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2010 CENSUS PLANNING MEMORANDA SERIES

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MEMORANDUM FOR The Distribution List

From: Burton Reist *[signed]*
Acting Chief, Decennial Management Division

Subject: 2010 Census Update/Leave Operational Assessment Report

Attached is the 2010 Census Update/Leave Operational Assessment Report. The Quality Process for the 2010 Census Test Evaluations, Experiments, and Assessments was applied to the methodology development and review process. The report is sound and appropriate for completeness and accuracy.

If you have questions about this report, please contact Sally Snodgrass at (301) 763-9374.

Attachment

2010 Census Update/Leave Operational Assessment

U.S. Census Bureau standards and quality process procedures were applied throughout the creation of this report.

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Address List Development Operations Integration Team

This document contains no Title 13 data or Personally Identifiable Information (PII)

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Executive Summary

This assessment provides the results, statistics, and analyses from the 2010 Census Update/Leave operation. The qualitative information presented, such as recommendations, is based on insight from team members who were involved in the development and implementation of the operation. Quantitative analysis comes from the Decennial Statistical Studies Division, the Geography Division, and the Decennial Management Division, which collected and summarized assessment data from various sources after the operation was completed in April 2010. Approximately 9.1 percent of housing units and 46.1 percent of land area nationwide (including Puerto Rico) were covered by the Update/Leave operation.

Assessment Methodology

The 2010 Census Update/Leave operation was assessed by:

- Using Cost and Progress System data.
- Evaluating assessment data files provided by the Decennial Statistical Studies Division, the Geography Division, and the Decennial Systems and Contracts Management Office, including the Paper Based Operations Control System team.
- Using budget models to compare budget estimates to actual spending.
- Using Decennial Management Division staffing models and Decennial Applicant, Personnel, and Payroll System data to determine projected, authorized, and actual staffing.
- Consulting summary reports from debriefings, observations, and lessons learned exercises to contribute qualitative information to the assessment.

Operation Overview

The objectives of the 2010 Census Update/Leave operation were to update address information and census maps and to hand-deliver 2010 Census questionnaires to households in designated areas. The operation was designed to support the enumeration of areas where the Census Bureau had concerns about accurate mail delivery and to determine the Census block location of each housing unit. The operation was conducted in areas where housing units:

- Did not receive mail through a city-style (house number/street name) address for the majority of housing units in the area.
- Received mail at a Post Office Box.
- Had a city-style address but the mail delivery shared a mail drop-off point with other housing units.

Some areas affected by natural disasters were also included in this operation.

All twelve Regional Census Centers had work in the Update/Leave operation: Kansas City had the largest workload, followed by Dallas and Denver (see Table 5.16). Update/Leave was

managed out of 304 Local Census Offices and was the only method of distributing questionnaires in Puerto Rico.

Update/Leave Production field work began in the Local Census Offices on March 1, 2010 and Quality Control field work began on March 8, 2010. The offices completed Production field work on March 28, 2010 and Quality Control field work on April 2, 2010.

Staffing and Workloads

Notable results from the 2010 Update/Leave operation include:

- Local Census Offices hired, trained, and managed the work of 598 Field Operations Supervisors, 4,013 Crew Leaders, and 48,292 Enumerators/Crew Leader Assistants for Production.
- Local Census Offices hired, trained, and managed the work of 156 Field Operations Supervisors, 1,050 Crew Leaders, and 11,302 Enumerators/Crew Leader Assistants for Quality Control.
- Update/Leave Enumerators updated address Listing Pages and maps and delivered questionnaires to 12,552,247 housing units in 202,890 Assignment Areas (which were groupings of blocks to create work units for Enumerators).

Budget and Cost

Overall, the Update/Leave operation used 79.2 percent ($105,855,049) of the direct field cost budget of $133,598,547, resulting in a $27,743,498 surplus. The three main drivers contributing to the surplus were:

- Production training costs ($4 million under budget).
- Production field work costs ($11 million under budget).
- Production mileage costs ($11 million under budget).

Operational Challenges

- Update/Leave was included in the initial release of the Paper Based Operations Control System. Because of a very tight development schedule, there was limited time for systems testing prior to deployment.
- During keying of Update/Leave Assignment Area Address Binders at the National Processing Center, a decision was made to stop capturing verified actions. This contingency action allowed time for keying data for housing units added during Update/Leave ("Adds") and assured delivery of all non-responding Adds to the Vacant Delete Check operation. This had an impact on the identification of the universe for this assessment and required some attention to determining how to flag Update/Leave addresses with Verified action codes.

Operational Successes

- The operation was completed on schedule.
- Operational stakeholders overcame challenges and developed and implemented contingency solutions for issues that arose during the operation and post processing.
- Non-responding Update/Leave Adds were delivered in time for the Vacant Delete Check operation, which started in early July 2010 at the Local Census Offices.

Summary Data for the Update/Leave Research Questions

The following table provides summary data for the research questions in this report. Details can be found in the report itself.

Summary Data for the Update/Leave Research Questions

Research Questions	Summary Data
1. What was the expected workload and how did that compare with the actual?	• Expected workload – 12,830,371 • Actual workload – 12,552,247
2. What was the expected budget and how did that compare with the actual?	• Expected budget – $133,598,547 • Actual cost – $105,855,049 • Surplus – $27,743,498
3. What was the expected staffing profile and how did that compare with the actual?	**Production Enumerator Staff** • Budgeted – 54,205 • Actual – 52,903 **Quality Control Enumerator Staff** • Budgeted – 9,719 • Actual – 12,508 NOTE: Actual staffing tallies for field positions reflect unique employees, which accounts for staff that dropped out or were released, in addition to their replacements. Staff who worked multiple positions within an operation are only counted in the position they worked the most hours.
4. What was the production rate (housing units/per hour)?	• Production Enumerators averaged 5.3 housing units/hour, which was close to the expected hourly production rate of 5.5 housing units per hour. • Quality Control Enumerators averaged 3.7 housing units/hour, which was 1.8 housing units/hour lower than the expected rate of 5.5 housing units per hour.

Research Questions	Summary Data
5. How does the baselined schedule compare with the actual?	• There was no change to the schedule from the planned field operation dates to the actual dates. The National Processing Center data capture and Geography Division processing dates were modified. This reduced risk to the schedule for processing and updating the Master Address File/Topologically Integrated Geographic Encoding and Referencing database.
6. What changes were implemented during the operation?	• During keying of the Update/Leave Assignment Area Address Binders at the National Processing Center, a decision was made to stop capturing verified addresses since these addresses had no changes. This action ensured completion of keying in time for delivery of non-responding housing units added during Update/ Leave to the Vacant Delete Check operation, which started in early July 2010 at the Local Census Offices.
7. What were the major findings from debriefings and observations?	• We need to examine the ability to move addresses to the correct blocks, rather than delete and add these addresses. • We need to provide specific instructions for label creation and questionnaire address printing to include the best town name for a ZIP Code when matching to the United States Postal Service City-State file. • Printing maps before the scheduled start of assignment preparation activities for the operation worked well and limited impact on assignment preparation. • Scheduled duration of the operation seemed adequate. • Work flowed smoothly between the Production and Quality Control phases. • All staff should be notified of common critical errors, and they can be retrained to prevent recurrence of these errors.

Research Questions	Summary Data
8. What were the key lessons learned and recommendations for the future?	• The primary recommendation is to automate the Update/Leave operation for the 2020 Census. • The elimination of keying allows direct transmission of Update/Leave updates to the Geography Division in a timelier manner, lessens the burden on transcription and keying, and enhances the goal of more quickly providing data to subsequent operations. • The Address List Development Operations Implementation Team also developed a list of lessons learned, the most important of which are listed in Section 5.9.
9. How many addresses, Assignment Areas, and blocks were sent to the Update/Leave operation?	• **Addresses** – 11,982,126 • **Assignment Areas** – 202,890 • **Blocks** – 1,549,176
10. What were the final field outcomes for address records?	Update/Leave final field outcomes for the workload of 12,552,247 addresses: • **Verify** – 8,867,870 (70.6 percent). • **Correction** – 2,205,692 (17.6 percent). • **Add** – 588,519 (4.7 percent). • **Delete** – 449,991 (3.6 percent) • **Uninhabitable** – 223,471 (1.8 percent). • **Duplicate** – 94,114 (0.8 percent). • **Empty Mobile Home Sites** – 75,724 (0.6 percent). • **Nonresidential** – 47,316 (0.4 percent).

Note: Non-responding housing units added during Update/Leave were sent to the Vacant Delete Check operation. Percentages do not add to 100 due to rounding.

Research Questions	Summary Data
11. What were the results of the Master Address File/Topologically Integrated Geographic Encoding and Referencing database update process for address records?	Final Master Address File/Topologically Integrated Geographic Encoding and Referencing database status for a total of 12,526,032 addresses from Update/Leave: • **Verify** – 8,867,753 (70.8 percent). • **Correction**– 2,199,370 (17.5 percent). • **Add** – 573,405 (4.6 percent). • **Delete** – 449,015 (3.6 percent). • **Uninhabitable** – 222,830 (1.8 percent). • **Duplicate** – 91,162 (0.7 percent). • **Empty Mobile Home Sites** – 75,226 (0.6 percent). • **Nonresidential** – 47,271 (0.4 percent). Note: Percentages do not add to 100 due to rounding.
What percentage of the addresses listed had complete (house number/street name) city-style addresses?	• Over 86 percent of the entire Update/Leave workload had complete city-style addresses. Over 88 percent of the addresses stateside and more than 76 percent in Puerto Rico had a complete city-style address.
How many records were rejected and what were the reasons?	• Nationwide, a total of 12,552,247 Update/Leave address records were received by Geography Division; 18,744 (less than two tenths of a percent) of these records were rejected during processing by Geography Division, leaving 12,533,503 processed records. The highest category of rejected records (over 50 percent) was duplicated processing identification numbers: of the total 9,955 rejected records for duplicated processing identification numbers, 6,567 (66 percent) came from Puerto Rico.
Were there an unexpectedly high or low number of added addresses?	• There were fewer Adds than expected. Only 4.6 percent of all Master Address File/Topologically Integrated Geographic Encoding and Referencing database updates were Adds. This is relatively low, compared to the 7.0 percent Add rate from Census 2000.

Research Questions	Summary Data
12. What were the Quality Control outcomes (initial observations, Dependent Quality Control check, Office Review)?	**Initial Observation Results:** • The majority of observed Enumerators, for which the National Processing Center received the Observation Checklists, passed their initial observation (97.2 percent of the Production Enumerators and 98.2 percent of the Quality Control Enumerators observed). **Dependent Quality Control Results:** • Paper Based Operations Control System – 6.0 percent of Assignment Areas failed Dependent Quality Control. • National Processing Center – 6.7 percent of Assignment Areas failed Dependent Quality Control. • Approximately 1,832,825 housing units were checked during Dependent Quality Control and Recanvassing (Assignment Areas that failed). • The Average Outgoing Quality Limits for individual Assignment Area workload sizes were met. **Office Review Results:** • Paper Based Operations Control System – 4.9 percent of Assignment Area Address Binders[1] failed the first Office Review and were sent out for repair. • National Processing Center – 5.7 percent of Assignment Area Address Binders failed the first Office Review and were sent out to the field for repair. An additional 10.1 percent of these binders failed the second Office Review.

Key Recommendations

- **Automate the Update/Leave operation in 2020.** There was a tremendous amount of writing and transcription of numbers. An automated Update/Leave operation could make use of an automated listing, mapping, and reporting instrument, with only paper questionnaires that would be dropped off at housing units after the Enumerators updated the address list and feature data using an automated instrument. Sending address and map updates directly to the Geography Division via automation would eliminate the time-consuming keying and digitizing operations involved with paper operations. Automation would also enhance the ability to more quickly deliver Update/Leave results to subsequent operations.

[1] Update/Leave Assignment Area Address Binders contained the Daily Work Record, Listing Pages (containing action codes and other data recorded based on Enumerator observation), and maps.

- **Use a bar coded system to record the 20-digit processing identification number on the questionnaire for housing units added during Update/Leave. Develop a means for the Enumerators and the National Processing Center to scan the bar code on the questionnaire for housing units added during Update/Leave.** This will increase efficiency and reduce transcription errors of long codes that uniquely identify and track added housing units.

- **Increase the amount of time dedicated to testing**. Enough time should be built into the schedule to allow for testing of all systems at each stage of development. Increased testing should include all testing from developmental to user testing, including the control system and processing systems.

Summary

Overall, the Update/Leave operation was deployed and implemented successfully. Update/Leave was completed on schedule and under budget.

Additional Update/Leave data tables are included in Appendix A. Additional recommendations and detailed lessons learned are included in Appendix B of this report.

1. 2010 Update/Leave Assessment Introduction

This introduction states the scope and purpose of this assessment and identifies the groups of users for whom this document is intended. It also provides background information and an operational overview for the Update/Leave (U/L) operation.

1.1 Update/Leave Operation Objective

The objectives of the 2010 Census U/L operation were to update address information and census maps and to hand-deliver 2010 Census questionnaires to households in designated areas. The operation was designed to support the enumeration of areas where the Census Bureau had concerns about accurate mail delivery and to determine the Census block location of each housing unit (HU). The operation was conducted in areas where HUs:

- Did not receive mail through a city-style (house number/street name) address for the majority of HUs in the area.
- Received mail at a Post Office (P.O.) Box.
- Had a city-style address but the mail delivery shared a mail drop-off point with other HUs.

Some areas affected by natural disasters were also included in this operation. Section 2 describes the U/L operation and types of enumeration areas.

1.2 Scope and Purpose of this Assessment

The purpose of the *2010 Census Update/Leave Operational Assessment* is to provide results, statistics, and analyses from the 2010 Census U/L operation. Section 5 answers the assessment questions that were developed by the U/L Subteam and approved by the Address List Development Operations Implementation Team (ALDOIT) and the Census Integration Group (CIG).

The assessment provides an overview of the 2010 U/L operation and a background of how the operation has developed since Census 2000. This assessment also covers the details of these aspects of the 2010 U/L operation:

- Workloads.
- Schedule and cost.
- Automation implementation results.
- Staffing and training.
- Lessons learned.

This assessment provides general information on the 2010 Census U/L operation. An overview of the operation is provided in Section 2. More detailed operational information and previously documented decisions are contained in the appropriate referenced

documents. The References section contains a list of reference documents, including edition dates and authors.

1.3 Intended Audience

This document is intended for the following users:

- ALDOIT.
- Executive Steering Committee (2020).
- Decennial Leadership Group.
- Additional internal stakeholders, such as program managers and subject matter experts involved in the planning of the 2020 Census.
- External stakeholders.

2. Background

This section provides background information for the following topics:

- Census 2000 U/L and Urban Update/Leave (UU/L) operations.
- Types of enumeration areas (TEAs) used for defining areas to conduct U/L operations.
- The 2004 U/L Census Test.
- The cancellation of the U/L operation in the 2008 Census Dress Rehearsal.
- The 2010 Census U/L operation.

An overview comparison of the Census 2000 and 2010 Census U/L operations is provided in Table 2.1.

Census 2000 Update/Leave and Urban Update/Leave (UU/L) Operations

For Census 2000, U/L and UU/L were planned and conducted as two distinct operations.

The Census 2000 U/L enumeration method was primarily designed to cover HUs in rural areas of the country. The U/L operation was used in these areas where the majority of HUs did not have city-style addresses (house number/street name), for determining the Census block location of each HU. Census 2000 U/L was conducted in areas where the Address Listing operation had been implemented several months earlier to develop the address frame.

The Census 2000 UU/L included areas where the Block Canvassing operation had been implemented several months earlier to develop the address frame in predominantly city-style address areas. UU/L included city-style address areas that were removed from the Mailout/Mailback (MO/MB) universe because of concerns of inaccurate mail delivery to the individual HU. For example, some UU/L areas included multi-unit buildings where the United States Postal Service (USPS) delivered mail to a drop point instead of individual unit designations. Another example of UU/L areas were communities that had city-style addresses, but many residents were required by the Postal Service to have their mail delivered to post office boxes, rather than to a mailbox located at the HU.

Description of the Census 2000 Update/Leave Field Operation

The 2000 U/L operation was conducted from March 3 through April 6, 2000. The U/L operation was managed from 363 of the 520 total Local Census Offices (LCOs). Of the 363 LCOs, there were nine LCOs in Puerto Rico, where U/L was the only method of distributing questionnaires. The operation had a workload of 22,542,204 HUs in 2,999 counties and 121,573 Assignment Areas (AAs), which were groupings of blocks to create work units for Enumerators.

The Census Bureau had conducted the Census 2000 Address Listing operation approximately 18 months earlier, primarily in rural areas with non-city style addresses. With the likelihood of changes to this address list, such as newly constructed HUs, demolished units, or those converted to nonresidential use, the U/L Enumerators updated address lists and maps (including collecting map spots) and hand-delivered questionnaires to HUs just prior to Census Day (April 1, 2000).

