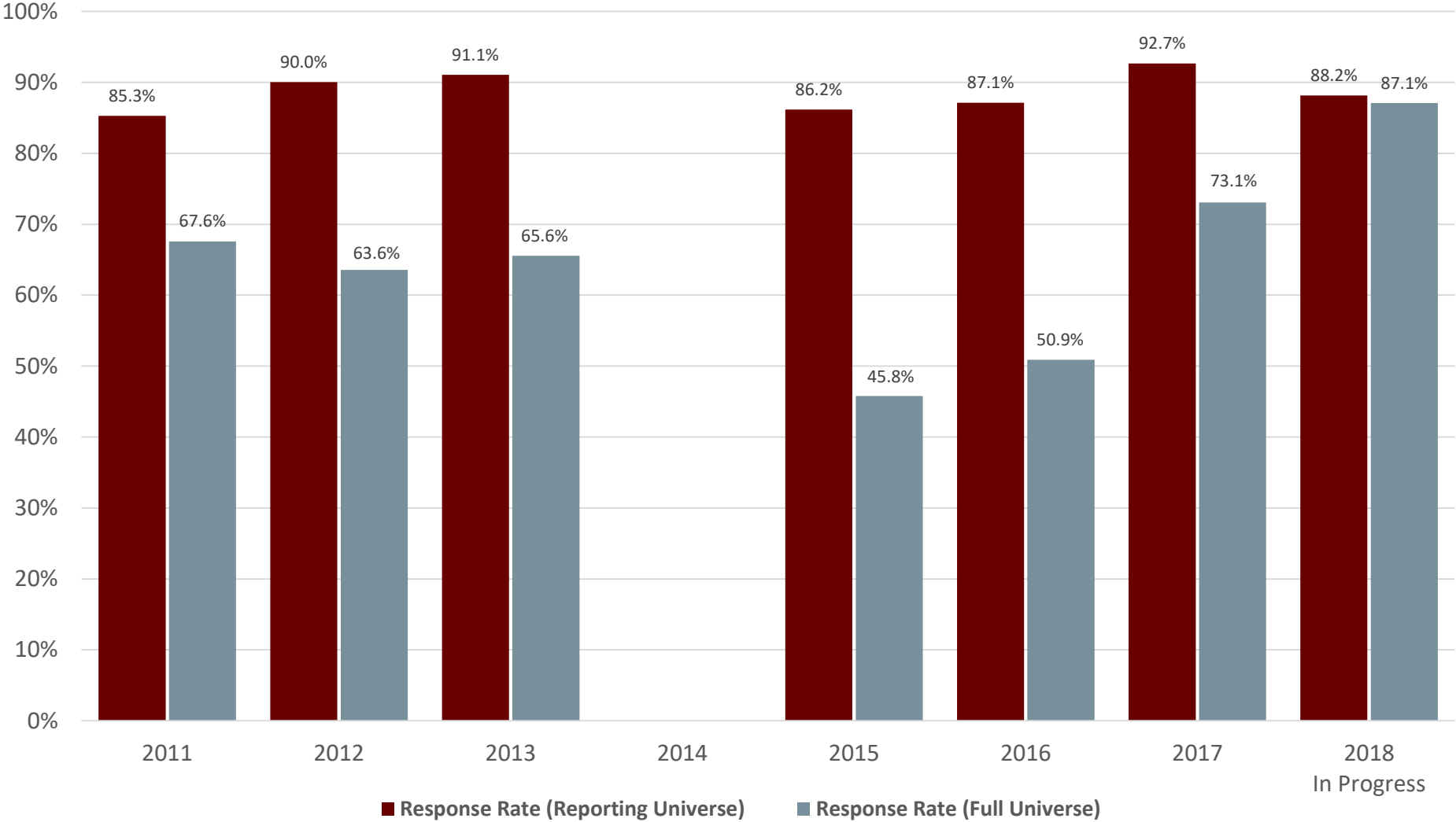
- Universe File
 - List of all governments eligible for the BAS
- Address File
 - BAS and HEO contact information for all governments eligible for the BAS
- BAS Letters, Emails, Forms, etc.
 - The universe and address files are used as the base for all BAS materials

Secure Web Incoming Module (SWIM)

- Provides participants with a secure way to upload data to the Census Bureau.
- Supports nine geographic programs.
- Participants have uploaded over 19,000 files to the Census Bureau via SWIM since 2015.

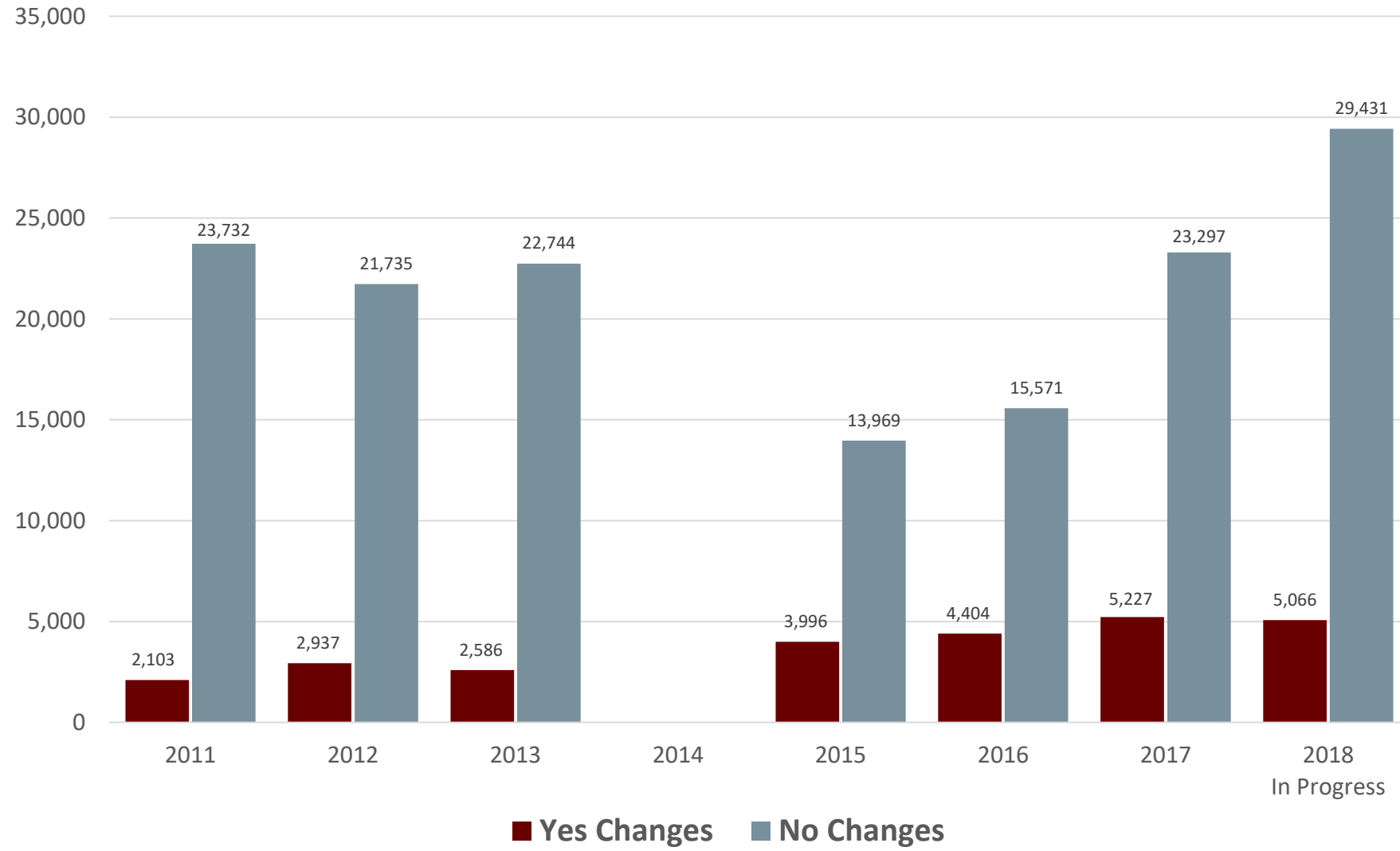
BAS Response Rate (2011-2018)