Description of the Census 2000 Urban Update/Leave Field Operation

The Census 2000 UU/L operation was conducted from March 3 through April 6, 2000, and was managed from eight of the 12 Regional Census Centers (RCCs) through 51 LCOs. The operation had a workload of 292,656 HUs in 12,843 AAs.

During the UU/L operation, Enumerators visited their assigned AAs with AA Address Binders containing lists of addresses verified or updated during Block Canvassing. Block Canvassing was conducted primarily in urban areas with city-style addresses approximately a year prior to Census Day. The UU/L Enumerator tasks were the same as the tasks for U/L Enumerators.

In 2000, no map spots were collected in UU/L. This was a major difference between U/L and UU/L.

Types of Enumeration Areas for Census 2000 and 2010 Census Update/Leave and Urban Update/Leave

In preparation for decennial operations, the delineation of Types of Enumeration Areas (TEAs) determined the enumeration methods to be conducted in different geographic areas. TEA delineation was based primarily on the predominant type of addresses found in those areas and physical accessibility. For further information on TEAs and the delineation process, refer to the *2010 Census Operational Assessment for TEA Delineation*, (Johanson, 2011).

For the U/L operation, TEA numbering for the 2010 Census was different from the Census 2000 TEA numbers, as described below:

- For Census 2000, the TEAs were identified as TEA 2 (U/L), TEA 7 (UU/L) and TEA 9 (also U/L after subsequent research of TEA 1, mailout/mailback (MO/MB) areas.[2] U/L and UU/L were conducted in two separate field operations.
- For the 2010 Census, the TEAs were identified as TEA 2 (U/L) and TEA 7 (UU/L). Even though U/L and UU/L were defined separately as types of enumeration areas, they were combined into a single field operation called "Update/Leave."

[2] In 2000, the TEA designation of "9" was an adjustment of the original Census 2000 TEA Delineation. Additional data showed that some areas originally assigned to TEA 1 (MO/MB) actually had a low rate of city-style addresses or had known deliverability problems. These areas were reset and designated to use the U/L methodology, but a separate TEA value was used to track the cases for evaluations.

The 2010 TEA 2 (U/L) areas consisted mostly of HUs that did not receive mail via a city-style address. In addition, all of Puerto Rico was designated as TEA 2.

The regional offices relied on their local knowledge to identify the UU/L areas for Census 2000 and for the 2010 Census. These consisted of urban areas where the Census Bureau was not confident in accurate mail delivery for these reasons:

- Mail delivery to a central drop point in multi-unit buildings.
- City-style address areas where residents used only P.O. Box mail delivery.

TEA 7 also included some areas impacted by natural disasters, such as Hurricanes Katrina, Rita, and Ike along the Gulf Coast. In these areas, U/L Enumerators updated maps and dropped off questionnaires to ensure accurate delivery to remaining HUs and to HUs under repair or construction.

The enumeration methodology, procedures, and training were the same for both TEAs 2 and 7. While 304 LCOs had a U/L operation workload, only 51 LCOs had a workload in TEA 7.

2004 Census Test Update/Leave Operation

The 2004 Census Test U/L operation was conducted from March 1 through March 31, 2004, and included Production and Quality Control (QC) phases. The operation was performed in the rural portion of the 2004 Census Test site, which covered Colquitt, Tift, and Thomas counties in southern Georgia. The workload was 27,737 HUs.

The objectives of the 2004 Census Test U/L operation were basically the same as those for the Census 2000 U/L operation, but the procedures were changed in order to facilitate testing of a new listing operation for Group Quarters (GQ). Refer to the 2010 Census Test Memoranda Series, Memo No. 29, *Study Plan for the Evaluation of the Special Place/Group Quarters Frame Development Operations, Evaluation 10* (Alberti, 2004).

The 2004 Census Test U/L Enumerators were instructed to identify all residential structures that they encountered in their assigned AAs as either an HU or an "Other Living Quarters" (OLQ). The category of OLQ included assisted living facilities, hotels/motels, transient places, and other places where services were provided. After U/L, a separate operation called Group Quarters Validation (GQV) determined whether or not an OLQ case should be categorized as an HU or GQ for purposes of enumeration (Marquette, 2004b).

2006 Census Test

The 2006 Census Test did not include an U/L operation.

2008 Census Dress Rehearsal Update/Leave Operation

The 2008 Census Dress Rehearsal was conducted in San Joaquin County, California and Fayetteville, North Carolina, which included the nine-county region of Chatham, Cumberland, Harnett, Hoke, Lee, Montgomery, Moore, Richmond, and Scotland counties. Both test sites contained Census 2000 U/L areas, but the U/L operation was canceled along with other enumeration operations due to budget constraints.

Before the U/L operation was eliminated from the 2008 Census Dress Rehearsal, the San Joaquin test site area was designated as entirely Mailout/Mailback. Refer to the 2008 Census Dress Rehearsal Memoranda Series No. 50, *Reduced Scope of the 2008 Census Dress Rehearsal and a One-Month Delay of Census Day* (Vitrano, 2007) for additional information on the cancellation of the 2008 Census Dress Rehearsal U/L operation.

2010 Census Update/Leave Planning and Development

Census headquarters (HQ) staff used a structured approach in planning and developing U/L to support key project management principles:

- Operational planning.
- Budget management.
- Schedule management.
- Risk management.
- Document management (including preparation and formal review of procedural manuals and training materials for U/L field staff).
- Systems management (development and testing).

Two interdivisional teams were directly involved in the planning, development, and implementation of U/L: ALDOIT and the U/L Subteam. These teams followed formal project management principles and processes and, in collaboration with other stakeholder divisions, planned the activities for U/L.

The U/L Subteam tracked the development and production of system deliverables related to U/L. For example, the U/L Subteam planned the U/L operation through development of a detailed operational plan and the execution of several activities to ensure readiness of all components and systems for U/L. The U/L Subteam reported to the ALDOIT.

ALDOIT tracked the development and production of Integrated System Team (IST) deliverables related to U/L. The team reviewed and ensured the IST functional requirements were appropriately defined to meet customer needs for each system. Software requirements were provided to development teams.

2010 Census Update/Leave Operation

The objectives of the 2010 Census U/L operation were to:

- Verify addresses and map features.
- Make corrections, additions, and deletions of addresses and map features to update the Master Address File (MAF)/Topologically Integrated Geographic Encoding and Referencing (TIGER) database (MTdb).
- Hand-deliver 2010 Census questionnaires to all HUs in U/L areas.

The 2010 Census U/L operation field work consisted of a Production phase and a QC phase. Data collected by field staff during the operation, such as changes to Address Listing Pages and spatial updates on maps, were sent to the National Processing Center (NPC) and then to the Geography Division (GEO) for processing and to update the MTdb. Residents were to return the hand-delivered census questionnaires by mail to data capture centers. Approximately 9.1 percent of all HUs and 46.1 percent of land area nationwide (including Puerto Rico) were covered by the U/L operation.

Update/Leave Production

The 2010 Census U/L Production phase was conducted from March 1 through March 26, 2010. The U/L operation was managed from 304 of the 494 LCOs. Of the 304 LCOs, there were a total of seven LCOs in Puerto Rico, where U/L was the only method of distributing questionnaires.

The operation had a completed workload of 12,552,247 HUs in 2,457 counties and 202,890 AAs. Compared to previous censuses, there were fewer HUs in U/L for 2010, primarily because of:

- Increased use of city-style addresses by the post office and communities.
- Efforts by the Census Bureau to maximize mail out/mail back (MO/MB) areas during the delineation of the 2010 TEAs.

Production Enumerators used AA Address Binders with lists of all known living quarters (LQs). Enumerators updated the list "ground to book" as they canvassed all blocks in their assigned AAs. Enumerators visited every structure they found in their AAs to look for HUs and to attempt to contact an occupant at every address. If the address was a HU and an occupant was available, the Enumerator provided a questionnaire labeled with the address for the HU. If an occupant was unavailable, the Enumerator placed the 2010 Census questionnaire in a plastic bag and left the labeled questionnaire where it could be easily seen by the occupant, such as on a doorknob. In both cases, the occupant was requested to complete the questionnaire and return it by mail. The Assistant Manager for Field Operations (AMFO) in the LCO managed the Production staff.

Update/Leave Quality Control

As a part of QC, all Enumerators (Production and QC) were observed following training. Observations were used as on-the-job training. If the Enumerator passed the first observation, the Enumerator continued working AAs. If the Enumerator failed the first observation, they were given additional training by the Crew Leader, followed by a second formal observation. Enumerators who could not pass the second observation were released.

Field work for the U/L QC phase occurred from March 8 through April 2, 2010. In the QC phase, a separate group of QC Enumerators conducted a Dependent Quality Control (DQC), where QC Enumerators checked a sample of addresses to determine the work was done correctly. In DQC, every AA completed in the Production phase was checked. In an operational phase called Recanvassing, the same QC Enumerators immediately recanvassed any AAs that failed the DQC check. AAs that had completed DQC and any necessary Recanvassing were sent to the LCO, where an additional quality check, Office Review, was performed. During the Office Review, office clerks reviewed each AA Binder for legibility, completeness, and consistency. Binders which could not be fixed in the LCO were sent back to the field, for an operational phase called Repair (see Section 5.13), which was conducted by QC Enumerators. The Assistant Manager for Quality Assurance (AMQA) in the LCO managed the QC staff.

Update/Leave Processing

After Production, DQC, Office Review, and any necessary repair, the LCOs shipped completed AA Address Binders (including updated Address Listing Pages, Add Pages, and maps) to NPC for keying and map digitizing. NPC digitized the map updates in TIGER and forwarded the keying results to GEO. GEO created the Address Update Files (ADDUP) to update the MTdb with U/L results.

The LCOs also shipped observation checklists and Office Review checklists to NPC for data capture. After data capture, NPC sent the output data to Decennial Statistical Studies Division (DSSD) to analyze the QC process.

For each HU that U/L Enumerators added in the field, they entered a processing identification number (ID) on the Add Page in the AA Binder. They transcribed onto the Add Page the first 14 digits of the 20-digit processing ID printed below the bar code on the unaddressed questionnaire. During U/L processing at NPC, keyers entered the transcribed processing ID for the added HUs. The processing ID linked the address keyed from the Add Pages at NPC to the questionnaire left with the occupant and subsequently mailed in and captured by the Decennial Response Integration System (DRIS).

During the process of updating the MTdb after U/L field work, GEO discovered a general lack of quality of the processing IDs. The data quality may have been impacted in part by transcription errors in the field and keying errors in NPC.

The following types of errors were identified in the processing IDs:

- Too many or too few characters.
- Invalid characters.
- Missing IDs.
- Valid but Duplicate IDs between stateside U/L questionnaires and Puerto Rico U/L questionnaires.
- Invalid and Duplicate IDs within stateside U/L questionnaires and within Puerto Rico U/L questionnaires.

Any U/L Adds that had missing, invalid, or duplicate processing IDs could not be linked to the questionnaires. To address the problems, GEO devised a contingency process called U/L Questionnaire Add Reconciliation. The Decennial Systems and Processing Office (DSPO) sent the unlinked records to GEO for reconciliation in July 2010. GEO attempted to match the response data to AA Address Binder data prior to adding new records to the MAF. This process helped to ensure that all U/L questionnaire Adds were eventually linked to a Master Address File Identifier (MAFID) record by the end of the Census. GEO updated the MTdb with the U/L reconciliation Adds prior to the creation of the Final Collection address products.

Flow of Non-responding Update/Leave Housing Units after Data Capture

After the data capture of questionnaires returned in the mail from U/L areas, the non-responding HUs were identified and sent to follow-up in the field as follows:

- If the Census Bureau did not receive enumeration response data for an HU that was part of the original universe of address records for U/L, the non-responding address was included in the Nonresponse Followup (NRFU) operation for enumeration.
- If the Census Bureau did not receive enumeration response data for an HU that was added during the U/L operation, the non-responding address was sent to the Vacant Delete Check (VDC) operation for enumeration.

Addresses for the known HUs were already in the NRFU-eligible universe as part of the enumeration universe, so that any respondent not returning the questionnaire received during U/L were followed up by the NRFU operation. However, the HUs that were added during U/L field work had to wait to be keyed and processed from the Add Pages, and therefore were sent to the later VDC operation, if the respondent had not mailed back the questionnaire delivered during U/L.

Comparison of Census 2000 and 2010 Census Update/Leave Operations

Although the major objectives of the Census 2000 U/L operation were essentially the same as the 2010 objectives, there were differences in the operational scope, processes, and

procedural approaches. Table 2.1 summarizes the similarities and differences in metrics between the Census 2000 U/L and 2010 Census U/L operations.

Table 2.1: Comparison of Census 2000 and 2010 Census Update/Leave Operations

Category	2000 U/L	2010 U/L
Dates of Field Work (including QC)	3/3 - 4/6/2000	3/1 - 4/2/2010
Number of Production Days	Planned: 21 Actual: 25	Planned: 20 Actual: 20
Number of Training Days	Enumerator: 3.50 days Crew Leader: 4.75 days Field Operations Supervisor: 4.25 days	Enumerator: 3.38 days Crew Leader: 4.25 days Field Operations Supervisor: 4.25 days
Hours of Training	Enumerator: 28 hours Crew Leader: 38 hours Field Operations Supervisor: 34 hours	Enumerator: 27 hours Crew Leader: 34 hours Field Operations Supervisor: 34 hours
Number of Participating LCOs	363 (69.8% of 520 LCOs)	304 (61.5% of 494 LCOs)
Estimated Production Workload (HUs)*	24,000,000	12,830,371
Actual Production Workload (HUs)†	22,542,204	12,552,247
Number of AAs	121,573	202,890
Average Cases (HUs) per AA	185.4	61.9
Actual QC Workload (AAs)	121,573	202,890
Actual Hourly Production Rate – Enumerator‡	3.1	5.3
Field Budget	$155,543,349	$133,598,547
Actual Cost	$130,005,399 (83.5% of budget)	$105,855,049 (79.2% of budget)
Cost/Case§	$5.77	$7.36

Sources: Census 2000 Master Activity Schedule, 2010 Census Integrated Schedule, Census 2000 U/L Program Management Plan, Census 2000 Evaluation of the U/L Operation, 2010 Decennial Management Division (DMD) Cost Assumptions, 2000 and 2010 DMD C&P system, Census 2000 DMD U/L Assessment. *Notes:* *Source of estimated workloads is cost model. †Actual Production workloads include HUs added during field work. ‡ Addresses worked (actual Production workload) divided by field work hours used by Enumerator. §Actual cost divided by actual Production workload. For 2010, adding the 12,552,247 Production cases plus 1,832,825 QC cases equals 14,385,072 total cases, divided by the total cost of U/L ($105,855,049), equals $7.36 per case. The 2000 cost/case is not adjusted for inflation.

Refer to Appendix C, which contains a summary of the similarities and differences in Enumerator procedures between the Census 2000 and 2010 Census U/L operations. The primary categories of procedural changes for 2010 were interviews, handling of GQs, assigning map spot numbers, Add Pages for HUs and GQs, and QC staffing.

3. Methodology

This section describes the files used to tabulate the assessment data, the files used for the U/L universe, and the types of addresses profiled in the results.

Information Used for the Operational Aspects of the Assessment

- DMD Cost and Progress System (C&P) reports: contained the comparison of budgeted and actual hours, miles, and costs associated with U/L training and field work (See Limitations Section).
- DMD Cost Models: contained planned staffing and budget allocations.
- Decennial Applicant, Personnel and Payroll System (DAPPS) data: contained actual staffing numbers for field positions.
- Debriefing, observation, and lessons learned reports: contained feedback from those involved in the operation.

Files Used for Tabulating Assessment Results

GEO provided the following files for use in tabulating assessment results:

- Enumeration MAF extract (MAFX): contained the addresses originally sent out in the U/L workload. This does not include the Adds discovered by Enumerators during U/L.
- Geographic Reference File - Codes (GRFC): contained the geographic information for assignment areas, states, counties, and blocks.
- U/L Address Update table: contained the addresses that were received from the field and used in the initial update of the MTdb for the U/L operation. This does not include updates for verified units and the U/L Add Reconciliation update.
- Final Tabulation MAFX: contained address information, geography (official tabulation block codes), and the final MTdb status for all U/L records including the Adds.

The Paper Based Operations Control System Team provided the following file for use in tabulating the QC assessment results:

- DQC file: contained the DQC results and the Office Review results collected in the Paper Based Operations Control System (PBOCS) in the LCOs during the operation.

NPC provided the following files for use in tabulating the QC assessment results:

- Observation Checklist file: contained the data from the observation checklists received and data captured at NPC.