(Percentage of Governments Responding)



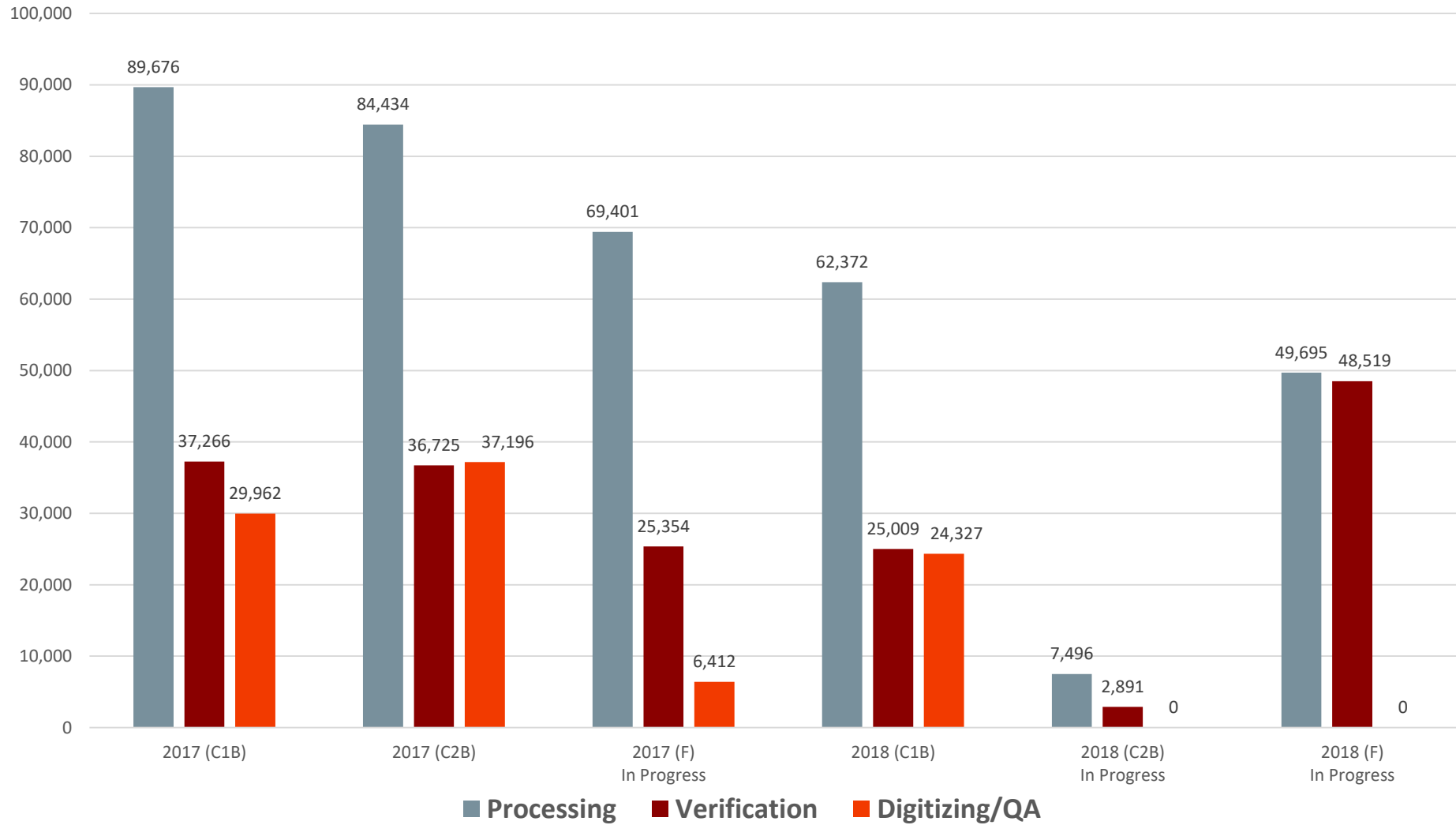
BAS Responses (2011-2018)

(Number of Governments)



BAS Processing and Updates (2017-2018)

(Number of Transactions)



BAS Preprocessing

- Staff records return date in BAS control system and creates text file.
- Scripts retrieve files submitted through SWIM and create standardized geodatabase and map template for processing and verification.
- Feedback sent to participants that provide whole entity files or other unusable returns.
- Log file documenting contents of submission created.

Digital Submission Return : 03/01/2018	James Bond ID : cleme309	Swim ID : <input type="text"/>	Move to Cycle2 : <input type="text"/>
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The screenshot displays three windows related to the BAS preprocessing workflow:

- Python 2.7.10 Shell:** Shows the execution of a script. The prompt is "Enter a BAS ID, or comma separated list of BAS IDs (with no spaces):".
- log.txt - Notepad:** Contains a log entry for a digital submission. It lists affected counties (e.g., 29209, 22111, 22027, etc.), a shapefile path, and a list of missing fields such as STATEFP, PLACEFP, NAMEFP, and AREA. It also lists layer names in GDB.
- File Explorer:** Shows a folder structure for a geodatabase. The path is 21 > 12100001000 > DB12100001000.gdb > benchmark > bas_*. The files include bas_aial, bas_arealm, bas_cdp, bas_concity, bas_county, bas_cousub, bas_edges, bas_offset, bas_place, bas_pointlm, bas_water, submission, bas18_12100001000_changes_inplace, bas18_12100001000_changes.shp, DB12100001000.mxd, and log.txt.

BAS Processing

- Updating the BAS control system
 - Entering processing dates, reviewing for duplicate submissions, checking for suspense records, determining types of changes
- Reviewing log file
 - Legal changes missing documentation (ordinance numbers, effective dates, authorization types)