- DQC form files: contained the data from the DQC forms received and data captured at NPC.
- Office Review checklist file: contained the data from the Office Review checklists received and data captured at NPC.

Identifying the U/L Universe

For this assessment, four main files were used to analyze the U/L universe of addresses (known addresses and addresses added during U/L field work):

- Enumeration MAFX.
- Supplemental NRFU MAFX.
- U/L Address Update file.
- Final Tabulation MAFX.

A brief description of each of these files follows:

- *Enumeration MAFX* – was a benchmark of the MAF prior to any Enumeration operations. It contained the universe of HUs[3] for all operations going out to the field, except the Update/Enumerate and Remote Alaska operations. From this file, unique flags were used to identify addresses, AAs and blocks for the U/L field operation. U/L addresses were identified by selecting records with a TEA value of 2 or 7.
- *Supplemental NRFU MAFX* – was a benchmark of the MAF from late Spring 2010 and contained the supplemental universe for the Non-Response Followup operation. The supplemental universe included late adds to the census process such as LUCA Appeal reinstates and new adds from the Spring 2010 Delivery Sequence File (DSF)[4] updates to the MAF. U/L updates were also scheduled to be completed in time to be included in the Spring 2010 benchmark.
- *U/L Address Update file* – this file supplies the final U/L field outcomes including the keying of the U/L Adds and delivery of all non-responding U/L Adds in time for the VDC operation for enumeration. A decision was made to stop capturing U/L addresses at NPC that had a field action code of Verified. Contingency plans were implemented to ensure a complete update for the U/L operation. GEO identified the universe of verified records and created a special update for those records. The U/L updates did not complete until late Summer 2010, and therefore could not be included in the Supplemental NRFU MAFX. This special contingency processing was called the U/L Address Update.

[3] The Enumeration MAFX also contained Group Quarters and Transitory Locations.
[4] The Census Bureau receives a DSF at least bi-annually as a source to update addresses in the MAF.

- *Final Tabulation MAFX* – was a final MAF benchmark for the 2010 Census. Since the U/L Address Update was applied after the delivery of the Supplemental NRFU MAFX, it was difficult to accurately identify the complete U/L universe of field actions. In order to identify the universe, it was necessary to combine data from the U/L Address Update with the Final Tabulation MAFX.[5] This Final Tabulation MAFX was used instead of the Supplemental NRFU MAFX to determine the final tally of field actions during U/L.

Original Source Determination

During the analysis of the U/L operation, we attempted to define the "original source" of addresses for each HU in the operation. The 2010 MAF Original Source variable was calculated by comparing the corresponding earliest census operation date by MAFID on the Final Tabulation MAFX to the DSF refresh variable. If there was no DSF flag prior to the operation date, then the MAF source corresponding to that operation date was taken to be the original source. If there was a DSF flag prior to the earliest operation date, then that DSF update cycle was considered the original source.

Other Living Quarters

OLQ records were preprinted on the Address Listing Page with a "Z" action to enable enumerators to distinguish between HUs and known OLQs while canvassing blocks. GEO was instructed to ignore these records during MTdb update. These records appear in the GEO reject file but were rejected due to their predisposition, not because they met the rejection criteria.

Types of Addresses Profiled in the Assessment Results

The U/L addresses were classified into five types of address categories based on the highest criterion met. The categories were:

- Complete city-style (included E911 addresses, some of which were not used for mail delivery, and areas impacted by natural disasters).
- Complete rural route.
- Complete P.O. Box.
- Incomplete address.
- No address information.

[5] The U/L Address Update supplied the final field outcomes for address records. The Final Tabulation MAFX included the entire U/L workload, including original U/L MAF updates and special processing updates for the verified units and reconciliation Adds. The Final Tabulation MAFX included all HUs with all their field outcomes and associated tabulation geography

The location house number and street name fields were used in the criteria for determining a complete city-style address, while location ZIP Code was not included.

- Complete city-style: included all units with a house number and street name.
- Complete rural route: included units without a complete city-style address but with a complete rural route address, such as Rural Route 2, Box 3.
- Complete P.O. Box: included units that did not have either a complete city-style or a complete rural route address, but had a complete P.O. Box address, such as P.O. Box 515.
- Incomplete address: included units with some address information but without a complete address of any type.
- No address information: included units without house number, street name, Rural Route, or P.O. Box information.

Addresses were further delineated by the presence or absence of a physical/location description collected during a census field operation.

Type of Geography Used to Tabulate Data

U/L field work was conducted using 2010 collection geography, which was based on features identifiable on the ground and defined by 2010 collection state, collection county, and collection block. However, 2010 tabulation geography was used for the tallies in this assessment and is used for the purpose of consistency across assessments.

4. Limitations

This section describes the limitations of the U/L analysis and advises stakeholders on interpreting data.

Comparison of Results to Previous Censuses

The types of enumeration areas, enumeration methodologies, and analysis variables for the 2010 Census may differ from previous censuses. Caution should be taken when comparing results across censuses.

Type of Address Classification

The types of addresses were determined by first looking at the location house number and street name fields. If both of these fields were filled for a given address record, it was classified as a complete city-style address. However, it is possible there may have been complete address information contained in one of these fields and not the other due to inconsistencies in form completion and/or data capture issues. Therefore, a complete house number and street name may be present in the street name or location description field on the U/L Address Listing Pages, and result in an understatement of the number of city-style addresses in the U/L workload. Conversely, "bad" or "invalid" data may be present in the house number or street name fields thereby resulting in an overstatement of the number of city-style addresses in the U/L workload.

Keying of Verify Actions

The intent of the U/L AA Address Binder keying operation was to capture every action code assigned to addresses on the Address Listing Pages. Due to the large volume of updates, Production keying fell behind schedule, and staff identified a risk in the ability to capture and update the MTdb with U/L Adds in time for the VDC operation. The keying operation was reassessed and the decision was made that NPC would stop keying records with Verify (V) actions (see Table 5.29).

As a result of this strategy, only a portion of the verified records were keyed and sent to GEO to update the MTdb. To ensure a complete update for the U/L operation, GEO identified the universe of verified records and created a special update for those records. Records were assigned a V action if:

- The record was in the U/L operation universe.
- The AA was identified as received and keyed in NPC.
- The record was not included on any of the address update files that NPC sent to GEO.

The special update was conducted after the delivery of the Supplemental NRFU MAFX GEO created, but before creation of the Final Collection products.

Identifying the Update/Leave Universe

Because the U/L reconciliation of verified records was updated after the delivery of the Supplemental NRFU MAFX, it was difficult to accurately identify the U/L universe. In order to identify the universe, it was necessary to combine data from the U/L Address Update with the Final Tabulation MAFX. The combined file might have included HUs in U/L areas that were not in U/L due to subsequent operations or units that were in U/L and did not end up in U/L areas because of actions from subsequent operations.

Corrections/Uninhabitable Actions

Table 5.23 represents the number of addresses identified as corrections and the number identified as uninhabitable. However, those classifications are combined in the Final Tabulation file. To acquire the number and percentages reported, the proportions from Table 5.23 were used as estimates for Table 5.29.

Original Source Determination

After it was decided that U/L Verify actions would no longer be keyed at NPC, GEO identified the universe of verified records and created a special update for those records. Because the update was conducted after the delivery of the Supplemental NRFU MAFX, these U/L records were given a later operation date. When the Original Source definition was applied, operations conducted after U/L were designated as the Original Source due to the methodology that was used. These particular records were subsequently identified and the initial U/L operation date was used to identify the correct Original Source. In most cases, the U/L operation became the Original Source for those records.

Additionally, U/L and other operations reported the same dates. Because these operation updates were not included in the U/L file delivered to the field, U/L needed to add them independently. In these cases, U/L was designated as the Original Source.

Possible Duplicates from Reconciliation of Questionnaire Adds

During the Add reconciliation process, GEO updated the MAF with addresses provided by respondents on U/L questionnaire returns. These data were provided to DSPO. The response data reflected the U/L addresses written on the questionnaires. The address information from the questionnaires was not parsed into separate fields as it was on the Address Listing Pages.

In an effort to reduce duplication, GEO attempted to match the response data to AA Address Binder data prior to adding new records to the MTdb. Given the address formatting differences, it is possible that duplicate addresses may not have been identified as matches in the reconciliation process. Because the Puerto Rico address structure is even more complex, the match rate was lower and the potential for duplication greater.

Determination of Size of Basic Street Address

A number of algorithms using different variables and hierarchies were considered for defining the size of the basic street address (BSA). Most methods yielded similar results. A decision was made to keep the definition simple by examining the location house number and street name of a given address record. If two records in the same collection block had the same location house number and street name combination, they were considered to be in the same basic street address. If an address record did not have a house number or street name, it was classified as a single unit.

Multiple Initial Observations Recorded on an Observation Checklist

In some cases, multiple initial observations were recorded on the same form. Crew Leaders were instructed to record up to two observations on the same form for the same Enumerator. They used a checklist printed on the form to indicate whether or not each Enumerator job task was performed correctly.

If an Enumerator demonstrated a good overall understanding of the required tasks, the Crew Leader entered a result of satisfactory on the back of the form. If an Enumerator did not have a good overall understanding of the tasks, the Crew Leader consulted the Field Operations Supervisor (FOS), who, in most cases, instructed the Crew Leader to conduct a second observation. If the Crew Leader observed an Enumerator twice, he or she entered the result of only the second observation on the back of the form. The results section required an entry of satisfactory or unsatisfactory, or "other" (such as the Enumerator resigned before the observation took place).

In addition, Production Enumerator and QC Enumerator observation checklists were printed on the front and back of the same form. An Enumerator could work on both the Production and QC phases of the U/L operation, so it was possible that both observations could have been recorded on the same copy of the form.

Because the observation checklist contained space for only one observation result, it was difficult to interpret the results if more than one observation was recorded on the same form.

Assumption That the Results in PBOCS are Accurate

The keying of the number of added HUs and OLQs prior to DQC form generation, and keying of DQC and Office Review results were not monitored or quality checked. Thus, the data could contain errors. However, for all operations, it is assumed that data recorded in PBOCS were accurate.

Missing QC Forms for Analysis

DSSD did not receive all necessary QC forms for data analysis, such as observation checklists for all Enumerators, DQC forms, and Office Review forms for all U/L AAs worked. The missing forms fell into one of the following categories:

- Never shipped from the LCOs to NPC for data capture.
- Lost during shipping.
- Misplaced after being received by NPC.

The C&P System output reports were not released to stakeholders outside of DMD due to issues in reported workload progress from the PBOCS to the C&P system staff. This impacted all of the operations using the initial release of the PBOCS. PBOCS was scheduled to begin a reformat for their deliveries of progress data just days prior to the end of U/L. It was decided to not reformat the data at this late date since it would zero out any previous data shown on the reports and there were just a few days remaining in the operation. The cost data for hours and mileage is reliable, but the workload progress data were tracked using a report showing AAs assigned and completed, titled D-370, "Progress Report." Further information can be obtained from the C&P assessment.

Staffing Data from DAPPS

Considering the fact that one Crew Leader Assistant (CLA) was budgeted for each Crew Leader, the DAPPS tallies for this position seem to reflect a lower number of CLAs than expected. For purposes of this analysis, it is assumed that all DAPPS data reflect the actual hours used and miles driven for each field staff position.

Cost and Progress System Progress Reports

The DMD C&P system was never generally released to users due to concerns with Production data.

5. Results

This section presents the results of the analysis of U/L data and provides answers to each of the twelve assessment questions. Data are presented in tabular format with accompanying explanations and insights into the data analysis.

The assessment questions are:

1. What was the expected workload and how did that compare with the actual? What were the impacts to the program? (Section 5.2).
2. What was the expected budget and how did that compare with the actual? What were the impacts to the program? (Section 5.3).
3. What was the expected staffing profile and how did that compare with the actual? What were the impacts to the program? (Section 5.4).
4. What was the production rate (HUs per hour)? (Section 5.5).
5. How does the baselined schedule compare with the actual? What were the impacts to the program? (Section 5.6).
6. What changes were implemented during the operation? What were the impacts to the field operation? (Section 5.7).
7. What were the major findings from debriefings and observations? (Section 5.8).
8. What were the key lessons learned and recommendations for the future? (Section 5.9).
9. How many addresses, Assignment Areas, and blocks were sent to the U/L operation? (Section 5.10).
10. What were the final field outcomes for address records? (Section 5.11).
11. What were the results of the MTdb update process for address records? What percentage of the addresses listed had complete (house number/street name) city-style addresses? How many records were rejected and what were the reasons? Were there an unexpectedly high or low number of added addresses? (Section 5.12).
12. What were the Quality Control outcomes (initial observations, DQC, Office Review)? (Section 5.13).

5.1 Scope of the Assessment Data

Data from the following sources were used to evaluate the 2010 U/L operation:

- Enumeration MAFX.
- U/L Address Update table.
- Final Tabulation Universe MAFX.
- QC form files (captured by NPC).

- PBOCS DQC file.
- DAPPS extracts.
- C&P reports.
- 2010 Cost Model.

In addition, qualitative information from debriefings, observations, and lessons learned reports were also used in this analysis.

5.2 Assessment Question 1: What was the expected workload and how did that compare with the actual? What were the impacts to the program?

Table 5.1 shows that the variance between the expected and actual Production workloads for the U/L operation was minimal. The total number of actual HUs worked during U/L was 12,552,247, which equated to only 2.2 percent fewer HUs actually worked than expected nationally. The stateside U/L workload was 2.6 percent fewer than expected; the Puerto Rico U/L workload included only 0.4 percent more HUs than expected. This difference can be attributable primarily to Add rates (the percentage of HU addresses added during field work that were not already on the Address Listing Pages). The actual stateside Add rate was only 4.3 percent compared with the 7.0 percent expected Add rate, while the actual Add rate for Puerto Rico was 0.2 percentage points less than the expected rate.

Table 5.1: Production Workload for Update/Leave

Production								
	Estimated Housing Units[*]	Actual Housing Units[†]	Variance		Estimated Adds		Actual Adds	
			Number	Percent	Number of Adds[‡]	Add Rate	Number of Adds[§]	Add Rate
Stateside	11,127,335	10,842,812	-284,523	-2.6	778,914	7.0	461,298	4.3
Puerto Rico	1,703,036	1,709,435	6,399	0.4	129,431	7.6	127,221	7.4
Total	**12,830,371**	**12,552,247**	**-246,589**	**-2.2**	**908,345**	**7.0**	**588,519**	**4.7**

Sources: [*]2010 DMD Cost Model, 3/1/2010, which includes the estimated number of Adds; [†]DSSD analysis Table 5.22 "field action counts"; [‡]Calculated based on planning assumptions of 7% Adds stateside and 7.6% Puerto Rico; [§]DSSD analysis of the 2010 U/L Address Update File – refer to Table 5.23 in this report. Some totals do not add due to rounding.

Analysis of Add Rates for Stateside and Puerto Rico

The determination of the expected Add rate was based primarily on the actual rates experienced in the Census 2000 U/L operation. Prior to the 2000 U/L operation, Address Listing was conducted about 14 months earlier to update the address list. However, for 2010, Address Canvassing (AC) was conducted about eight months prior to U/L, and the timing of both operations in 2010 likely contributed to the lower than expected Add rate stateside.

Puerto Rico's Add rate was higher than stateside, although not higher than predicted for Puerto Rico. The percentage of actual Adds being higher than stateside may possibly be

attributed to the more complex Puerto Rico address schema, which was comprised of many more address fields than stateside. For the first time in a decennial environment, the AC hand-held computer (HHC) forced users to capture data in a format compliant with census address standards for Puerto Rico. The 2010 U/L operation was paper-based, as in 2000, and could not perform the data capture validation that was possible in the HHC to ensure data entry complied with Census standards. Additionally, although a Puerto Rico specific Add Page was provided, some U/L Enumerators used stateside Add Pages for adding newly discovered addresses in Puerto Rico. In these cases, NPC tried to interpret data from Puerto Rico-style addresses from the stateside forms in order to capture the Adds into Puerto Rico database address fields for GEO. The actual workload to expected variance was so small that the impact to the program was negligible.

Analysis of QC Workloads

The expected and actual QC workload for U/L is presented in Table 5.2. The total number of HUs in the DQC sample and recanvass was 1,832,825, which was about 19 percent less than the estimate of 2,258,145. The DQC rate and the recanvass rate also presented in this table help to explain the variance between the estimated and actual HUs included the QC workload.