BAS 2018 Digital Processing and Verification				
BAS Entity ID	GPP Entity ID	ST	Entity Name	ES
7050000000	ST05	AR	Arkansas	A
Paper returned: N NPC Hold? N Suspense? N				
Entity Reporting Adjacencies: N - NO Select Affected Adjacencies # of Selected Adjacencies 0				
Entity Reported Status: C - Change (requiring digitizing)				
Digital Agency reported by:				
Entity Response Method: Digital Changes affect tribal area? N Changes affect Coextensive School District? N				
IntraNETIX Created Date: <input type="text"/> IntraNETIX Posted Date: <input type="text"/> Digitizing Method: M - Manual				
GCAT Required?: Y GCAT keyed: 04/04/2018 GCN required? N GCN created: <input type="text"/>				
Change type: All Boundaries				
Processing: Start Date 03/22/2018 Complete Date 03/30/2018 Time 20 # of Changes 196 James Bond ID panac001				
Verification: Start Date 04/02/2018 Complete Date 04/04/2018 Time 5 # of Changes 138 # of Errors 12 James Bond ID moebi001				
Change type: <input type="text"/>				
Processing: Start Date <input type="text"/> Complete Date <input type="text"/> Time <input type="text"/> # of Changes <input type="text"/> James Bond ID <input type="text"/>				

```

log.txt - Notepad
File Edit Format View Help
7050000000
Submission Type:
DIGITAL
Affected counties:

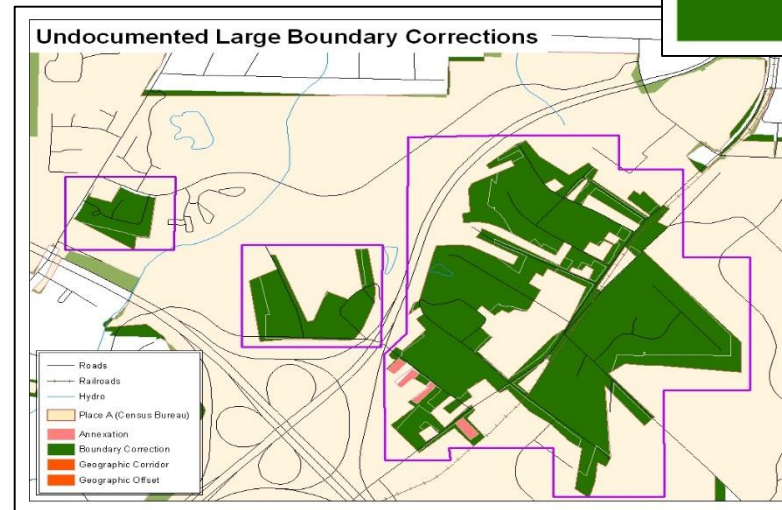
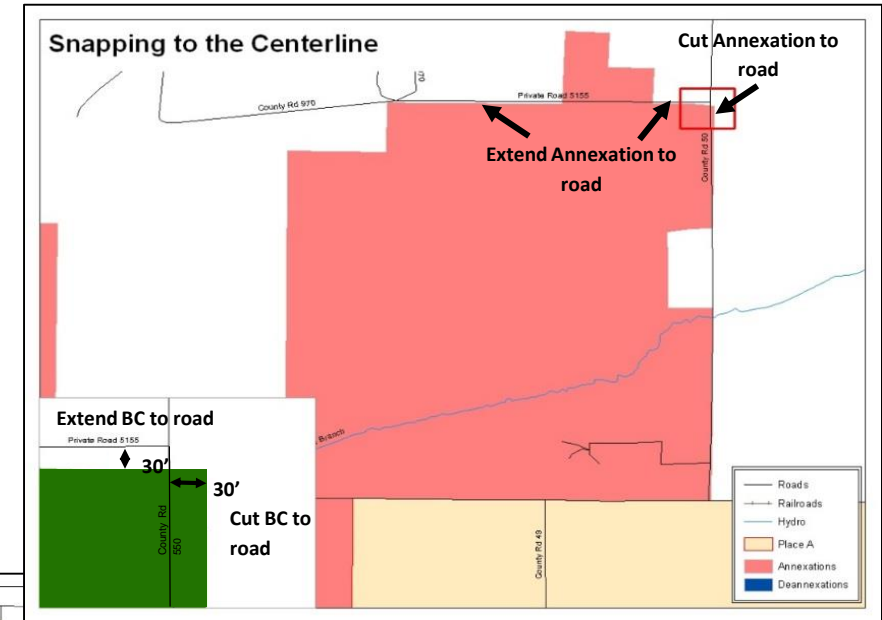
29209, 22111, 22027, 05055, 05147, 05145, 05029, 05137, 05113, 05085, 05019, 05049, 05083, 05091,
05001, 05015, 05141, 05071, 05129, 05051, 05069, 05079, 05121, 05065, 05127, 05105, 05031, 0502
3, 05059, 05027, 05103, 05149, 05095, 05093, 05143, 05101, 05013, 05037, 05107, 05047, 05033, 050
67, 05021, 05045, 05005, 05081, 05009, 05041, 05123, 05097, 05135, 05061, 05099, 05119, 05053, 05
007, 05087, 05039, 05025, 05035, 05073, 05125, 05115, 05089, 05117, 05011, 05109, 05139, 05131, 0
5075, 05111, 05057

==Shapefile Summary=====
Shapefile:
\\batch4.ditd.census.gov\mtdata012_legalareas\BAS\Digital_BAS_2018\processing
\05\7050000000\bas18_10500008260_return\bas18_10500008260_return.shp
Change Type:
inplace
Expected field(s) missing:
Field "STATEFP" was missing, you will need to populate this field.
Field "PLACEFP" was missing, you will need to populate this field.
Field "NAMELSAD" was missing, you will need to populate this field.
Field "AREA" was missing, you will need to populate this field.
Layer name in GDB:
bas18_7050000000_changes_inplace
    
```

BAS Processing

- Spatial and Attribute Review

- Attribute checker results
- Undocumented legal changes
- Contacting participant to obtain missing documentation, ask questions about return, etc.
- Boundary to feature relationships
- Snapping
- Flagging changes for deletion
 - Slivers, etc.



```
attribute_check_inplace.txt - Notepad
File Edit Format View Help
File: bas18_70500000000_changes_inplace
Change type: inplace

STATEFP field is present and the correct type and length
PLACEFP field is present and the correct type and length
NAME field is present and the correct type and length
NAMESAD field is present and the correct type and length
CHNG_TYPE field is present and the correct type and length
EFF_DATE field is present and the correct type and length
AUTHTYPE field is present and the correct type and length
DOCU field is present and the correct type and length
AREA field is present and the correct type and length
RELATE field is present and the correct type and length

FID | Problem
1 unexpected RELATE value for legal change
2 unexpected RELATE value for legal change
3
4 unexpected RELATE value for legal change
5
6
7
8
9
10
11 unexpected RELATE value for legal change
12
13
14
15 unexpected RELATE value for legal change
16
17 unexpected RELATE value for legal change
18
```

BAS Processing

- Flagging “Late BAS” (post 1/1 legal changes)
- Keying legal change and relationship change documentation
 - Geographic Catalog (GCAT) and Geographic Change Notes (GCN)
- Tracking processing work
 - Filling out the PROCESS and P_COMMENTS fields
- Running linear feature script

(1) Entity Type:	Place File
(2) Date Submitted:	11/10/2016
(3) Type of Change:	Deleted Entity
(4) State-Code(s):	AR-05
(5) County-Code(s):	Lawrence County-075
(6) Area Name:	College City city
(7) Area Code:	14770
(8) ANSI Code:	02404097
(9) Legal Description:	city
(10) FIPS Class Code:	C1
(11) Description of Change:	Merged into Walnut Ridge city (72890).
(12) Date of Change:	01/01/2017
(13) Source:	2016 BAS
(14) Internal Use:	Reported through GUPCP.

**Change Action/ Change Geography
PLACE**

Search Clear Back Home

***Required Fields**

*STATEFP: 05 Arkansas *VNTAGE: 90 *NAME: Bentonville
 *PLACEFP: 05320 *MTCFCP: G411C *NAMELSAD: Bentonville city

Add Delete

Geotid	* Action Type	Auth Type	Local Authorization Number	Local Effective Date	Acres	State Authorization Number	State Effective Date	Keying Date	Boundary Change Type	State Certified
<input type="checkbox"/> 441901327727	A	O	2016-20	08/14/2015				04/06/2017		Edit
<input type="checkbox"/> 441901327730	A	O	2016-125	09/27/2016				04/06/2017		Edit
<input type="checkbox"/> 441901327733	A	O	2017-1	01/10/2017				04/06/2017		Edit
<input type="checkbox"/> 441901327672	A	O	2016-24	02/09/2016				04/06/2017		Edit
<input type="checkbox"/> 441902089115	A	O	2017-27	12/28/2017				03/29/2018		Edit
<input type="checkbox"/> 441902089118	A	O	2017-24	12/14/2017				03/29/2018		Edit
<input type="checkbox"/> 441902089121	B	O	2016-19	10/20/2016				03/29/2018		Edit
<input type="checkbox"/> 441902089124	A	O	2017-20	09/12/2017				03/29/2018		Edit

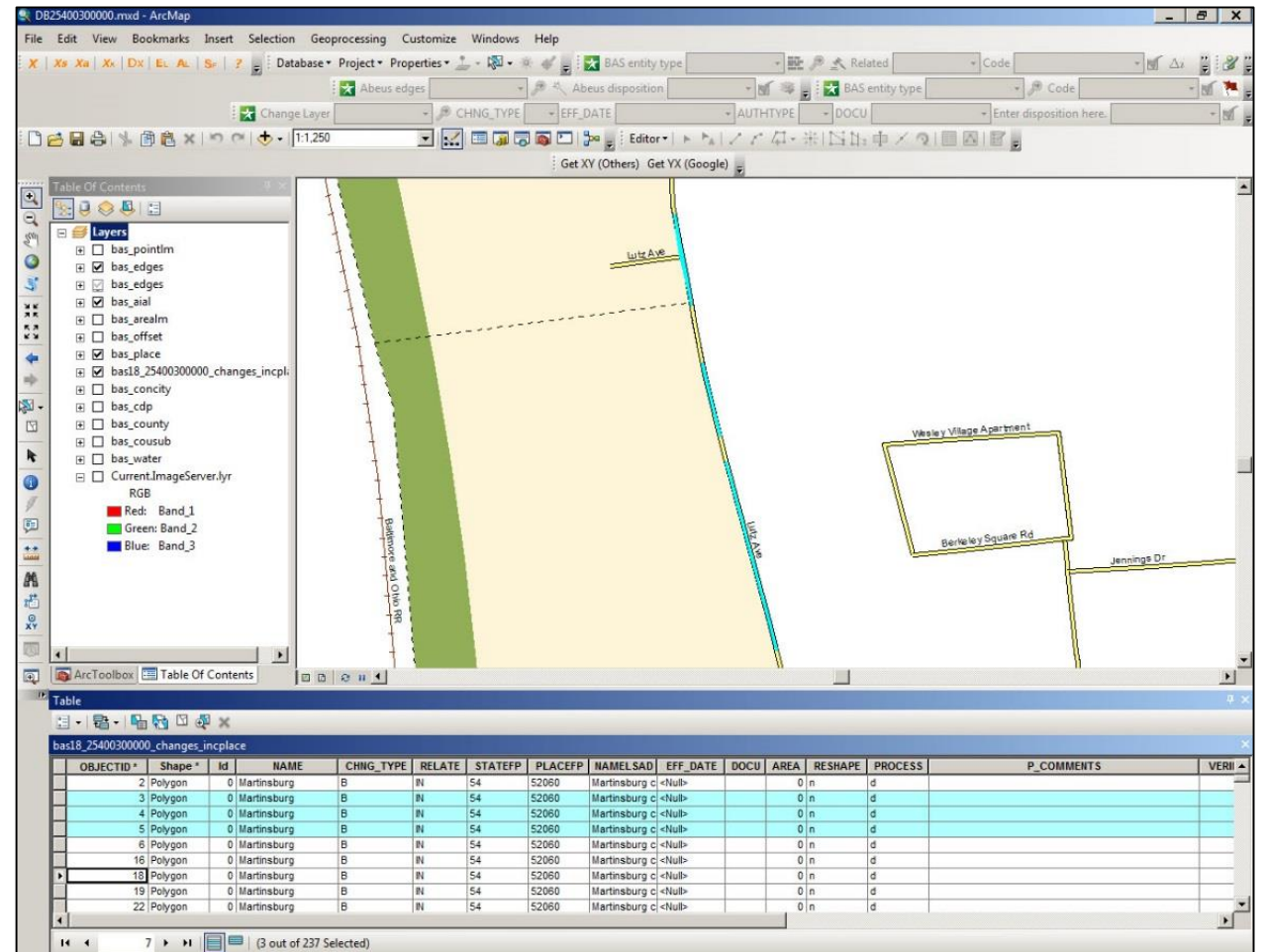


U.S. Department of Commerce
 Economics and Statistics Administration
 U.S. CENSUS BUREAU
 census.gov

CHNG_TYPE	EFF_DATE	DOCU	AREA	RELATE	RESHAPE	PROCESS	P_COMMENTS	VERIFY	V_COMMENTS	DIGITIZE	D_COMMENTS
A	1/16/2018	01-2018	0.77	IN	n	y	gcat keyed, LATE BAS	y			
A	1/16/2018	18-03	2.17	IN	n	y	gcat keyed, LATE BAS	y			
A	1/30/2018	09-2018	5.239	IN	n	y	gcat keyed, LATE BAS	y			
A	1/30/2018	08-2018	5.49	IN	n	y	gcat keyed, LATE BAS	y			
A	1/4/2018	16-37	14.58	IN	n	y	LATE BAS, gcat keyed, combined area with other ident. ord number	y			
A	2/7/2018	2-316	36.75	IN	n	y	gcat keyed, LATE BAS	y			
A	1/16/2018	A18-01	0	IN	n	y	gcat keyed, LATE BAS	y			

BAS Verification

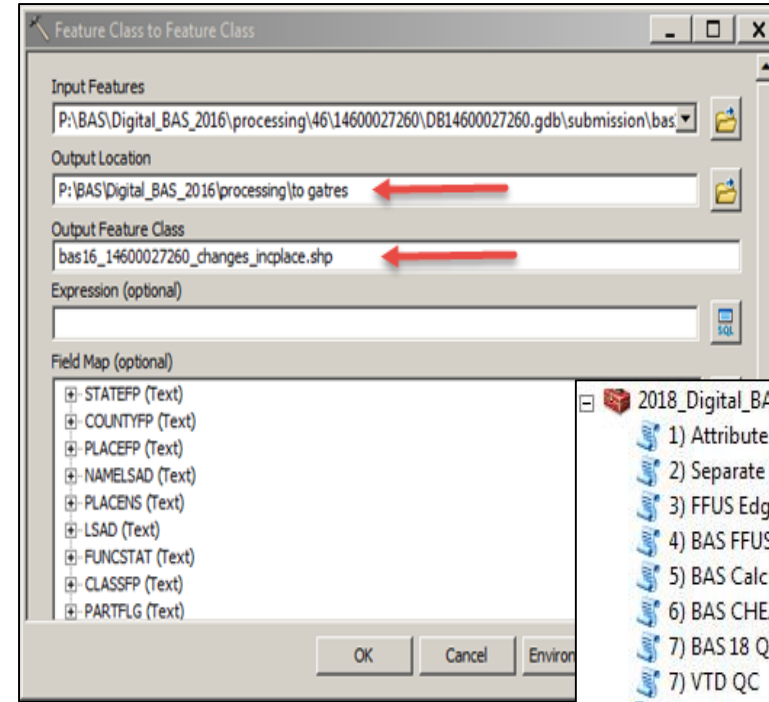
- Another individual reviews processors work
 - Was legal documentation and/or geographic relationship change documented correctly?
 - Are polygons flagged for deletion valid deletes, or are there changes flagged for delete that should not be deleted?



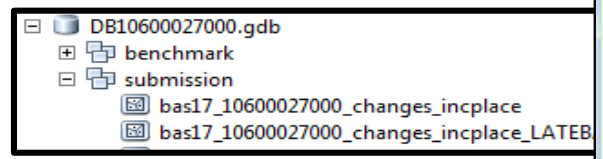
OBJECTID*	Shape*	Id	NAME	CHNG_TYPE	RELATE	STATEFP	PLACEFP	NAME/SAD	EFF_DATE	DOCU	AREA	RESHAPE	PROCESS	P_COMMENTS	VERIFY
59	Polygon	0	Martinsburg	A	IN	54	52060	Martinsburg c	<Null>		0	n	s	legal change did not have annexation info or effective da	
165	Polygon	0	Martinsburg	D	OUT	54	52060	Martinsburg c	<Null>		0	n	s	legal change did not have annexation info or effective da	

BAS Verification

- Additional verification requirements
 - Separate “Late BAS” changes
 - Separate “Suspense” changes
 - Select “Affected Entities” and “Adjacent Entities” in control system
 - Create “Mapsheet” in control system
 - Export shapefiles and import them



- 2018_Digital_BAS_Tools
 - 1) Attribute Check
 - 2) Separate Linear Features
 - 3) FFUS Edge Creation Tool
 - 4) BAS FFUS QC
 - 5) BAS Calculate Percentage Overlap
 - 6) BAS CHEAPET QC
 - 7) BAS 18 QC
 - 7) VTD QC
- Export to gages



Entity Response Method: Digital Changes affect tribal area? Changes affect Coextensive School District?