The actual DQC rate was the percent of HUs worked during DQC within each AA (HU level percentage). The actual recanvass rate was the DQC fail rate of AAs (AA level percentage) instead of the percentage of units that were recanvassed. Since the expected recanvass rate was determined at the AA level, the data for the actual recanvass rate are also presented at the AA level rather than the HU level for comparison. The QC workload was 18.8 percent less than planned. This difference can be primarily attributed to the fact that the recanvass HU count used in calculating the expected QC workload did not exclude the units worked during the DQC sample. Therefore, the expected number of recanvassed units was overestimated, since the DQC sample units in the AAs that failed DQC were counted twice. In addition, the expected recanvass rate was 10.0 percent of all AAs, but the actual Recanvassing rate was 6.0 percent overall. Overall, this meant that approximately 8,116 fewer AAs were recanvassed than budgeted. The overall impact to the program was a minimal surplus in field costs.

Table 5.2: Quality Control Workload for Update/Leave

Quality Control								
	Estimated Housing Units[a]	Actual Housing Units[b]	Variance		DQC Rate (HUs)		Recanvass Rate (AAs)	
			Number	Percent	Expected[c]	Actual[d]	Expected[e]	Actual[f]
Stateside	1,958,411	1,511,828	-446,583	-22.8%	7.6%	8.0%	10.0%	5.4%
Puerto Rico	299,734	320,997	21,263	7.1%	7.6%	7.3%	10.0%	12.4%
Total	**2,258,145**	**1,832,825**	**-425,320**	**-18.8%**	**7.6%**	**7.9%**	**10.0%**	**6.0%**

Sources: [a]2010 DMD Cost Model, 3/1/2010; [b]DSSD data analysis of a combination of PBOCS DQC file and NPC keyed DQC form file; [c]DSSD 2010 U/L QC Plan; [d]DQC Rate Actual is from DSSD data analysis of a combination of PBOCS DQC file and NPC keyed DQC form file; [e]DSSD 2010 U/L QC Plan; [f]DSSD data analysis of PBOCS DQC file.

Analysis of DQC Rates

The DQC rate (which is the within AA sample rate of HUs) in Table 5.2 shows that overall, more HUs were sampled than expected (7.6 percent expected compared with 7.9 percent actual). The expected DQC rate was determined based on an average AA size of 65 HUs. If an AA contained 65 units, five units were worked during DQC, which accounts for approximately 7.6 percent of the HUs in the AA. Since the size of the AAs varied, the DQC rate varied a little during the actual operation.

Analysis of Recanvass Rates

Although the expected recanvass rate (which is the DQC failure rate, or the percentage of AAs that should be recanvassed) was 10.0 percent, the overall actual recanvass rate was 6.0 percent (4 percent less than expected), according to the PBOCS DQC file. The expected error rate of 10.0 percent was roughly estimated using the results recorded from Census 2000, the 2004 Census test, and the Address Canvassing operation in 2010. This may explain the stateside rate of 5.4 percent, where the bulk of the U/L work was performed. However, the recanvass rate in Puerto Rico was actually higher than expected (10.0 percent expected compared with 12.4 percent actual). This may be attributed to the fact that listing addresses in Puerto Rico may be more difficult and subjective than stateside, given the complexity of address standards, and greater number of address fields, for Puerto Rico.

5.3 Assessment Question 2: What was the expected budget and how did that compare with the actual? What were the impacts to the program?

The following tables break down various aspects for the primary U/L budget and cost categories. The operation used 80 percent ($105,855,049) of the direct field cost budget of $133,598,547, resulting in a $27,743,498 surplus, as summarized in Table 5.3 below.[6] This

[6] The cost results presented in this assessment were generated by program staff using methods pre-dating the U.S. Census Bureau's commitment to comply with Government Accountability Office's cost estimating guidelines and the Society of

was attributable to surpluses in Production training, Production field work, and Production mileage costs (see Tables 5.4 – 5.9). The actual cost per case was $7.36.[7]

Summary of All Costs for Update/Leave Production and Quality Control

Table 5.3 summarizes all budgeted and actual costs for U/L Production and QC by cost category.

Table 5.3: Cost Summary for Update/Leave Production and Quality Control

	Costs for All Production Positions			Costs for All QC Positions		
Cost Category	**Budget**	**Actual**	**Percent of Budget Used**	**Budget**	**Actual**	**Percent of Budget Used**
Training	$24,936,750	$20,799,685	83.4%	$4,922,095	$4,063,005	82.6%
Field Work	$87,670,135	$64,517,568	73.6%	$16,069,56	$16,474,791	102.5%
Totals	**$112,606,885**	**$85,317,253**	**75.8%**	**$20,991,66**	**$20,537,796**	**97.8%**
Production	$112,606,885	$85,317,253	75.8%			
QC	$20,991,662	$20,537,796	97.8%			
Grand Totals	**$133,598,547**	**$105,855,049**	**79.2%**			

Source: 2010 Census U/L C&P Reports. Field work includes miles for training and field work.

The cost analysis in Tables 5.4 through 5.10 includes budgeted and actual direct field costs for Production and QC staff including Enumerators, Crew Leaders, CLAs, and FOSs. Data are provided at the national level for all stateside and Puerto Rico LCOs for the following cost categories:

- Production hours and salary costs (including overtime).
- Training hours and salary costs (including overtime).
- Mileage costs (Production and training combined).
- Other expenses, such as:
  - Telephone charges.
  - Tolls.
  - Parking fees.
  - Small purchases, if approved.

Cost Estimating and Analysis best practices. While the Census Bureau believes these cost results are accurate and will meet the needs for which they will be used, the methods used for estimating costs of 2010 Census operations may not meet all of these guidelines and best practices. The Census Bureau will adhere to these guidelines in producing 2020 Census cost estimates.

[7] The cost per case is calculated by dividing the actual cost by the actual production workload. See Table 2.1.

- Fares for buses, subways, and other public transportation.
- Per Diem for official overnight travel, plus personal telephone calls not-to-exceed $5 per day while in a per diem status.

The cost analysis does not include the following:

- Census HQ costs.
- RCC costs.
- LCO infrastructure and clerical costs.

Cost Analysis for Update/Leave Production Training

Tables 5.4 and 5.5 provide a comparison of budgeted and actual hours cost and number of hours used for U/L Production training and U/L QC training, respectively.

Table 5.4 presents data for training hours and costs for each Production field staff position. The budgeted training hours were calculated by multiplying the authorized staff positions by their authorized training hours, which were:

- Enumerator – 27 hours.
- CLA – 27 hours.
- Crew Leader – 34 hours.
- FOS – 34 hours.

Table 5.4: Update/Leave Production Training Hours and Costs by Position

Production								
Position	Training Cost Budget	Training Cost Actual	Variance		Training Hours Budget	Training Hours Actual	Variance	
			Number	Percent			Number	Percent
Enumerator	$21,871,727	$17,601,420	$-4,270,307	-19.5	1,485,460	1,326,214	-159,246	-10.7
CLA*	$619,766	$541,660	$-78,106	-12.6	32,286	40,594	8,308	25.7
Crew Leader	$2,164,892	$2,373,153	$208,261	9.6	148,992	176,751	27,759	18.6
FOS	$280,365	$283,451	$3,086	1.1	17,441	18,826	1,385	7.9
Total	**$24,936,750**	**$20,799,685**	**$-4,137,065**	**-16.6**	**1,684,179**	**1,562,384**	**-121,795**	**-7.2**

Source: 2010 U/L C&P Reports. Note: *CLAs were trained and paid as Enumerators. After training, these positions were allocated budget hours and miles for field work.

The cost for Production Enumerator training was 19.5 percent less than budgeted, while 10.7 percent fewer training hours were charged than budgeted for Enumerators. This savings might have resulted from a lower than expected employee turnover rate. Also, LCOs did not experience a high rate of "no shows" at initial training sessions, and replacement training was not required in several LCOs.

Actual training hours for CLAs exceeded the budget by 25.7 percent, although actual training costs were $78,106 below the budget. Since CLAs were trained and paid as Enumerators, we believe there was some confusion on how training hours for the CLA position were charged.

The cost of training Crew Leaders was almost 10 percent more than budgeted and training hours for Crew Leaders were 18.6 percent more than expected.

Overall, the actual training cost was about $4.1 million (16.6 percent) less than budgeted for all U/L Production field staff positions. Generally speaking, the time to train Crew Leaders and FOSs exceeded the budgeted hours and the associated cost was slightly higher than expected. For the Enumerator position, the training hours and costs were less than budgeted.

The Production training costs were $4.1 million of the overall surplus. The majority of the surplus was for Enumerators ($4,270,307). FLD was allowed a 50 percent frontloading training rate. The cost model budgeted for 57,560 Enumerator training positions.

Dividing the 1,326,214 hours used for Enumerator training by 27 hours (budgeted training duration) indicates approximately 49,119 Enumerators were trained. This number seems accurate when compared to the 48,292 total Enumerator positions in Production. FLD made good use of frontloading without over training and thus saved the census over $4.1 million dollars.

Cost Analysis for Update/Leave QC Training

Table 5.5 presents data for training hours and costs for each QC field staff position. The budgeted training hours were calculated by multiplying the authorized staff positions by their authorized training hours, which were:

- QC Enumerator – 27 hours.
- QC CLA – 27 hours.
- QC Crew Leader – 34 hours.
- QC FOS – 34 hours.

Table 5.5: Update/Leave Quality Control Training Hours and Costs by Position

Quality Control								
Position	Training Cost Budget	Training Cost Actual	Variance		Training Hours Budget	Training Hours Actual	Variance	
			Number	Percent			Number	Percent
QC Enumerator	$3,972,195	$3,423,027	-$549,168	-13.8	285,859	255,527	-30,332	-10.6
QC CLA*	$454,137	$144,246	-$309,891	-68.2	23,888	10,896	-12,992	-54.4
QC Crew Leader	$438,611	$443,382	$4,771	1.1	31,483	32,161	678	2.2
QC FOS	$57,152	$52,351	-$4,801	-8.4	3780	3,451	-329	-8.7
Total	**$4,922,095**	**$4,063,005**	**-$859,089**	**-17.5**	**345,010**	**302,034**	**-42,976**	**-12.5**

Source: 2010 U/L C&P Reports. Note: *QC CLAs were trained and paid as QC Enumerators. After training these positions were allocated budget hours and miles for field work.

Overall training costs for QC were 17.5 percent less than expected, contributing $859,089 to the operational surplus. Actual training hours were 12.5 percent less than budgeted.

For all U/L QC training, the actual hours and costs were less than budgeted. The Crew Leader is the only position where hours and cost exceeded the budgeted amounts. A training costs savings was accrued for the other three field positions: QC Enumerator, QC CLA, and QC FOS. The reasons for the hours and cost under-runs were the same as those described above for U/L Production. We saved $860,000 by not using 10.6 percent of the QC Enumerator training hours. Although more staff were hired than were budgeted (see table 5.12), Production staff were moved from the Production workforce to the QC staff and provided gap training, which helped lower the number of actual QC training hours used. This provided the overall $860,000 surplus in the QC training budget.

Cost Analysis for Update/Leave Production Field Work

Tables 5.6 and 5.7 provide a comparison of budgeted and actual hours and cost for U/L Production field work and U/L QC field work, respectively. Table 5.6 presents a comparison of budgeted and actual hours and salary costs for field work for each Production field staff position.

Table 5.6: Update/Leave Production Field Work Hours and Costs by Position

Production								
Position	Field Work Cost Budget	Field Work Cost Actual	Variance		Field Work Hours Budget	Field Work Hours Actual	Variance	
			Number	Percent			Number	Percent
Enumerator	$34,495,375	$32,264,149	$-2,231,226	-6.5	2,382,493	2,373,997	-8,496	-0.4
CLA*	$5,973,709	$2,933,080	$-3,040,629	-50.9	415,579	212,063	-203,516	-49.0
Crew Leader	$14,514,380	$9,551,344	$-4,963,036	-34.2	740,776	612,343	-128,433	-17.3
FOS	$3,545,050	$2,282,411	$-1,262,639	-35.6	176,495	130,778	-45,717	-25.9
Total	**$58,528,514**	**$47,030,983**	**$-11,497,531**	**-19.6**	**3,715,343**	**3,329,181**	**-386,162**	**-10.4**

Source: 2010 U/L C&P Reports. Note: *CLAs were trained and paid as Enumerators. After training these positions were allocated budget hours and miles for field work.

The field work cost for Production Enumerators was about $2.2 million (6.5 percent) less than budgeted, while field work hours were very close to budget. Crew Leader field work cost was about $5 million (34.2 percent) less than budgeted and actual Crew Leader field work hours were about 17 percent less than planned. Overall, the actual field work cost was about $11.5 million (19.6 percent) less than budgeted for U/L Production field staff (see below).

Since there were 40 percent more Production staff, working close to their production rate (5.3 actual compared with 5.5 budgeted), plus less time driving since actual mileage was 40 percent less than budgeted (see Table 5.8), the result was that the work was completed at a faster rate than anticipated. This yielded an $11.7 million surplus. This can be attributed to the fact that 23 percent of all AAs were U/UL, where HUs were located closer together than in U/L areas and thus work could be completed faster than anticipated. Since other census field operations had taken place, there were more experienced staff available to be hired for U/L. This may have also contributed to the surplus in the field work hours used compared with the plan.

Cost Analysis for Update/Leave QC Field Work

Table 5.7 presents a comparison of budgeted and actual hours and salary costs for field work for each QC field staff position.

Table 5.7: Update/Leave Quality Control Field Work Hours and Costs by Position

Quality Control								
Position	Field Work Cost Budget	Field Work Cost Actual	Variance		Field Work Hours Budget	Field Work Hours Actual	Variance	
			Number	Percent			Number	Percent
QC Enumerator	$5,745,235	$6,838,616	$1,093,381	19.0	419,313	501,862	82,549	19.7
QC CLA*	$1,142,534	$852,327	$-290,207	-25.4	83,614	61,895	-21,719	-26.0
QC Crew Leader	$3,149,199	$2,299,190	$-850,009	-27.0	166,313	145,761	-20,552	-12.4
QC FOS	$812,384	$495,772	$-316,612	-39.0	43,416	28,910	-14,506	-33.4
Total	**$10,849,352**	**$10,485,905**	**$-363,447**	**-3.3**	**712,656**	**738,428**	**25,772**	**3.6**

Source: 2010 U/L C&P Reports. Note: *QC CLAs were trained and paid as QC Enumerators. After training these positions were allocated budget hours and miles for field work.

Although the QC process sampled almost 19 percent fewer addresses than expected (see Table 5.2) and Recanvassing rates were less than budgeted (6 percent actual compared with 10 percent planned as shown in Table 5.2), the overall QC field work cost and actual hours used were close to the planned costs and hours.

However, QC field costs were only a minimal savings at approximately $363,447. The QC workload was less than expected and the production rate was close to the expected (5.2 cases per hour planned compared with 5.5 cases per hour budgeted). Looking historically at other Census operations tells us that the QC production rate is usually somewhat lower than the production rate since QC Enumerators need to review the data entered by the Enumerator, compare this to what they see, and then record their findings on a paper form. An estimated production rate for QC probably should have been less than the expected rate of 5.5 cases per hour.

Cost Analysis for Update/Leave Production Field Work and Training Mileage

Table 5.8 provides a comparison of budgeted and actual mileage cost and miles driven for U/L Production field work and training. The D-308 payroll forms used by field staff to report hours, miles, and other expenses could distinguish training miles from Production miles, but the DAPPS did not store this information. Thus, the cost summaries in this section do not separate training mileage cost from the Production mileage cost.

Table 5.8: Update/Leave Miles and Mileage Costs for Production Field Work and Training by Position

Production								
Position	Miles Cost Budget	Miles Cost Actual	Variance		Miles Budget	Miles Actual	Variance	
			Number	Percent			Number	Percent
Enumerator	$22,741,646	$12,321,666	-$10,419,980	-45.8	41,625,099	24,643,331	-16,981,768	-40.8
CLA*	$2,085,850	$1,078,005	-$1,007,845	-48.3	3,477,826	2,156,010	-1,321,816	-38.0
Crew Leader	$3,645,650	$3,233,590	-$412,060	-11.3	6,583,924	6,467,180	-116,744	-1.8
FOS	$668,475	$853,324	$184,849	27.7	1,238,501	1,706,649	468,148	37.8
Total	**$29,141,621**	**$17,486,585**	**-$11,655,036**	**-40.0**	**52,925,350**	**34,973,170**	**-17,952,180**	**-33.9**

Source: 2010 U/L C&P Reports. Note: *CLAs were trained and paid as Enumerators. After training these positions were allocated budget hours and miles for field work.

The overall mileage cost was 40 percent less than planned and overall mileage driven was almost 34 percent less than expected. Production staff drove fewer miles than budgeted. Census 2000 actual data were used in calculating assumptions for mileage. These initial operational budget assumptions were reassessed and adjusted after the 2010 Census AC operation. The AC operation provided more up-to-date data on the 2010 Census budget assumptions; however, mileage remained the largest surplus category for U/L. Also, 23 percent of the AAs were in UU/L areas. The UU/L areas were mostly in the natural disaster areas impacted by hurricanes, and some impacted areas included in the U/L operation were in the MO/MB (TEA 1) areas in past censuses. AAs in these areas generally required less mileage to canvass. Total saving in miles budgeted were approximately $11.7 million.