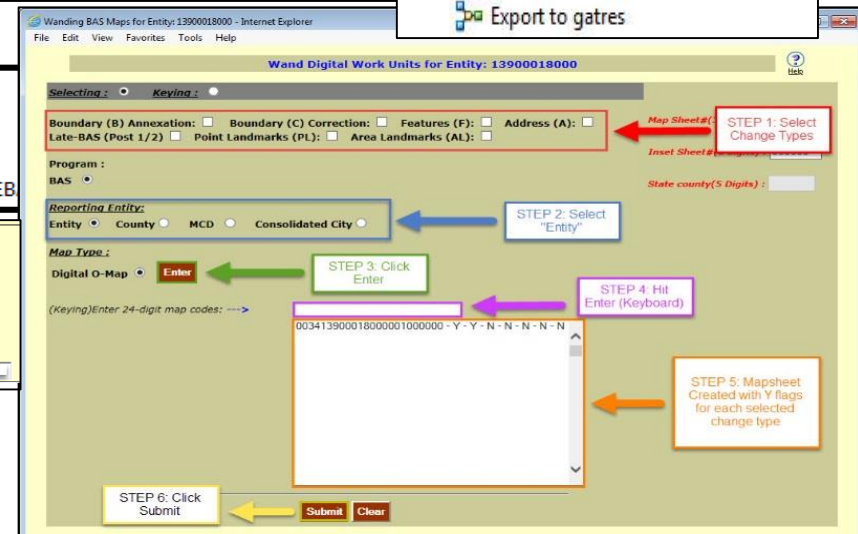
IntraNETIX Created Date: IntraNETIX Posted Date: Digitizing Method: [M - Manual]

GCAT Required?: Y GCAT keyed: 02/07/2018 GCN required? [N] GCN created:

Change type: Annexations only

Processing: Start Date 02/06/2018 Complete Date 02/07/2018 Time 3.5 # of Changes 20 James Bond ID

Verification: Start Date 02/14/2018 Complete Date 02/14/2018 Time 5 # of Changes 20 # of Errors 0 James Bond ID