Cost Analysis for Update/Leave QC Field Work and Training Mileage

Table 5.9 provides a comparison of budgeted and actual mileage costs and miles driven for U/L QC field work and training.

Table 5.9: Update/Leave Miles and Mileage Costs for Quality Control Field Work and Training by Position

Quality Control								
Position	Miles Cost Budget	Miles Cost Actual	Variance		Miles Budget	Miles Actual	Variance	
			Number	Percent			Number	Percent
QC Enumerator	$3,854,920	$4,400,565	$545,645	14.2	7,468,122	8,801,130	1,333,008	17.8
QC CLA*	$440,996	$484,677	$43,681	9.9	689,772	969,354	279,582	40.5
QC Crew Leader	$770,301	$926,500	$156,199	20.3	1,471,372	1,852,999	381,627	25.9
QC FOS	$153,998	$177,145	$23,147	15.0	302,500	354,289	51,789	17.1
Total	**$5,220,215**	**$5,988,886**	**$768,671**	**14.7**	**9,931,766**	**11,977,772**	**2,046,006**	**20.6**

Source: 2010 U/L C&P Reports. Note: *QC CLAs were trained and paid as QC Enumerators. After training these positions were allocated budget hours and miles for field work.

The overall QC mileage costs were 14.7 percent more than planned and overall mileage was about 20.6 percent more than expected (see below). Considering that the QC workload was 18.8 percent less than expected (see Table 5.2), then the overall miles per case budgeted for QC were likely underestimated. The cost model for U/L assumed 2.8 miles per case for both Production and QC Enumerators. QC Enumerators averaged 4.8 miles per case.

QC Enumerators drove more miles than budgeted. This is not unusual, as this also happened in the 2010 Address Canvassing operation. Typically, Production staff drove to AAs that were geographically clustered, generally resulting is less miles reaching each AA. In the case for QC, Enumerators were assigned multiple AAs and these most likely were not clustered due to the fact that Production work had to be completed first. Therefore, in most cases the QC Enumerator worked the sample selected addresses in an AA, and then drove to another AA. This increased travel between work assignments most likely contributed to the small overage in QC mileage.

Analysis of Other Costs for Update/Leave Production and Quality Control

Table 5.10 presents data for budgeted and actual reimbursable expenses, overtime, per diem, and telephone charges, for both the Production and QC phases of the operation.

The results indicate that both Production and QC staff exceeded the budget for these variables. While each expense category exceeded the budget, overtime had the most significant impact on the cost overrun. Overtime used by Production staff was 229.5 percent over budget and QC staff overtime was 278.1 percent over budget.

Table 5.10: Other Reimbursable Expenses for Update/Leave Production and Quality Control (Overtime, Per Diem, and Telephone)

	Other Expenses for All Production Positions			Other Expenses for All QC Positions		
Other Costs	**Budget**	**Actual**	**Percent of Budget Used**	**Budget**	**Actual**	**Percent of Budget Used**
	$2,482,121	$5,641,307	227.3%	$453,167	$1,498,708	330.7%
Breakdown of Overtime (included in Other Costs totals above)						
Overtime	**Budget**	**Actual**	**Percent of Budget Used**	**Budget**	**Actual**	**Percent of Budget Used**
	$2,051,490	$4,708,473	229.5%	$399,117	$1,109,886	278.1%

Source: 2010 Census U/L C&P data.

In summary, the U/L operation was completed approximately $27 million under budget. The three main factors contributing to the surplus were:

- Production training costs ($4 million under budget – see Table 5.4).
- Production field work costs ($11 million under budget – see Table 5.6).

- Production mileage costs ($11 million under budget – see Table 5.8).

Although the operation came in 27.7 million dollars under budget, there were no impacts to the overall U/L Production or Quality Control phases of the program.

Cost Summary: Accounting for the Entire Surplus

Total budget U/L	$133,598,547	(see Table 5.3)
Total costs of U/L	$105,855,049	(see Table 5.3)
Surplus	$ 27,743,498	

Where Was the Surplus?

Production Training	$ 4,137,065	(see Table 5.4)
QC Training	$ 859,089	(see Table 5.5)
Production Hours	$11,497,531	(see Table 5.6)
QC Hours	$ 363,447	(see Table 5.7)
Production Mileage	$11,655,036	(see Table 5.8)
	$28,512,168	
Less Overage for QC Mileage	$ 768,671	(see Table 5.9)
Operational total surplus	**$27,743,497**[8]	

5.4 Assessment Question 3: What was the expected staffing profile and how did that compare to the actual? What were the impacts to the program?

Staffing Analysis for Update/Leave Production

A comparison of budgeted and actual staffing for U/L Production is presented in Table 5.11:

[8] Budgeted numbers are higher by $1.00 due to rounding.

Table 5.11: Update/Leave Production Staffing Profile

Production				
Position	DMD Budgeted*	Actual Hired†	Variance	
			Number	Percent
Stateside				
Enumerator and CLA	43,263	41,889	-1,374	-3.2
Crew Leader	3,329	3,581	252	7.5
FOS	417	536	119	28.5
Total	**47,009**	**46,006**	**-1,003**	**-2.1**
Puerto Rico				
Enumerator and CLA	6,622	6,403	-219	-3.3
Crew Leader	510	432	-78	-15.3
FOS	64	62	-2	-3.1
Total	**7,196**	**6,897**	**-299**	**-4.2**
All Positions (Stateside and Puerto Rico)				
Enumerator and CLA	49,885	48,292	-1,593	-3.2
Crew Leader	3,839	4,013	174	4.5
FOS	481	598	117	24.3
Total	**54,205**	**52,903**	**-1,302**	**-2.6**

Sources: *DMD Cost Model, Budget Formulation Branch, DMD, March 1, 2010; †Special DAPPS Query for Distinct Employee IDs by Operation (November 2010). *Note:* Budgeted staffing includes 50 percent frontloading for Enumerators.

Total U/L Production staffing was 2.6 percent lower than budgeted. The cost model allowed for a 50 percent frontloading rate for enumerators. Frontloading is a staffing strategy of over-selecting Enumerators for specific field operations to compensate for the risk of attrition and to limit the risk that some staff may not be able to work the assumed hours per day or days per week.

The only significant staffing group contributing to a staffing overage was FOSs, where the number hired was 24.3 percent more than expected. Enumerators/CLAs were actually under-hired by 3.2 percent. Overall staffing for the Production phase was close to budget.

Note that the actual hired number for both Production and QC includes all employees who ever worked on U/L, including those who worked less than a day. CLAs were trained and paid as Enumerators and thus are combined with the Enumerator budgeted and hired numbers. Actual staffing tallies for field positions are inflated as they reflect unique employees, which account for staff that dropped out or were released, in addition to their replacements. Staff who worked multiple positions within an operation are only counted in the position they worked the most hours.

Staffing Analysis for Update/Leave QC

A comparison of budgeted and actual staffing for U/L QC is presented in Table 5.12.

Table 5.12: Update/Leave Quality Control Staffing Profile

Quality Control				
Position	**DMD Budgeted***	**Actual Hired†**	**Variance**	
			Number	**Percent**
Stateside				
QC Enumerator and CLA	7,701	9,963	2,262	29.3
QC Crew Leader	671	961	290	43.2
QC FOS	76	140	64	84.2
Total	**8,448**	**11,064**	**2,616**	**31.0**
Puerto Rico				
QC Enumerator and CLA	1,166	1,339	173	14.8
QC Crew Leader	90	89	-1	-1.1
QC FOS	15	16	1	6.7
Total	**1,271**	**1,444**	**173**	**13.6**
All Positions (Stateside and Puerto Rico)				
QC Enumerator and CLA	8,867	11,302	2,435	27.4
QC Crew Leader	761	1,050	289	38.0
QC FOS	91	156	65	71.4
Grand Total	**9,719**	**12,508**	**2,789**	**28.7**

Sources: *DMD Cost Model, Budget Formulation Branch, DMD, March 1, 2010; †Special DAPPS Query for Distinct Employee IDs by Operation (November 2010). *Note:* Budgeted staffing includes 50 percent frontloading for Enumerators.

Overall U/L QC was overstaffed by 28.7 percent, while the QC workload was about 19 percent less than expected, as shown in Table 5.2. The largest single group contributing to this staffing overage was QC Enumerators/CLAs, who were over-hired by 27.4 percent. Note that, as with Production staffing, the actual hired number includes all employees who ever worked on U/L QC, including those who worked less than a day. CLAs were trained and paid as QC Enumerators and thus are combined with the QC Enumerator budgeted and hired numbers. Actual staffing tallies for field positions are inflated as they reflect unique employees, which account for staff that dropped out or were released, in addition to their replacements. Staff who worked multiple positions within an operation are only counted in the position they worked the most hours.

5.5 Assessment Question 4: What was the production rate (HUs per hour)?

The field staff hourly production rate (5.3 HUs per hour) was close to planned (5.5 HUs per hour) for the U/L Production field work, as shown in Table 5.13.

Table 5.13: Production Rate for Update/Leave Production

Production								
	Estimated Housing Units*	Budgeted Enumerator Hours†	Expected Enumerator Production Rate‡	Actual Housing Units¶	Actual Enumerator Hours†	Actual Enumerator Production Rate (HUs/Hour)	Production Rate Variance	Percent Variance
Stateside	11,127,335	2,067,526	5.5	10,842,812	2,038,789	5.3	0.2	-3.6%
Puerto Rico	1,703,036	314,967	5.5	1,709,435	343,508	5.0	0.5	-9.1%
Total	**12,830,371**	**2,382,493**	**5.5**	**12,552,247**	**2,373,997**	**5.3**	**0.2**	**-3.6%**

Sources: *DMD Cost Model, Budget Formulation Branch, DMD, March 1, 2010; †2010 U/L C&P Reports; ‡March 10, 2010 DMD Cost Model; ¶DSSD analysis of 2010 U/L Address Update File, refer to Table 5.20. *Note*: Actual Production rate = Number of addresses worked/Production hours used by Enumerator (for field work). Some totals due not add due to rounding.

Production rates in Puerto Rico were slightly lower than stateside. The Puerto Rico Enumerators checked more address fields per record, and likely resulted in the lower production rate.

Table 5.14 shows that the actual QC Enumerator production rate overall was lower (32.7 percent) than budgeted. For most Census operations, the QC production rate is somewhat lower than the production rate due to increased driving between assignments, the time it takes to review Enumerator data, and the time required to manually complete the Quality Control Record. Conducting DQC in areas impacted by hurricanes may also have impacted the production rate due to more complex QC work for determining ground truth. The budgeted QC production rate of 5.5 HUs per hour may have been overestimated in the cost model for U/L QC.

Table 5.14: Production Rate for Update/Leave Quality Control

Quality Control								
	Estimated Housing Units*	Budgeted Enumerator Hours†	Expected Enumerator Production Rate‡	Actual Housing Units¶	Actual Enumerator Hours†	Actual Enumerator Production Rate (HUs/Hour)	Production Rate Variance	Percent Variance
Stateside	1,958,411	363,879	5.5	1,511,828	422,744	3.6	1.9	-34.5%
Puerto Rico	299,734	55,434	5.5	320,997	79,118	4.1	1.4	-25.5%
Total	**2,258,145**	**419,313**	**5.5**	**1,832,825**	**501,862**	**3.7**	**1.8**	**-32.7%**

Sources: *DMD Cost Model, Budget Formulation Branch, DMD, March 1, 2010; † 2010 U/L C&P Reports; ‡March 10, 2010 DMD Cost Model; ¶DSSD data analysis of a combination of PBOCS DQC file and NPC keyed DQC form file.
Note: Actual Production Rate = number of field actions/Production hours used by QC Enumerator (for field work).

5.6 Assessment Question 5: How does the baselined schedule compare with the actual? What were the impacts to the program?

The U/L operation was scheduled from March 1, 2010 to March 28, 2010 for the Production field work, and March 8, 2010 to April 2, 2010 for the QC field work. There was no change to this schedule from the planned field operation dates to the actual dates.

However, the keying schedule at NPC was modified, due to the change in the keying of 'Verified' field actions. Although there were unplanned needs in the production schedule to complete all the required decennial processing, all updates were completed on time. Part of the demand to GEO's production schedule in summer of 2010 was the U/L Add Reconciliation updates, which were not planned. This operation resulted from the issues with linking questionnaire data for added units to address data in the AA Binder data.

Due to late submission by the LCOs of some QC forms to NPC, delivery of all keyed QC output data to DSSD was delayed. Although NPC provided interim files, DSSD receipt of all QC files was three months later than planned. An extension to the schedule was approved to key these forms. The extension did not impact any field work for subsequent operations, but did delay the schedule for writing the U/L Quality Profile in DSSD.

5.7 Assessment Question 6: What changes were implemented during the operation? What were the impacts to the field operation?

The primary change implemented during the U/L operation was in the post-processing of U/L field actions. A decision was made to stop keying verified addresses because field staff made no changes to these addresses during the field operation. This change was implemented to allow keying to be completed in time for the delivery of non-responding HUs added during U/L to the VDC operation.

While there were no impacts to the field portion of the operation, there was an impact to the program. The lack of keying of verified addressed impacted GEO MTdb updating processes and also impacted the quality of the assessment files and associated DSSD analysis. (See Section 4, Limitations - *Keying of Verify Actions*).

5.8 Assessment Question 7: What were the major findings from debriefings and observations?

Findings from RCC Debriefings

RCC Managers made the following key recommendations for U/L in their debriefing sessions held in September 2010[9]:

[9] Note: Additional information for findings and recommendations from debriefings is included in Section 5.8 and Appendix B.

- Examine the ability to move addresses to the correct blocks while in the field, rather than using the Delete/Add actions. This recommendation has implementation limitations in a non-automated operation, since these units are eligible for NRFU if a response is not received.
- Use a targeted communications program to educate the public on the type of enumeration deployed in their areas.
- Consider geography in remote areas in determining field staffing levels, instead of relying solely on workloads.
- Provide specific instructions for label creation and questionnaire address printing to include the best town name for a ZIP Code when matching to the USPS City State file.
- Printing maps well ahead of the operation worked well and limited impact on assignment preparation.
- Scheduled duration of the operation seemed adequate.
- Work flowed smoothly between Production and QC.
- Production staff should be notified of common critical errors, so the Production Enumerators can be retrained and to assist in preventing recurrence of these errors.

Findings from LCO, Crew Leader, and Enumerator Debriefings

These major findings came from the LCO, Crew Leader, and Enumerator debriefing reports:

- Most Crew Leaders and Enumerators felt that training and the operation as a whole went smoothly.
- The PBOCS D-370 series Progress Reports, showing which AAs Enumerators were assigned and completed, were very useful and used often.
- The PBOCS D-220 series Performance Reports, showing hours, miles, and completion rates, were not useful and therefore not used often.
- A few Crew Leaders and Enumerators (both stateside and Puerto Rico) reported that maps and map spots were inaccurate.

Findings from LCO Management Debriefings

LCO Managers and Assistant Managers completed a manager debriefing questionnaire in July 2010. The results indicated that over 90 percent of respondents assessed that U/L staffing, training, and management preparedness were adequate or better.

The following findings came from summaries of narrative comments provided by LCO management in the debriefing questionnaire response files:

- U/L was a well planned, organized, and managed operation. The goals were clear, the time line did not change, and the operation ran smoothly. The workflow between the Production and Quality Control phases went well.
- PBOCS was the largest challenge. Real time reports were needed for this operation.
- Hand-held computers should be used for payroll for this operation.

5.9 Assessment Question 8: What were the key lessons learned and recommendations for the future?

- Conduct testing of reporting systems with realistic production data to ensure correct and consistent reports are being generated.
- Back end data capture (keying and scanning) should be tested in a production environment (such as dress rehearsal) to ensure system readiness and allow staff an opportunity to work through issues.
- Provide an area located on the outside of the AA Binder to display the current status of the AA, thus avoiding having to open the binder to track AA progress throughout the workflow process.
- Develop a plan/process for reconciliation of AA Address Binders that will provide sufficient tracking of shipping and receipt from the LCO to NPC to ensure that all binders have been received, and have the ability to determine from system reports any missing binders and the ability to trace their source and status.
- Ensure that the budgeted and actual costs for CLAs are developed and tracked separately from the Enumerator position for all CLA training and field work.
- Update the cost model in a timely manner any time there are changes to operational assumptions. For example, the decision to combine U/L and UU/L workloads was made earlier in the decade, but the combined workload was not reflected in the cost model until December 2009. This did not allow planners the ability to see the cost model data reflecting UU/L early in the planning process.