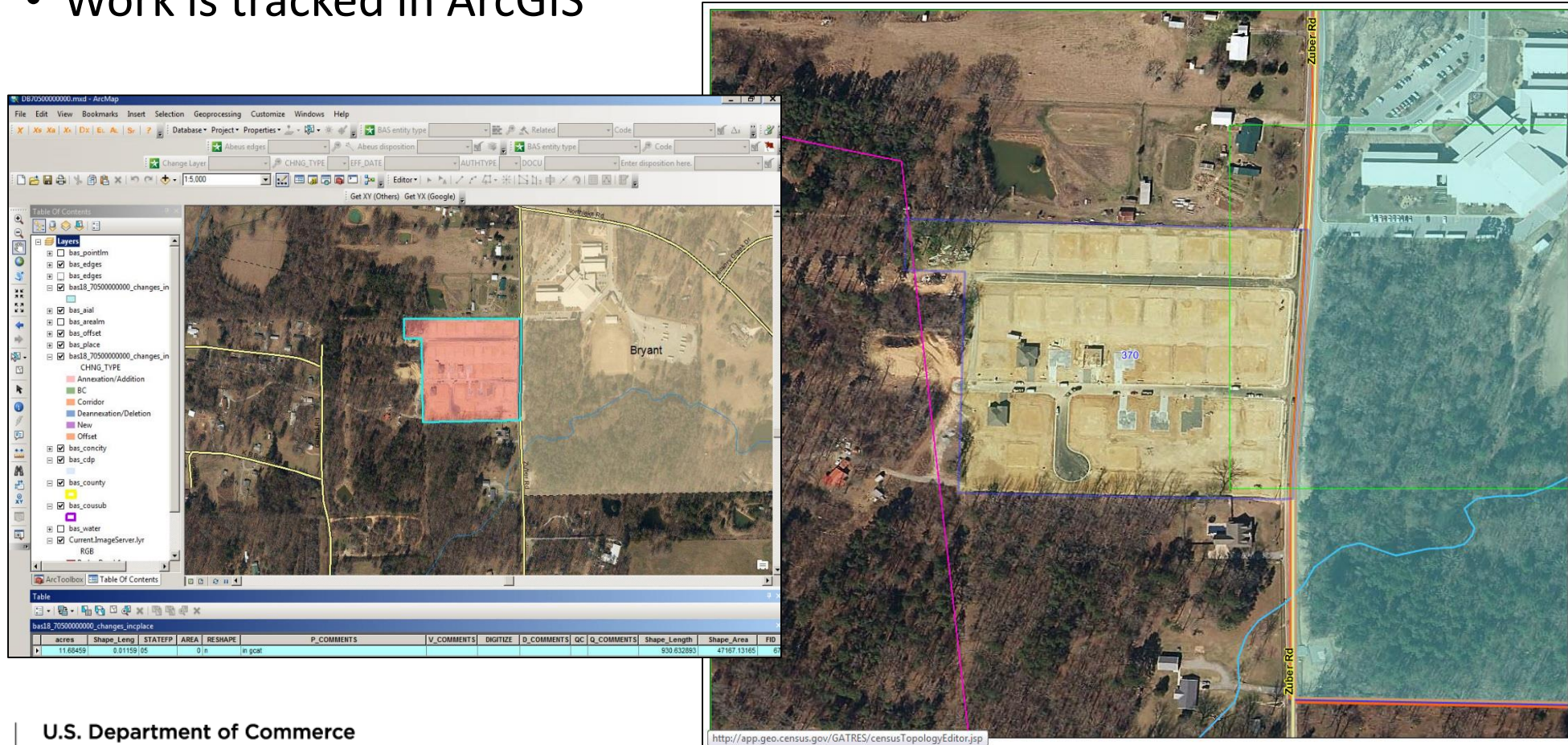


BAS Digitizing

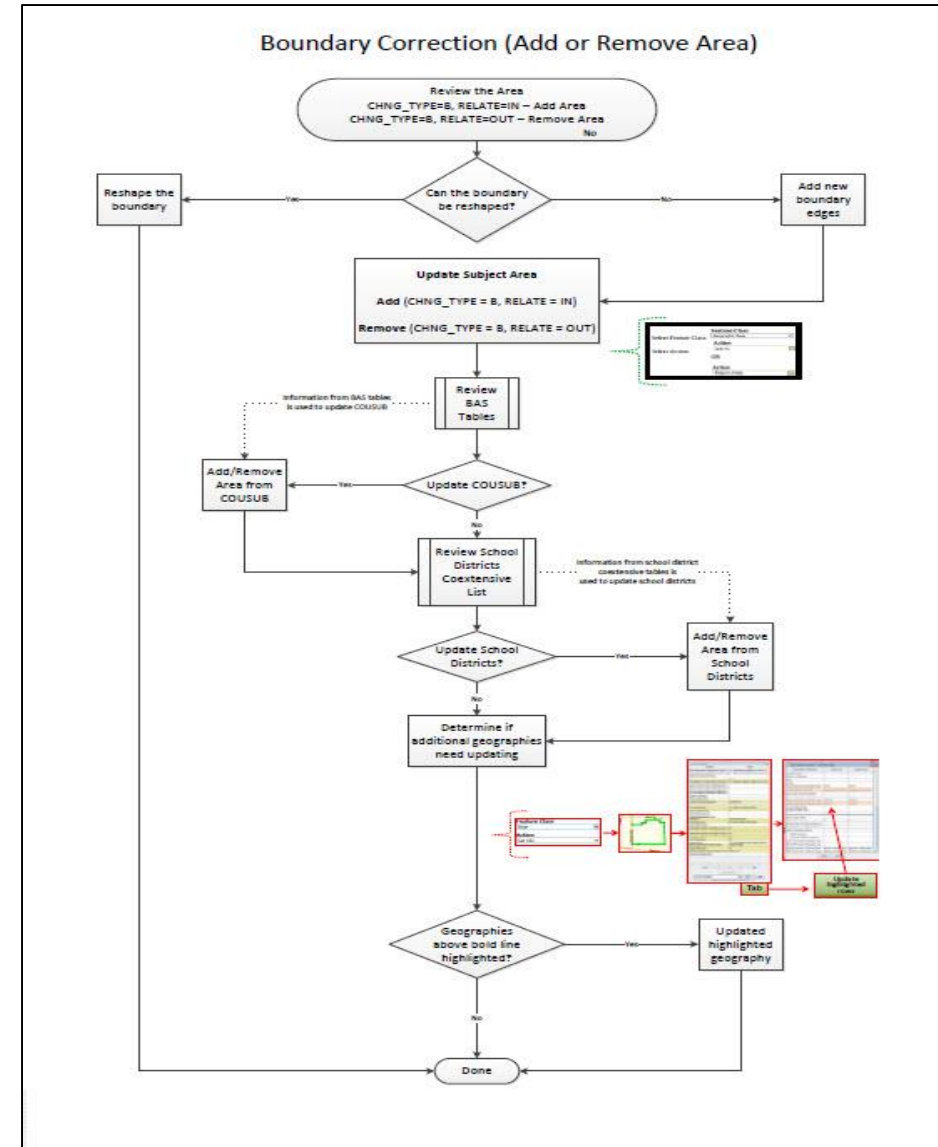
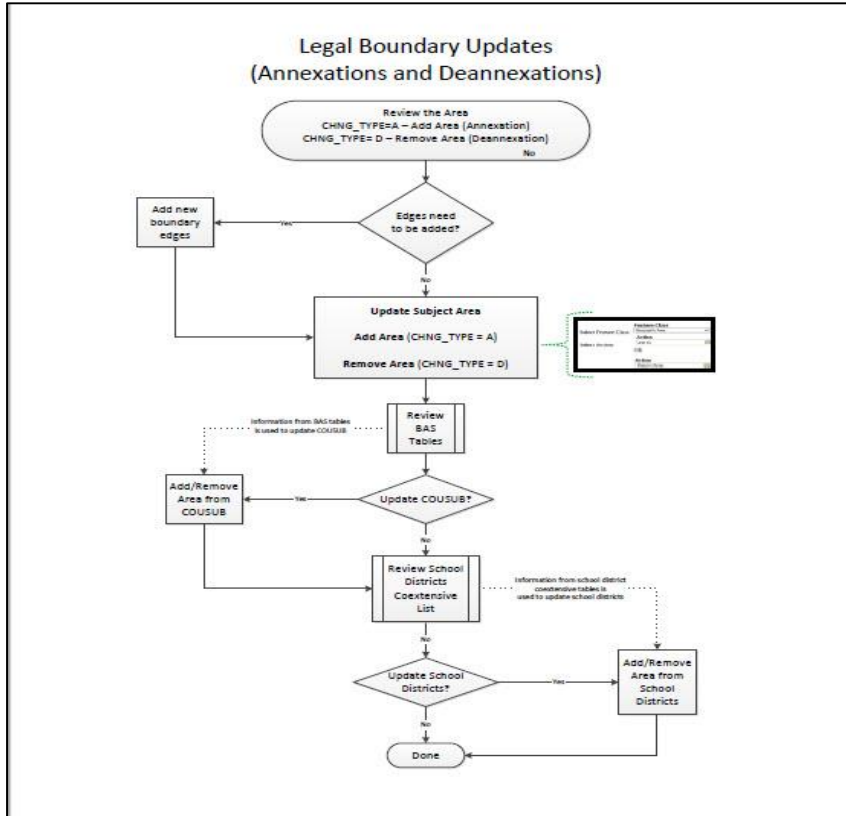
- Digitizers use the change polygon shapefiles to make boundary updates to tribal, state, county, county subdivision, and place boundaries. To update boundaries, digitizers...
 - Add boundary edges
 - Reshape existing boundary edges
 - Updating legal boundary coverage (of the above geographies)
 - Updating underlying geographies (statistical and administrative areas)
- Batch updates for large overage updates (new incorporations, county redistricting, etc.)
- Boundary decision making done in processing/verification.

BAS Digitizing

- Shapefiles are loaded to MAF/TIGER as a reference for digitizing.
- Work is tracked in ArcGIS