Refer to Appendix C for a complete listing of all Lessons Learned generated by stakeholders after the operation was completed.

5.10 Assessment Question 9: How many addresses, Assignment Areas, and blocks were sent to the U/L operation?

As shown in Table 5.15, there were 11,982,126 addresses sent to the U/L operation, of which 10,399,379 were stateside and 1,582,747 were in Puerto Rico. For the stateside workload, 7,985,381 (76.8 percent) addresses came from TEA 2 and 2,413,998 (23.2 percent) were from TEA 7. The entire Puerto Rico workload was in TEA 2.

Table 5.15: Addresses Sent to Update/Leave by Type of Enumeration Area

	Stateside		Puerto Rico		Total	
TEA	Number of Addresses	Percent	Number of Addresses	Percent	Number of Addresses	Percent
2	7,985,381	76.8	1,582,747	100.0	9,568,128	79.9
7	2,413,998	23.2	0	0.0	2,413,998	20.1
Total	**10,399,379**	**100.0**	**1,582,747**	**100.0**	**11,982,126***	**100.0**

Source: 2010 Enumeration MAFX.
Note: *167 records were flagged as HUs in the 2010 Enumeration MAFX but later were identified as OLQ in the Address Update Table.

Table 5.16 provides a distribution of the total addresses sent to U/L by RCC. The Kansas City RCCs had more addresses in the U/L workload than any other region, accounting for 21.2 percent of the total workload, followed by Denver and Dallas at 15.6 percent. The New York RCC had the lowest percentage at less than 0.1 percent.

Table 5.16: Addresses Sent to Update/Leave by Regional Census Center and Puerto Rico

RCC	Number of Addresses	Percent
Atlanta	608,873	5.1
Boston*	784,493	6.5
Charlotte	198,085	1.7
Chicago	386,688	3.2
Dallas	1,870,392	15.6
Denver	1,871,232	15.6
Detroit	895,299	7.5
Kansas City	2,542,365	21.2
Los Angeles	254,885	2.1
New York	4,776	<0.1
Philadelphia	415,716	3.5
Seattle	566,575	4.7
Puerto Rico	1,582,747	13.2
Total	**‡11,982,126**	**†100.0**

Source: 2010 Enumeration MAFX.
Notes: *The Boston RCC managed Puerto Rico. However, the Puerto Rico numbers are presented separately in this table. †Total does not add to 100 due to rounding. ‡167 records were flagged as HUs in the 2010 Enumeration MAFX but later were identified as OLQ in the Address Update Table.

GRFC tables were used to identify 304 LCOs with a U/L AA. Table 5.17 gives the distribution of AAs by TEA. The distribution of the percentage of AAs is similar to that of addresses in Table 5.15. Among stateside AAs, TEA 2 comprises 77.1 percent of the total workload compared to 22.9 percent from TEA 7. All of Puerto Rico was classified as TEA 2.

Table 5.17: Update/Leave Assignment Areas by Type of Enumeration Area

TEA	Stateside		Puerto Rico		Total	
	Number of AAs	Percent	Number of AAs	Percent	Number of AAs	Percent
2	142,534	77.1	18,098	100.0	160,632	79.1
7	42,449	22.9	0	0.0	42,449	20.9
Total	**[*]184,983**	**100.0**	**18,098**	**100.0**	**[†]203,081**	**100.0**

Source: 2010 Enumeration GRFC. *Notes:* [*]Because 191 AAs span both TEA 2 and 7, there are 184,792 unique stateside AAs. [†]Because 191 AAs span both TEA 2 and 7, there are 202,890 unique total AAs.

Table 5.18 shows the distribution of the AAs by RCC. Similar to the patterns in Table 5.16, the Kansas City RCC has the highest percentage of U/L AAs with 21.1 percent, followed by Denver with 20.8 percent and Dallas at 16.6 percent. The New York RCC had the lowest percentage at less than 0.1 percent.

Table 5.18: Update/Leave Assignment Areas by Regional Census Center and Puerto Rico

RCC	Number of AAs	Percent
Atlanta	9,909	4.9
Boston*	13,381	6.6
Charlotte	3,441	1.7
Chicago	7,153	3.5
Dallas	33,494	16.5
Denver	42,175	20.8
Detroit	13,473	6.6
Kansas City	42,875	21.1
Los Angeles	3,173	1.6
New York	70	<0.1
Philadelphia	6,414	3.2
Seattle	9,234	4.6
Puerto Rico	18,098	8.9
Total	**202,890**	†**100.0**

Source: 2010 Enumeration GRFC. *Notes:* *The Boston RCC managed PR. However, the Puerto Rico numbers are presented separately in this table. †Total does not add to 100 due to rounding.

GRFC tables were used to identify 304 LCOs with U/L blocks. Table 5.19 shows the distribution of U/L collection blocks by TEA. AAs were made up of collection blocks, which may or may not have contained HUs in them. Collection blocks without HUs were included in the workload and contributed to total hours and mileage expended by Enumerators searching for all HUs in each AA and block.

Among the stateside blocks, 1,188,099 were from TEA 2, while 321,640 were from TEA 7. The workload in Puerto Rico was comprised of 39,437 blocks. The distribution of the percent of blocks in Table 5.19 is similar to that of AAs in Table 5.17.

Table 5.19: Update/Leave Collection Blocks by Type of Enumeration Area

TEA	Stateside		Puerto Rico		Total	
	Number of Blocks*	Percent	Number of Blocks*	Percent	Number of Blocks*	Percent
2	1,188,099	78.7	39,437	100.0	1,227,536	79.2
7	321,640	21.3	0	0.0	321,640	20.8
Total	**1,509,739**	**100.0**	**39,437**	**100.0**	**1,549,176**	**100.0**

Source: 2010 Enumeration GRFC. *Note:* *2010 Collection Blocks.

Table 5.20 shows the distribution of the blocks by RCC. In contrast to Tables 5.16 and 5.18, Table 5.20 shows the Denver RCC with the highest percentage of blocks at 26 percent, followed by Kansas City at 25.2 percent and Dallas at 17.3 percent. The New York RCC had the lowest percentage at less than 0.1 percent, which is consistent with the results in Table 5.16 and Table 5.18.

Table 5.20: Update/Leave Collection Blocks by Regional Census Center and Puerto Rico

RCC	Number of Blocks	Percent
Atlanta	76,348	4.9
Boston*	54,146	3.5
Charlotte	14,799	1.0
Chicago	54,146	3.5
Dallas	268,440	17.3
Denver	403,125	26.0
Detroit	81,664	5.3
Kansas City	390,448	25.2
Los Angeles	26,829	1.7
New York	197	<0.1
Philadelphia	29,932	1.9
Seattle	120,406	2.5
Puerto Rico	39,437	7.8
Total	**1,549,176**	†**100.0**

Source: 2010 Enumeration GRFC. *Note:* * The Boston RCC managed Puerto Rico. However, the Puerto Rico numbers are presented separately in this table.

As shown in Table 5.21, 85.4 percent of the entire U/L workload consisted of units with a complete city-style address. For stateside, a city-style address was defined as having a house number and a street name present on the U/L Address Listing Pages. In PR, a city-style address was defined as having either a house number and a street name or *urbanization*[10] or *carretera*[11] or *ramal*,[12] or both a building number and an apartment

[10] An *urbanization* (URB) in Puerto Rico is a housing subdivision in which the homes are often built by a single developer. Homes within an URB usually have unique house numbers, the streets are often named, and in some cases they have gated entrances.

[11] A *carretera* is a type of street. It is similar to what is considered a 'state road' stateside. They are often found in more rural areas often spanning long distances across the island. They are also commonly associated with kilometer/hectometer markers and are identified by a 1,2,3 or 4 digit number.

Carreteras with 1 and 2 digits usually indicate primary roads. Examples are PR 2 and PR 52.

Carreteras with 3 digits usually indicate secondary roads. An example is PR 129.

complex name present on the U/L Address Listing Pages. About 78 percent of the units in Puerto Rico had a complete city-style address.

Close to ten percent of the total units had an incomplete address (no complete city-style address, or no rural route or P.O. Box, but some address information present). It is possible there may have been complete address information contained in one address field due to inconsistencies in form completion and/or data capture issues. A complete house number and street name could be contained in the street name field or location description field.

Carreteras with 4 digits usually indicate tertiary roads, although in some cases a 3-digit carretera indicates a tertiary road as well. Examples are PR 4479 and PR 479.

[12] A *ramal* in Puerto Rico, like a carretera, is a type of street. Ramals are often found in rural areas of the island, and in small communities, and can be main thoroughfares or tertiary service-like roads. A ramal is usually identified by an 'R' followed by a 3 or 4-digit number that in many cases reflects the carretera from which it stems. An example would be R1124, off of Carretera 124. Both Carreteras and Ramals are sometimes referred to as state roads (i.e. PR111).

Table 5.21: Addresses Sent to Update/Leave by Address Type

Type of Address	Stateside		Puerto Rico		Total	
	Number of Addresses	Percent	Number of Addresses	Percent	Number of Addresses	Percent
Complete City-Style Address	9,006,912	86.6	1,229,631	77.7	10,236,543	85.4
with location description	3,100,335	29.8	472,936	29.9	3,573,271	29.8
without location description	5,906,577	56.8	756,695	47.8	6,663,272	55.6
Complete Rural Route Address	244,964	2.4	92,588	5.8	337,552	2.8
with location description	244,860	2.4	89,994	5.7	334,854	2.8
without location description	104	<0.1	2,594	0.2	2,698	<0.1
Complete Post Office Box Address	89,056	0.9	34,244	2.2	123,300	1.0
with location description	89,056	0.9	34,034	2.2	123,090	1.0
without location description	0	0.0	210	<0.1	210	<0.1
Incomplete Address	982,139	9.4	193,124	12.2	1,175,263	9.8
with location description	982,033	9.4	191,135	12.1	1,173,168	9.8
without location description	106	<0.1	1,989	0.1	2,095	<0.1
No Address Information	76,308	0.7	33,160	2.1	109,468	0.9
with location description	76,308	0.7	33,160	2.1	109,468	0.9
without location description	0	0	0	0	0	0
Total	**10,399,379**	***100.0**	**1,582,747**	***100.0**	**†11,982,126**	***100.0**
with location description	4,492,592	43.2	821,259	51.9	5,313,851	44.3
without location description	5,906,787	56.8	761,488	48.1	6,668,275	55.7

Source: 2010 Enumeration MAFX. *Notes:* *Total does not add to 100 due to rounding. † 167 records were flagged as HUs in the 2010 Enumeration MAFX but later were identified as OLQ in the Address Update Table.

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In summary, there were:

- 11,982,126 addresses sent to the U/L operation (Stateside: 10,399,379; Puerto Rico: 1,582,747).
- 202,890 U/L AAs (Stateside: 184,792; Puerto Rico: 18,098).
- 1,549,176 U/L blocks (Stateside: 1,509,739; Puerto Rico: 39,437).

5.11 Assessment Question 10: What were the final field outcomes for address records?

The address update file was created by GEO to update the MTdb. The file included all of the addresses that were assigned an action code by enumerators in the field. This does not include updates for verified units and the U/L Add Reconciliation update.

The Final Tabulation MAFX contained address information, geography (official tabulation block codes), and the final MTdb status for all decennial records including adds. The files also contained universe and operations flags that were used for tabulations of the characteristics of interest. Both the address update file and the final tabulation MAFX files were used for assessment question 10.

Table 5.22 shows 12,552,247 addresses were assigned a field action during the U/L operation. The number of addresses is 10,842,812 or 86.6 percent, stateside compared with 1,709,435, or 13.4 percent, in Puerto Rico.

Compared to the Enumeration universe (Table 5.15), there are 443,433 more addresses stateside and 126,688 more addresses in Puerto Rico. These records were assigned an Add action by field personnel.

Table 5.22: Update/Leave Field Action Counts

	Number of Addresses	Percent
Stateside	10,842,812	86.6
Puerto Rico	1,709,435	13.4
Total	**12,552,247**	**100.0**

Source: 2010 U/L Address Update Files and 2010 Final Tabulation MAFX.

Table 5.23 contains a summary of the final U/L field action codes. There were 588,519 addresses assigned an Add action, which accounted for 4.7 percent of the entire U/L universe. About 91 percent of the total U/L Adds were from U/L registers and about 9 percent were from U/L questionnaires. Adds from U/L questionnaires were approximated by subtracting the U/L Address Update table Adds from the Final Tabulation MAFX U/L

Adds. Stateside, the proportion of Adds from U/L registers compared with U/L questionnaires was similar to Puerto Rico.

A total of 8,867,870, or 70.6 percent, of the total U/L addresses were assigned a Verify action. Nationwide, 25.1 percent of the total U/L addresses were field verified and 45.5 percent were assigned a Verify action (automated) during post-processing (see Section 4, Limitations). The number of automated verifies was approximated by calculating the difference between the verified U/L HUs in Final Tabulation MAFX and verified addresses in the U/L Address Update table.

Table 5.23: Update/Leave Counts by Field Action Codes

Field Action Codes	Stateside		Puerto Rico		Total	
	Number of Addresses	Percent	Number of Addresses	Percent	Number of Addresses	Percent
Adds*	**461,298**	**4.3**	**127,221**	**7.4**	**588,519**	**4.7**
Adds from U/L Registers	421,348	3.9	113,490	6.6	534,838	4.3
Adds from U/L Questionnaires	39,950	0.4	13,731	0.8	53,681	0.4
Correction	**1,686,042**	**15.6**	**519,650**	**30.4**	**2,205,692**	**17.6**
Uninhabitable	**188,684**	**1.7**	**34,787**	**2.0**	**223,471**	**1.8**
Delete	**383,348**	**3.5**	**66,643**	**3.9**	**449,991**	**3.6**
Empty Mobile Home Sites	**75,144**	**0.7**	**130**	**<0.1**	**75,274**	**0.6**
Duplicate	**81,104**	**0.8**	**13,010**	**0.8**	**94,114**	**0.8**
Nonresidential	**40,999**	**0.4**	**6,317**	**0.4**	**47,316**	**0.4**
Total Verify	**7,926,193**	**73.1**	**941,677**	**55.1**	**8,867,870**	**70.6**
Field Actions†	3,155,778	29.1	691	<0.1	3,156,469	25.1
Automated	4,770,415	44.0	940,986	55.1	5,711,401	45.5
Total§	**10,842,812**	**‡100.0**	**1,709,435**	**‡100.0**	**12,552,247**	**‡100.0**

Sources: 2010 U/L Address Update File; 2010 Final Tabulation MAFX. *Notes:* * Register Adds came from Enumerator Listing Pages, while questionnaire Adds were obtained from GEO/DSPO U/L Reconciliation (see Section 4 – Limitations). †Field Action Verifies came from Enumerator Listing Pages, while Automated Verifies came from NPC (see Section 4 – Limitations). ‡Total does not add to 100 due to rounding. §OLQs were preprinted on the Listing Page with a Z action code to assist in canvassing of HUs and were not action codes returned by Enumerators. The Z action codes were excluded from this table.

In summary, there were a total of 12,552,247 U/L addresses from the field, of which 10,842,812 were stateside and 1,709,435 were in Puerto Rico. This number included 588,519 (4.7 percent) Adds. The vast majority (70.6 percent) of field actions were Verify actions, where no changes were made to the address records sent to the field.

5.12 Assessment Question 11: What were the results of the MTdb update process for address records? What percentage of the addresses listed had complete (house number/street name) city-style addresses? How many records were rejected and what were the reasons? Were there an unexpectedly high or low number of added addresses?

Table 5.24 provides the distribution of addresses received, rejected, and processed by MTdb action code.

Nationwide, a total of 12,552,247 U/L address records were received by GEO; 18,744 of these records were rejected during GEO processing, leaving 12,533,503 processed records. Of the 18,744 addresses rejected from GEO processing, 15,114 addresses, or 80 percent, were assigned Add actions by field personnel. Adds from U/L questionnaires were derived by subtracting the U/L ADDUP Adds from the Final Tabulation MAFX U/L Adds.

The number of automated verifies was derived by calculating the difference between the verified U/L HUs in the Final Tabulation MAFX and verified HUs in the U/L Address Update table.

Additional tables defining MTdb updates by structure size by basic street address can be found in Appendix A.

Table 5.24: Update/Leave Records Rejected in MTdb

Action Codes	Stateside			Puerto Rico			Total		
	Received	Rejected	Processed	Received	Rejected	Processed	Received	Rejected	Processed
Add*	**461,298**	**6,116**	**455,182**	**127,221**	**8,998**	**118,223**	**588,519**	**15,114**	**573,405**
Register	421,348	6,116	415,232	113,490	8,998	104,492	534,838	15,114	519,724
Questionnaire	39,950	0	39,950	13,731	0	13,731	53,681	0	53,681
Correction	**1,686,042**	**391**	**1,685,651**	**519,650**	**213**	**519,437**	**2,205,692**	**604**	**2,205,088**
Uninhabitable	**188,684**	**3**	**188,681**	**34,787**	**0**	**34,787**	**223,471**	**3**	**223,468**
Delete	**383,348**	**66**	**383,282**	**66,643**	**42**	**66,601**	**449,991**	**108**	**449,883**
Empty Mobile Home Site	**75,144**	**15**	**75,129**	**130**	**3**	**127**	**75,274**	**18**	**75,256**
Duplicate	**81,104**	**2,276**	**78,828**	**13,010**	**481**	**12,529**	**94,114**	**2,757**	**91,357**
Nonresidential	**40,999**	**19**	**40,980**	**6,317**	**4**	**6,313**	**47,316**	**23**	**47,293**
Total Verify†	**7,926,193**	**117**	**7,926,076**	**941,677**	**0**	**941,677**	**8,867,870**	**117**	**8,867,753**
Field Action	3,155,778	117	3,155,661	691	0	691	3,156,469	117	3,156,352
Automated	4,770,415	0	4,770,415	940,986	0	940,986	5,711,401	0	5,711,401
Total ‡	**10,842,812**	**9,003**	**10,833,809**	**1,709,435**	**9,741**	**1,699,694**	**12,552,247**	**18,744**	**12,533,503**

Source: 2010 U/L Address Update file and 2010 U/L Reject file. *Notes:* *Register Adds came from Enumerator Listing Pages, while questionnaire Adds were obtained from GEO/DSPO U/L Reconciliation (see Section 4 – Limitations). †Field Action Verifies came from Enumerator Listing Pages, while Automated Verifies came from NPC (see Section 4 – Limitations). ‡OLQ (OLQs) were not assigned a Z action code during field work, but were included on the listing page as a reference for the Enumerator to identify HUs. GEO was instructed to ignore Z actions during MTdb update. The Z action codes were excluded from this table.

Table 5.25 lists the reasons for rejected cases during the MTdb edit process of incoming records from the field action file. There were 18,744 address records rejected by GEO.

The highest category of rejected records (over 50 percent) were duplicated processing IDs ("CUSTIDs").[13] Of the total 9,955 rejected records for duplicated processing IDs, 6,567 (66 percent) came from Puerto Rico.

About 15 percent or 2,798 of the total rejected address records were rejected during GEO processing because they matched to the same unit as a surviving record (the address on the listing page matched the duplicated address) and were retired. This type of MTdb reject indicated that the Enumerator identified an address as a duplicate – however – rather than correctly recording the line number of the surviving record on the listing page, the Enumerator recorded one of the following instead:

- Recorded the line number of the address identified as the duplicate (it referred to itself).
- Identified the surviving address as a duplicate (referred back to an address that was already identified as a duplicate).

[13] In the context of U/L processing IDs, the terms PROCID and CUSTID are essentially the same. The PROCID from U/L was stored in the CUSTID field of the update files used for this assessment.

Table 5.25: Update/Leave Records Rejected in MTdb by Reason

Reason for Rejection	Stateside		Puerto Rico		Total	
	Number	Percent	Number	Percent	Number	Percent
Duplicate Processing IDs (CUSTIDs)	3,388	37.6	6,567	67.4	9,955	53.1
Illegal Block Number‡	1,745	19.4	1,368	14.0	3,113	16.6
Same MAFUNIT as a Survivor and Retired	2,288	25.4	510	5.2	2,798	14.9
Illegal or Missing Value‡	1,108	12.3	1,066	11.0	2,174	11.6
Illegal Surviving MAFID/Unit Status Code combination‡	164	1.8	170	1.8	334	1.8
Target MAFID Could Not be Found	167	1.9	4	0.0	171	0.9
Address Component Changed for Action K, V, D, N, L‡	143	1.6	7	0.1	150	0.8
Multiple Transactions Targeting the same MAFID	0	0.0	49	0.5	49	0.3
Total†	**9,003**	**100.0**	**9,741**	***100.0**	**18,744**	**100.0**

Source: 2010 U/L Address Update Reject File. *Notes:* *Total does not add to 100 due to rounding. †OLQ (OLQs) were not assigned a Z action code during field work, but were included on the listing page as a reference for the Enumerator to identify HUs. GEO was instructed to ignore Z actions during MTdb update by classifying them as rejects. The Z action codes were excluded from this table. ‡"Illegal" values, numbers, or code combinations are those that the MTdb update process determines are invalid for the database. Records with the following GEO action codes were not expected to have any address changes: K (vacant mobile home site), V (verify), D (delete), N (nonresidential) and L (duplicate).

The Final Tabulation MAFX files contained address information, geography (official tabulation block codes) and the final MTdb status for all decennial records including Adds. The files also contained universe and operations flags that were used for tabulations of the characteristics of interest. The Final Tabulation MAFX files were used for Table 5.26 and subsequent tables in this section.

Table 5.26 shows the distribution of HUs in the Final Tabulation MAFX by TEA. Nationwide, 79.8 percent of the total U/L HUs were in TEA 2 and 20.2 percent of the total U/L HUs were in TEA 7.

Of the 12,526,032 records that were originally in a block designated as a U/L TEA for enumeration, 4,043 (all stateside) shifted to a block with a non-U/L TEA by the final tabulation MAFX. Due to MTdb update rules, and efforts to remove duplication from census operations, it was possible for a MAF unit from U/L to be updated by additional 2010 Census operations. If an update occurred, there was a chance a different block, which may have been in a different TEA, became the preferred block when the Final Tabulation products were created. The preferred block was assumed to be the most accurate location because it was the most recent information obtained.

TEA is derived from collection geography, and MAF units without an associated collection block did not have a TEA value (a null value). Of the 4,043 records that changed TEA, 383

records were assigned a null value. A record updated in the MTdb during the U/L Add Reconciliation may have been missing a collection block. If the record was delivered from DSPO without a valid block and if it matched to a MAF unit without a collection block, the TEA may not have been identified on the Final Tabulation MAFX. (These cases seem to be DSF-only units that were not geocoded).

Table 5.26: Update/Leave MTdb Update by Type of Enumeration Area

TEA	Stateside		Puerto Rico		Total	
	Number of Addresses	Percent	Number of Addresses	Percent	Number of Addresses	Percent
2	**8,295,537**	**76.6**	**1,699,298**	**100.0**	**9,994,835**	**79.8**
7	**2,527,154**	**23.4**	**0**	**0.0**	**2,527,154**	**20.2**
Change of TEA from 2 or 7 to:	**4,043**	**<0.1**	**0**	**0.0**	**4,043**	**0.0**
Missing*	383	<0.1	0	0.0	383	<0.1
1	3,462	<0.1	0	0.0	3,462	0.0
3	2	<0.1	0	0.0	2	0.0
4	2	<0.1	0	0.0	2	0.0
5	170	<0.1	0	0.0	170	0.0
6	24	<0.1	0	0.0	24	0.0
Total	**10,826,734**	**†100.0**	**1,699,298**	**100.0**	**‡12,526,032**	**100.0**

Source: 2010 Final Tabulation MAFX. *Notes:* *TEA is derived from the collection geography, and MAF units without an associated collection block will not have a TEA value. †Total does not add to 100 due to rounding. ‡There were 12,552,247 total field actions and 12,526,032 total MTdb update actions. The difference was 26,215 records, of which 18,744 were rejects as described in Table 5.25. The remaining 7,471 records were processed by updating the block information and these records were not flagged as U/L updates on the products produced for this assessment.

As shown in Table 5.27, after MTdb updates were complete, the Kansas City RCC had the highest percentage of U/L addresses with 21 percent, followed by Dallas with 15.7 percent and Denver with 15.5 percent.

The distribution of U/L addresses across RCCs in the Final Tabulation MAFX was very similar to the Enumeration universe (Table 5.16). The only difference is that the Final Tabulation MAFX includes U/L Adds. As indicated in Table 5.26, there were 383 records that did not have a TEA value or RCC information. The RCC for those records was derived from the state and county code.

Table 5.27: Update/Leave MTdb Update by Regional Census Center and Puerto Rico

RCC	Number of Addresses	Percent
Atlanta	640,573	5.1
Boston*	814,866	6.5
Charlotte	207,565	1.7
Chicago	400,617	3.2
Dallas	1,961,044	15.7
Denver	1,942,797	15.5
Detroit	929,899	7.4
Kansas City	2,625,424	21.0
Los Angeles	270,117	2.2
New York	5,007	<0.1
Philadelphia	434,023	3.5
Seattle	594,802	4.7
Puerto Rico	1,699,298	13.6
Total	**12,526,032**	†**100.0**

Source: 2010 Final Tabulation MAFX. *Notes:* *The Boston RCC managed Puerto Rico. However, the Puerto Rico numbers are presented separately in this table. †Total does not add to 100 due to rounding.

Table 5.28 shows the U/L addresses in the Final Tabulation MAFX by address type. Over 86 percent of the entire U/L workload had complete city-style addresses. Over 76 percent of the addresses in Puerto Rico had a complete city-style address. All address types other than city-style were intended to be accompanied by a physical location description. Most of the units without city-style addresses had a location description. The distribution of the percentage of addresses is very similar to the Enumeration universe (Table 5.21).

Table 5.28: Update/Leave MTdb Update by Address Type

Type of Address	Stateside		Puerto Rico		Total	
	Number of Addresses	Percent	Number of Addresses	Percent	Number of Addresses	Percent
Complete City-Style Address	9,566,991	88.4	1,293,452	76.1	10,860,443	86.7
with location description	3,528,939	32.6	539,572	31.8	4,068,511	32.5
without location description	6,038,052	55.8	753,880	44.4	6,791,932	54.2
Complete Rural Route Address	255,982	2.4	111,294	6.5	367,276	2.9
with location description	253,815	2.3	109,025	6.4	362,840	2.9
without location description	2,167	<0.1	2,269	0.1	4,436	<0.1
Complete Post Office Box Address	85,231	0.8	35,439	2.1	120,670	1.0
with location description	84,819	0.8	35,286	2.1	120,105	1.0
without location description	412	<0.1	153	<0.1	565	<0.1
Incomplete Address	860,034	7.9	213,946	12.6	1,073,980	8.6
with location description	854,004	7.9	202,823	11.9	1,056,827	8.4
without location description	6,030	0.1	11,123	0.7	17,153	0.1
No Address Information	58,496	0.5	45,167	2.7	103,663	0.8
with location description	57,153	0.5	43,428	2.6	100,581	0.8
without location description	1,343	<0.1	1,739	0.1	3,082	<0.1
Total	**10,826,734**	**100.0**	**1,699,298**	**100.0**	**12,526,032**	**100.0**
with location description	4,778,730	44.1	930,134	54.7	5,708,864	45.6
without location description	6,048,004	55.9	769,164	45.3	6,817,168	54.4

Source: 2010 Final Tabulation MAFX.

Table 5.29 contains a summary of the U/L MTdb update action codes. The update to MTdb was similar to the field action status of the records in the U/L Address Update Table (Table 5.23). Overall, there were fewer Adds than expected. Only 4.6 percent of all MTdb updates were Adds. This percentage is relatively low, compared to the 7.0 percent Add rate from Census 2000. Of the 573,405 total added records, close to 85 percent were new Adds. Matched Adds were those that were merged with existing records in the MTdb, while new Adds were those that became new MTdb records. All Adds from field operations went through Non-ID Processing.[14]

[14] Any questionnaire delivered during U/L for an added HU lacked a census identification number (Census ID), hence the term "Non-ID." These questionnaires included a Processing ID instead that was used for tracking purposes. Added records going through Non-ID Processing were known as Type C cases. For additional information, refer to the "2010 Census Non-ID Processing Assessment" (Niosi, 2012).

There were 12,552,247 total field actions and 12,526,032 total MTdb update actions. The difference was 26,215 records, of which 18,744 were rejects as described in Table 5.25. The remaining 7,471 records were processed by updating the block information. However, due to incomplete data, these records were not flagged as U/L updates on the products produced for this assessment.

Table 5.29: Update/Leave MTdb Update by Action

Action Codes	Stateside		Puerto Rico		Total	
	Number of Addresses	Percent	Number of Addresses	Percent	Number of Addresses	Percent
Add	**455,182**	**4.2**	**118,223**	**7.0**	**573,405**	**4.6**
Matched	86,044	0.8	175	<0.1	86,219	0.7
New MTdb Record	369,138	3.4	118,048	7.0	487,186	3.9
Correction*	**1,680,282**	**15.6**	**519,127**	**30.6**	**2,199,370**	**17.5**
Uninhabitable*	**188,039**	**1.7**	**34,752**	**2.0**	**222,830**	**1.8**
Delete	**382,458**	**3.5**	**66,557**	**3.9**	**449,015**	**3.6**
Empty Mobile Home Site	**75,099**	**0.7**	**127**	**0.0**	**75,226**	**0.6**
Duplicate	**78,639**	**0.7**	**12,523**	**0.7**	**91,162**	**0.7**
Nonresidential	**40,959**	**0.4**	**6,312**	**0.4**	**47,271**	**0.4**
Verify	**7,926,076**	**73.2**	**941,677**	**55.4**	**8,867,753**	**70.8**
Total	**10,826,734**	**100.0**	**1,699,298**	**100.0**	**12,526,032**	**100.0**

Source: 2010 Final Tabulation MAFX. *Notes:* * Correction and Uninhabitable were approximated using the percent of each field action from the U/L ADDUP file.

Table 5.30 presents the U/L addresses in the Final Tabulation MAFX by the size of the structure at the basic street address. For stateside, a basic address was defined by a house number and a street name, in addition to other street name prefixes and suffixes (e.g. East, Old, Bypass) within a collection block and ZIP Code. For Puerto Rico addresses, a basic address was defined three ways, because address records with the apartment complex field filled in were presumably part of a multi-unit structure. Thus, the eligible Puerto Rico addresses in the Final Tabulation MAFX were broken into three datasets:

- Addresses with apartment complex and building ID filled in.
- Addresses with apartment filled and building ID null.
- All remaining addresses.

A BSA for the first dataset was defined by apartment complex name and building ID number within a collection block; a BSA for the second dataset was defined by apartment complex within a collection block; and a BSA for the third dataset was defined by a house number and a street name, similar to stateside; along with other Puerto Rico specific address fields (*urbanization*, *ramal*, and *carretera*).

For addresses in the combined stateside and Puerto Rico universe, single unit housing structures comprised 81.6 percent of the total workload. Among the 2,309,464 addresses with a multi-unit structure, over 40 percent contained 2-4 units. The breakdown of the basic street address by action code is in Appendix A, Tables A-1 to A-7 (Stateside) and Appendix A, Tables A-8 to A-14 (Puerto Rico).

Table 5.30: Update/Leave MTdb Update by Basic Street Address

Size of Structure	Stateside		Puerto Rico		Total	
	Number of Addresses	Percent	Number of Addresses	Percent	Number of Addresses	Percent
Single Unit	**9,314,994**	**86.0**	**901,574**	**53.1**	**10,216,568**	**81.6**
Multi-Unit	**1,511,740**	**14.0**	**797,724**	**46.9**	**2,309,464**	**18.4**
2 – 4 units	708,434	6.5	267,650	15.8	976,084	7.8
5 – 9 units	180,112	1.7	107,746	6.3	287,858	2.3
10 – 19 units	171,448	1.6	117,183	6.9	288,631	2.3
20 – 49 units	237,795	2.2	128,200	7.5	365,995	2.9
50+ units	213,951	2.0	176,945	10.4	390,896	3.1
Total	**10,826,734**	**100.0**	**1,699,298**	**100.0**	**12,526,032**	**100.0**

Source: 2010 Final Tabulation MAFX.

Table 5.31 shows the distribution of original sources for addresses in the Final Tabulation MAFX. The three top categories of original sources were: Census 2000 operations, having the highest percentage of U/L Original Source with 42.5 percent, followed by 2010 Address Canvassing (20.6 percent), and the 1990 Census (11.1 percent).

The methodology for calculating the 2010 MAF Original Source variable was to compare the corresponding earliest census operation date by MAFID on the Final Tabulation MAFX to the DSF refresh variable. If there was no DSF flag prior to the operation date, then the MAF source corresponding to that operation date was taken to be the original source. If there was a DSF flag prior to the earliest operation date, then that DSF update cycle was considered the original source.

Because of the numerous DSF update cycles leading up to the 2010 Census (there are generally two update cycles or "DSF Refreshes" per year, one in the spring and one in the fall), for the purposes of this analysis, the DSF original source categories were grouped into three subcategories in Table 5.31:

- **DSF (Census 2000 and Before)** – includes DSF records prior to Spring 2000.[15]
- **DSF (Pre-Address Canvassing)** – includes DSF records between Fall 2000 and Spring 2008.
- **DSF (Pre-Supplemental Delivery)** – includes DSF records between Fall 2008 and Fall 2009.