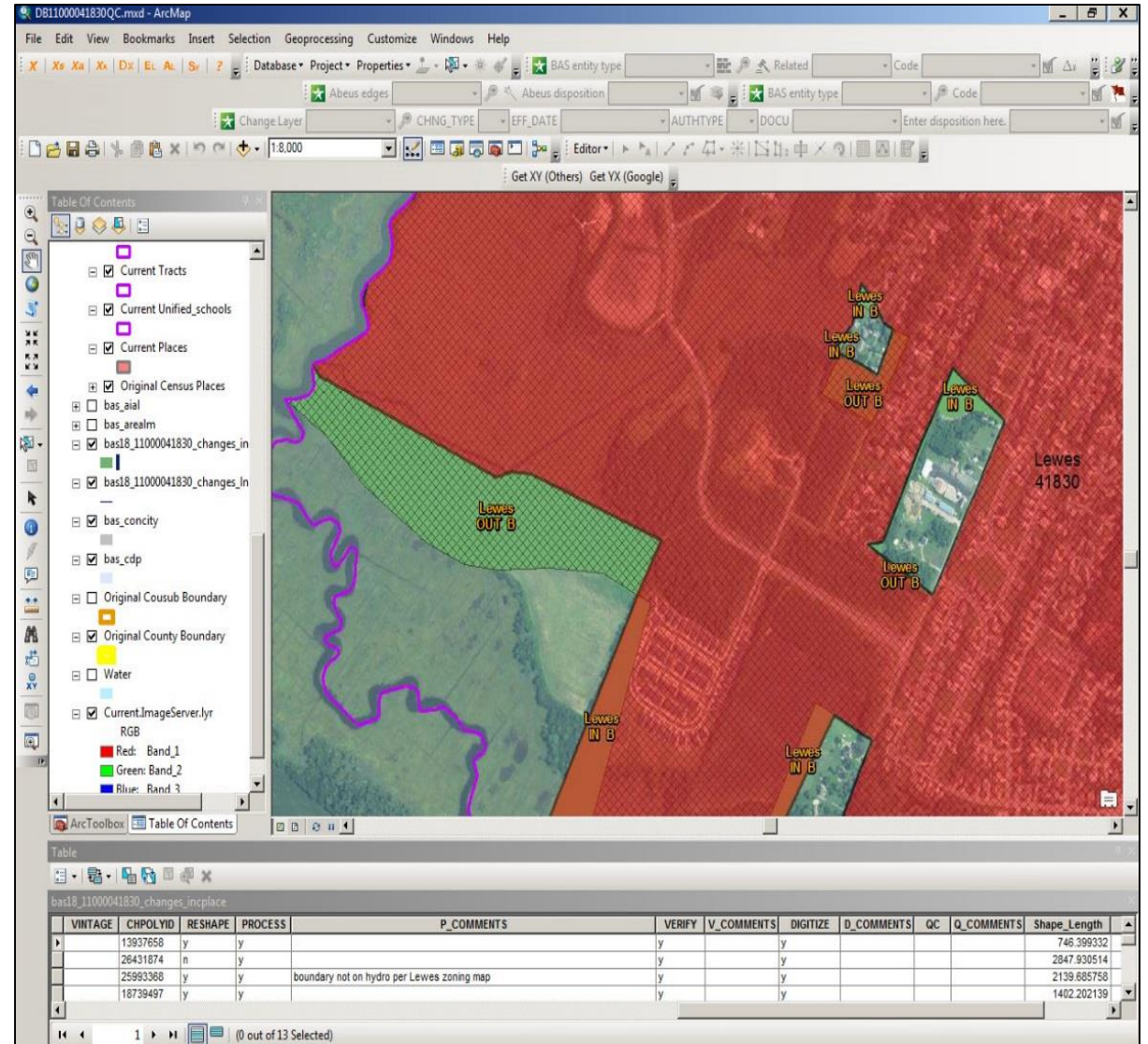


BAS Digitizing



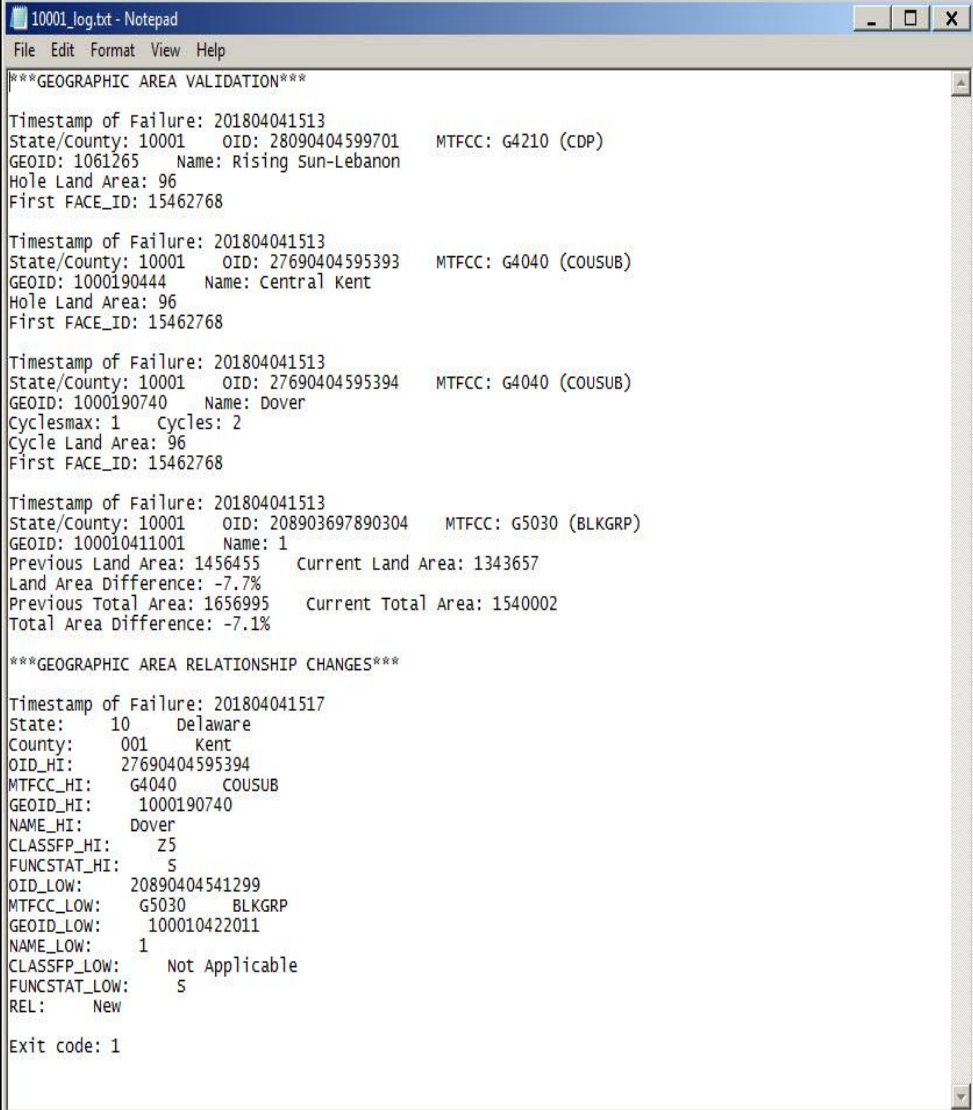
BAS Initial QA

- Initial QA'er runs QC scripts
 - Auto-orders LISRDS shapefiles
 - System flags changes that do not meet digitizing tolerance
 - System creates shapefile output files where digitizing did not follow polygon
- Another individual reviews the work of the digitizers
 - Were changes correctly digitized?
 - Was underlying geography correctly updated?
- Updated geographies pulled from MAF/TIGER. Updated geographies compared to changes to determine if updates were applied correctly (to legal, stat, and admin areas.)
- Initial QA conducted using ArcGIS and errors corrected in GATRES



BAS Initial QA

- Geographic Area Checks (GAC)
 - GACs are run during Initial QA to compare the updated data to the previous benchmark. These checks look for small holes in geographic coverage, new or deleted relationships, or large changes in geographic area
 - GACs can also identify an update that was erroneously made by another program or operation.



```
10001_log.txt - Notepad
File Edit Format View Help

***GEOGRAPHIC AREA VALIDATION***

Timestamp of Failure: 201804041513
State/County: 10001   OID: 28090404599701   MTFCC: G4210 (CDP)
GEOID: 1061265   Name: Rising Sun-Lebanon
Hole Land Area: 96
First FACE_ID: 15462768

Timestamp of Failure: 201804041513
State/County: 10001   OID: 27690404595393   MTFCC: G4040 (COUSUB)
GEOID: 1000190444   Name: Central Kent
Hole Land Area: 96
First FACE_ID: 15462768

Timestamp of Failure: 201804041513
State/County: 10001   OID: 27690404595394   MTFCC: G4040 (COUSUB)
GEOID: 1000190740   Name: Dover
Cyclesmax: 1   Cycles: 2
Cycle Land Area: 96
First FACE_ID: 15462768

Timestamp of Failure: 201804041513
State/County: 10001   OID: 208903697890304   MTFCC: G5030 (BLKGRP)
GEOID: 100010411001   Name: 1
Previous Land Area: 1456455   Current Land Area: 1343657
Land Area Difference: -7.7%
Previous Total Area: 1656995   Current Total Area: 1540002
Total Area Difference: -7.1%

***GEOGRAPHIC AREA RELATIONSHIP CHANGES***

Timestamp of Failure: 201804041517
State: 10   Delaware
County: 001   Kent
OID_HI: 27690404595394
MTFCC_HI: G4040   COUSUB
GEOID_HI: 1000190740
NAME_HI: Dover
CLASSFP_HI: Z5
FUNCSTAT_HI: 5
OID_LOW: 20890404541299
MTFCC_LOW: G5030   BLKGRP
GEOID_LOW: 100010422011
NAME_LOW: 1
CLASSFP_LOW: Not Applicable
FUNCSTAT_LOW: 5
REL: New

Exit code: 1
```

BAS Final QC

- The SDCPB runs quality control checks on each submission prior to each benchmark
- Updated legal geography layers are extracted from MAF/TIGER and are compare to the “complete” layer that includes all changes made to the boundary.
- Similar checks run during Initial QA
- The Final QC process is heavily automated and integrated with the data artifacts from the update process.

BAS/ACS Benchmarking

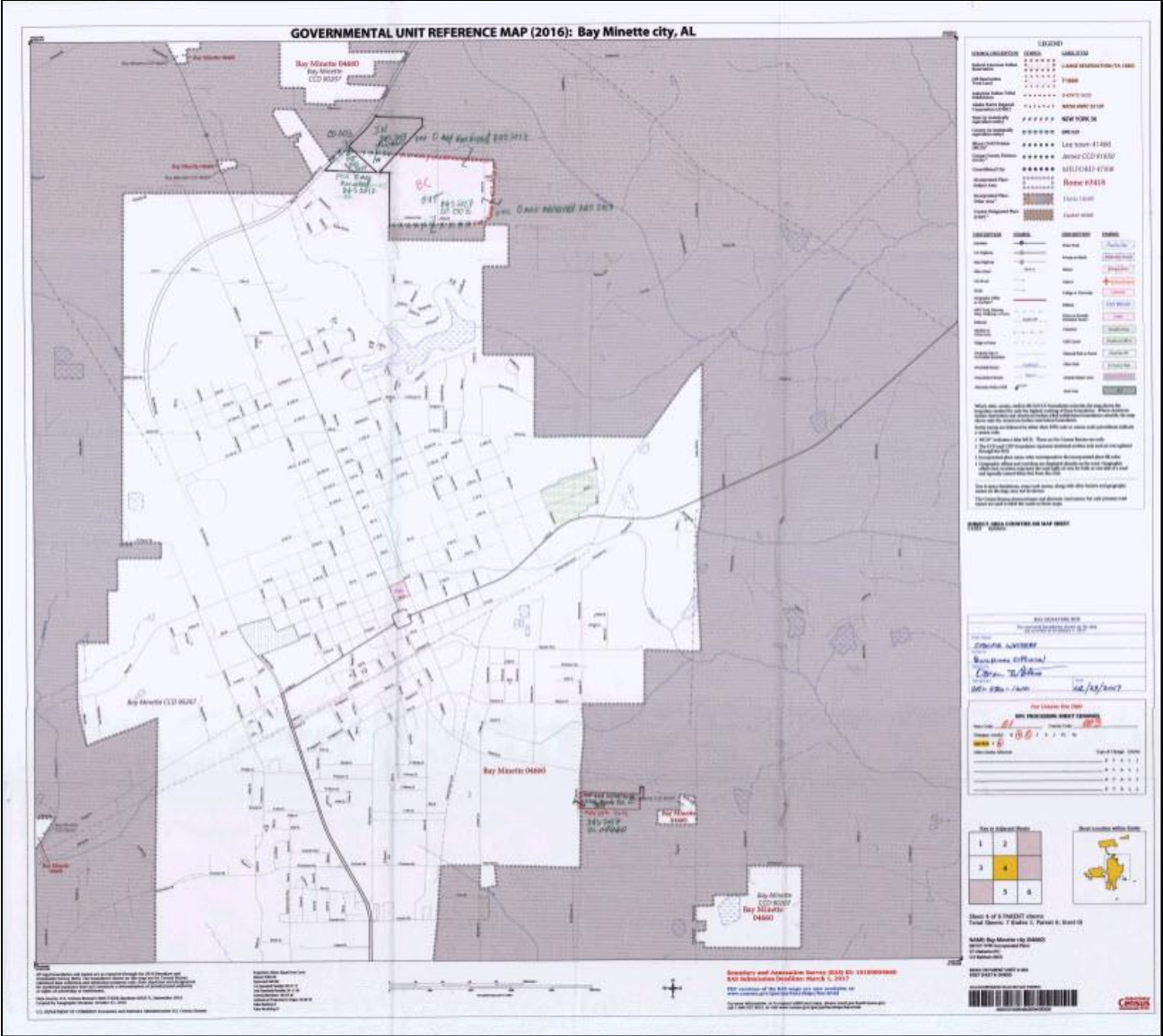
- Before the final products are created, business rules and geographic area checks are run against the updated data. These rules look at changes in geographic relationships and mismatches between the MAF/TIGER database and GCAT.
- Since there are multiple operations updating our integrated database at the same time, these rules also can identify an update unintentionally made to legal boundaries by another program.

BAS Closeout

- Lessons Learned
 - All BAS staff has access to a lessons learned file that can be updated throughout each BAS cycle
 - Lessons learned collected at weekly BAS meetings
 - Lessons learned also collected at end of year closeout meeting

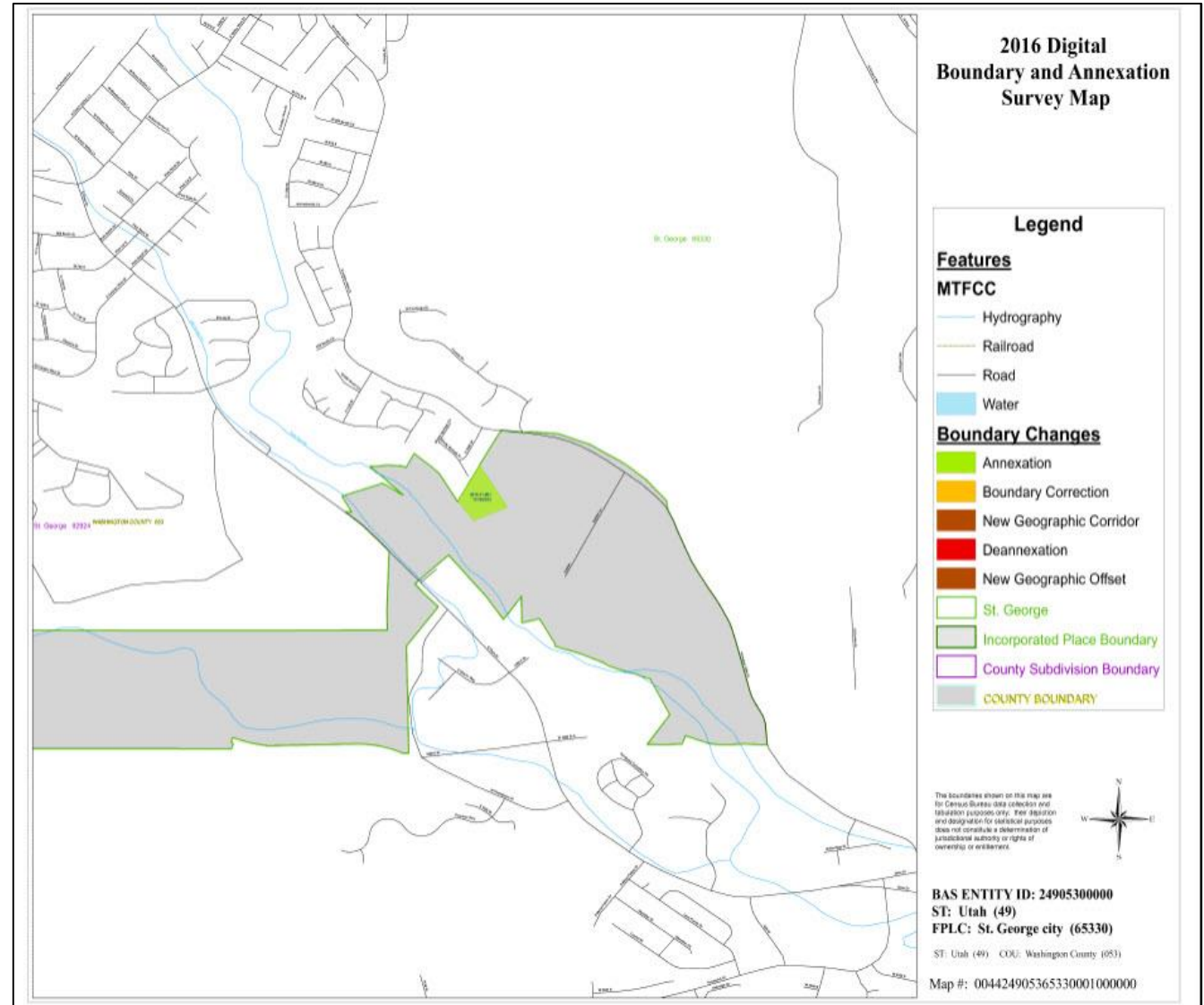
BAS Closeout

- Intranetix Mapping
 - All paper maps are scanned on large-format scanners and are loaded into a database



BAS Closeout

- Intranetix Mapping
 - All digital returns have PDF map(s) created that are loaded to the Intranetix database



Questions?

BAS Contact Information

Email: geo.bas@census.gov

Phone: 1-800-972-5651 (toll free)

Alternate: 301-763-1099

Mike Clements

Email: michael.j.clements@census.gov

Phone: 301-763-9124

Allison Shafer

Email: allison.c.shafer@census.gov

Phone: 301-763-1850