The following categories were created by grouping the remaining original sources to facilitate analysis in Table 5.31:

- **2000-2010 Survey Updates** – includes the addresses from:
  - Demographic Areas Address Listing (DAAL) Listing.
  - DAAL GQ Listing.
  - FACHS (Frame Assessment for Current Household Surveys) updates.
  - ACS GQ Frame Research.
- **2000-2010 HQ Updates** – includes the addresses from:
  - Rural Directory, Structure Coordinate Enhancement (SCEMA).
  - January 2006 Mississippi Field Work.
  - GQ Geocoding Updates.
  - HQ Override - post Census 2000.
  - MISC (Miscellaneous - 99).
- **2010 GQ List Updates** – includes the addresses from:
  - Federal State Cooperative Program for Population Estimates (FSCPE) GQ Updates.
  - Service Based Enumeration (SBE) Research by NPC.

[15] The DSF update cycle refers to the vintage of update by using "Spring" or "Fall" and the year (e.g. Spring 2000), because the updating cycle covers a period of a few months, from the time of receipt of the DSF file from the USPS to pre-processing of the file to updating the MTdb with the data.

Table 5.31: Update/Leave MTdb Update by Original Source

Original Source	Stateside		Puerto Rico		Total	
	Number of Addresses	Percent	Number of Addresses	Percent	Number of Addresses	Percent
Census 2000 Operations	4,460,507	41.2	864,108	50.9	5,324,615	42.5
2010 Address Canvassing	1,890,217	17.5	689,583	40.6	2,579,800	20.6
1990 Census	1,387,789	12.8	0	0.0	1,387,789	11.1
DSF (Pre-Supplemental Delivery)	1,162,947	10.7	0	0.0	1,162,947	9.3
DSF (Pre-Address Canvassing)	585,913	5.4	0	0.0	585,913	4.7
2010 UL/UUL	358,764	3.3	119,005	7.0	477,769	3.8
2010 LUCA	437,368	4.0	25,818	1.5	463,186	3.7
DSF (Census 2000 and Before)	392,853	3.6	0	0.0	392,853	3.1
2000-2010 Survey Updates	111,610	1.0	0	0.0	111,610	0.9
2010 GQV	19,411	0.2	754	0.0	20,165	0.2
2000-2010 HQ Updates	17,889	0.2	0	0.0	17,889	0.1
2004-2008 Census Tests	1,251	<0.1	0	0.0	1,251	<0.1
2010 New Construction	126	<0.1	0	0.0	126	<0.1
2010 GQ List Updates	86	<0.1	30	0.0	116	<0.1
2010 LUCA Appeals	2	<0.1	0	0.0	2	<0.1
2010 Count Review - HU Misses	1	<0.1	0	0.0	1	<0.1
Total	**10,826,734**	***100.0**	**1,699,298**	**100.0**	**12,526,032**	***100.0**

Source: 2010 Final Tabulation MAFX. *Note*: * Total does not add to 100 due to rounding.

In summary, there were:

- 12,533,503 processed addresses (Stateside: 10,833,809; Puerto Rico: 1,699,694).
- 18,744 rejected addresses (Stateside: 9,003; Puerto Rico: 9,741).
- About 87 percent of the entire U/L workload were complete city-style addresses (Stateside: 88.4 percent; Puerto Rico: 76.1 percent).
- 12,526,032 addresses on the MTdb post-processing (Stateside: 10,826,734; Puerto Rico: 1,699,298).
- Fewer Adds than expected. Only 4.6 percent of all MTdb updates were Adds. This is relatively low, compared to the 7.0 percent Add rate from Census 2000.

5.13 Assessment Question 12: What were the Quality Control outcomes (initial observations, DQC, Office Review)?

The goal of the QC program was to ensure that the completed AA Address Binders and the corresponding maps were updated accurately, completely, and legibly. The U/L QC program included these components:

- An assembly check of the AA Address Binders.
- An initial observation of each Enumerator.
- A DQC of each AA.
- Crew Leader review of each AA Binder for legibility and completeness.
- Office review(s) of materials shipped to NPC, including AA Address Binders, corresponding maps, and DQC forms.

NPC received data from three forms completed by field and LCO office staff:

- D-1222 (UL), Observation Checklist.
- D-1190 (UL), DQC Form.
- D-446, Office Review Checklist.

Because the AA Address Binder assembly check was considered to be an informal quality check, the LCOs did not send Forms D-972, AA Binder Assembly QC Checklist, to NPC for data capture. The LCOs shipped the AA Address Binders to NPC after each AA was completed, and NPC removed the DQC forms for data capture. The LCOs shipped the Observation Checklist forms and the Office Review Checklist forms to NPC at the close of the U/L operation.

NPC keyed all three forms from paper and sent files to the DSSD for review and analysis. NPC also shipped any forms received after data capture closeout to DSSD.

During the U/L operation, the results of the DQC and Office Review(s) were captured in PBOCS in the LCOs. In addition to the keyed form data from NPC, DSSD received a file from PBOCS containing DQC results and Office Review results. Whenever possible, the results reported in this assessment are from both the NPC data capture operation and the DQC file from PBOCS. This document provides high level results of the QC operations. For detailed information on the results of QC operations, refer to the *2010 Census: Update/Leave Quality Profile* (Parks, 2011).

Results of the Initial Observations

Crew Leaders or CLAs conducted an initial observation of each Enumerator to ensure the field procedures were understood. According to the PBOCS DQC file, a total of 42,321 Enumerators worked during U/L Production, and 9,643 Enumerators worked during U/L QC. Thus, NPC expected to receive an Observation Checklist for 51,964 Enumerators. However, the NPC captured data for only 26,782 Observation Checklists. After data capture close out, NPC shipped

an additional 280 Observation Checklists to HQ; these were found during keying of the AA Address Binders and in other materials from later operations.

Possible explanations for the discrepancy between the number of checklists data captured and the number expected include the following:

- The Crew Leaders/CLAs did not complete the form or turn it in to the LCOs.
- The LCOs shredded the forms in the offices instead of shipping them to NPC.
- NPC misplaced the forms after receiving them.

Prior to analysis, a total of 2,965 Observation Checklists were removed from the universe for various reasons, such as:

- Observation Checklists were missing applicant ID numbers.
- Observation Checklists were exact duplicates of other forms, excluding the notes fields.
- Multiple Observation Checklists were completed for the same Enumerator.
- Observation Checklists contained data for both observation types (Production or QC).
- Observation Checklists with no observation type indicated.

DSSD analysts had to ensure there was one Observation Checklist for each Enumerator by observation type – Production or QC. An Enumerator who worked on both Production and QC could have had two observation forms – one for Production and one for QC. Therefore, the results for the Production Enumerators are reported separately from the QC Enumerators.

Of the 23,817 unduplicated Observation Checklists used in the analysis, 19,376 were Production Enumerator Observation Checklists and 4,441 were QC Enumerator Observation Checklists. However, only 14,916 of the Production Enumerator Observation Checklists and 4,018 QC Enumerator Observation Checklists contained results of the initial observation.

Analysis of those Observation Checklists received by NPC indicated that the majority of observed Enumerators for which NPC received the Observation Checklists passed their initial observation – 97.2 percent of the Production Enumerators and 98.2 percent of the QC Enumerators. For a summary of Observation Checklist results by type of Enumerator, see Table 5.32.

Table 5.32: Update/Leave Results of the Initial Observation(s) for Observed Enumerators

Results	Production		QC	
	Count	Percent	Count	Percent
Satisfactory	14,494	97.2	3,946	98.2
Unsatisfactory	241	1.6	38	1.0
Other	181	1.2	34	0.9
Total	**14,916**	**100.0**	**4,018**	**100.0**

Source: NPC keyed data file of U/L Initial Observation forms. *Note:* There were 4,883 Enumerator observation forms excluded due to missing Observation Results information.

During the observations, Crew Leaders recorded the Enumerators' performance as they completed 20 tasks. According to the Production Enumerator Observation Checklists, the most common error recorded during the observation was the failure to enter the correct action code for each address on the Address Listing Page. Unlike the Production Enumerators, the most common error committed by 93 QC Enumerators was failure to show census identification and provide a copy of the Confidentiality Notice to each respondent.

Results of the Dependent Quality Control Check

Following the completion of Production field work on an AA, QC Enumerators performed DQC on every AA, verifying a sample of address units listed or updated during the Production phase of U/L. If the AA failed the DQC, the QC Enumerator recanvassed the remaining units in the AA. According to the final PBOCS U/L DQC file, the DQC failure rate for 202,889 AAs[16] was 6.0 percent. Therefore, QC Enumerators recanvassed 12,241 AAs.

NPC received, checked-in, and keyed 233,460 completed DQC pages. Since DSSD received three files of data from the DQC forms, they determined the actual number of keyed forms based on the number of unique AAs contained in one of the three files. Every AA should have undergone one DQC. After removing duplicate records for the same AA, the DQC data capture universe was 199,981 unique DQC forms. Possible reasons for the NPC file missing DQC forms include the following:

- The forms may have been misplaced in the LCO.
- The forms may have been lost in shipping.
- The forms may have been misplaced after arriving at NPC.

An additional 8,100 DQC forms did not contain results and were therefore omitted from the analysis that follows. Of the 191,881 DQC forms with results, 6.7 percent failed DQC, with 12,812 AAs requiring Recanvassing. The combination of keying errors (both at NPC and in the

[16] The total number of AAs canvassed during U/L was 202,890. One AA was missing a DQC result in the PBOCS DQC file.

LCO), missing DQC forms, and illegible DQC forms could account for the discrepancies between the pass/fail decisions recorded in PBOCS and captured on the actual DQC forms. See Table 5.33 for a comparison of the PBOCS and NPC results from the DQC.

Table 5.33: Update/Leave Results of the Dependent Quality Control in PBOCS and Data Captured at the National Processing Center

Results	PBOCS		NPC	
	Count	Percent	Count	Percent
AAs Passed DQC	190,648	94.0	179,069	93.3
AAs Failed DQC	12,241	6.0	12,812	6.7
All AAs:	**202,889**	**100.0**	***191,881**	**100.0**

Source: PBOCS DQC file and NPC keyed data file of the DQC forms. Note: *There were 8,100 DQC forms excluded from the NPC total form count due to missing DQC Results information.

The QC Enumerator recorded both critical and noncritical errors on the DQC forms. The DQC forms contained a decision rule that specified the 'allowable' number of errors given the AA size. The most common critical error occurred when a Production Enumerator incorrectly removed a unit from the U/L universe (marked the unit as a Delete, Duplicate, Uninhabitable, Empty Mobile Home Site, or Nonresidential), but the QC Enumerator believed it was a real unit. By far the most frequent noncritical error was "Map Spot Error: Out of Sequence on Map, or Not Added or Deleted on Map," which indicates the map spot for the unit was not updated correctly on the block map for the AA.

Overall, the DQC was designed to achieve no more than a 5.5 percent weighted Average Outgoing Quality Limit (AOQL) for critical errors and 15.2 percent for noncritical errors across AAs, which allowed for varying AOQLs based on AA workload sizes. The AOQL is the worst quality of address data the Census Bureau would expect across all AAs after the completion of Production and QC listing and any necessary Recanvassing. While the weighted AOQL design was not achieved, the AOQLs for the individual AA workload sizes were met. The estimate of the weighted AOQL was based on an assumption of the distribution of AA workload sizes, and this assumption was not met. There tended to be smaller AAs than expected and AOQLs designed for smaller AAs were higher than the weighted AOQL. DSSD plans to update future AOQL QC sample designs to better reflect the distribution of U/L AA workload sizes to the extent feasible.

Using both the PBOCS U/L DQC file and the NPC keyed data file, the approximate number of units worked during a QC phase of U/L was 1,832,825. Unfortunately, the PBOCS DQC file contained the number of lines in an AA Binder instead of the number of HUs in the AA. The goal was for every block to have a chance of being selected, even if the block contained no units. Therefore, every block in the AA contained a line on the Address Listing Page that counted toward the number of lines in the AA Binder, but did not actually represent an HU. In addition, OLQs and nonresidential units were included in the count of units worked during U/L. The DQC form contained the actual number of units in the AA; however DQC forms were missing for over 3,000 AAs. For the majority of the AAs, the actual number of units pre-printed on the DQC

form was used to calculate the QC workload. For the other AAs, the number of lines was used, which in some cases could be an overestimate of the actual number of units. Fortunately, the workload still remained under the budgeted QC workload, even with the overestimated AA sizes.

Results of the Office Review

After all materials were submitted to the LCOs, office staff conducted a review of the AA Address Binders and additional materials, checking for completeness and legibility. If an AA Binder contained errors the office staff could not fix, it was sent back to the field for repair, and then underwent a second Office Review.

The Office Review pass/fail decisions for every AA were captured in PBOCS. According to the PBOCS DQC file, 95.1 percent of the 202,890 AAs passed the first Office Review. Therefore, approximately five percent of the AA Address Binders were sent back to the field for repair.

The second Office Review data were not captured properly in PBOCS, so there are no results in the PBOCS file to show how often an AA Binder failed the second Office Review. If a binder failed the second Office Review, it was shipped without corrections to NPC in the interest of time.

Originally, it was planned to receive Office Review data only from PBOCS, and the forms were to be destroyed in the LCOs. However, an evaluation study provided requirements to capture the Office Review forms at NPC. The total number of Office Review forms captured at NPC was 160,327 (19 forms were keyed at headquarters). In addition to the 160,346 forms keyed at NPC and HQ, HQ received additional Office Review forms via FedEx. Of the 153,030 Office Review forms containing results, 5.7 percent failed the first Office Review. Of the 11,737 forms with a response to the second Office Review, 10.1 percent failed.

The difference between the number of forms keyed at NPC and the Office Review workload in PBOCS could be a reflection of the change in the office procedures. For example, because the original plan was to destroy the Office Review forms in the office, LCO staff may have done that instead of shipping them to NPC. Also, U/L was the only operation for which the LCOs shipped the Office Review forms to NPC and that may have caused confusion in some LCOs.

See Table 5.34 for a comparison of the PBOCS and NPC results from the first Office Review.

Table 5.34: Update/Leave Results of the First Office Review in PBOCS and Data Captured at the National Processing Center

Results	PBOCS		NPC	
	Count	Percent	Count	Percent
AA Address Binders - Passed	192,922	95.1	144,247	94.3
AA Address Binders - Failed	9,968	4.9	8,783	5.7
Total AAs	**202,890**	**100.0**	*153,030	**100.0**

Source: PBOCS DQC file and NPC keyed data file of the Office Review checklists.
Note: *There were 7,316 Office Review forms excluded from the NPC total form count due to missing Office Review results information.

Summary of Quality Control Outcomes

In summary, the majority of observed Enumerators for which NPC received the Observation Checklists passed their initial observation (97.2 percent of the Production Enumerators and 98.2 percent of the QC Enumerators).

During the DQC, the majority of the AA Address Binders passed, minimizing the Recanvassing workload (6.0 percent failed according to the PBOCS DQC file and 6.7 percent failed according to the NPC DQC file) and the AOQLs set for the individual AA sizes were met.

In the end, the majority of the AA Address Binders passed the first Office Review (4.9 percent failed according to the PBOCS DQC file and 5.7 percent failed according to the NPC file), minimizing the need for repair.

6. Related Evaluations, Experiments, and/or Assessments

2010 Census Address Canvassing Operational Assessment

2010 Census Group Quarters Enumeration Operational Assessment

2010 Census Group Quarters Validation Operational Assessment

2010 Census Non-ID Processing Assessment

2010 Census of Puerto Rico Assessment

2010 Census Operational Assessment for TEA Delineation

2010 Census Update/Leave Quality Profile

2010 Census Vacant Delete Check Operational Assessment

Evaluation of Automation in Field Data Collection in Address Canvassing Report

7. Key Conclusions and Recommendations

Through the planning, development, and execution of the U/L operation, the Census Bureau stakeholders accumulated knowledge and experience that will assist in more effective and efficient planning and development of future census operations. This section provides conclusions drawn from this assessment, highlights achievements of the 2010 Census, and identifies key recommendations to consider for implementation in the 2020 Census.

7.1 Conclusions

The assessment of the U/L operation revealed major successes. LCO, RCC, and HQ staff applied their program management expertise in planning and implementing U/L, such as:

- Completing a field workload of 12,552,247 addresses that were located in challenging areas that traditionally did not have city-style addresses, or were converting from E911 addresses not consistently used for mailing, and were more rural areas. The workload was also located in some challenging areas severely impacted by natural disasters earlier in the decade.

- Completing field work on schedule and completing the U/L AA Binder Keying operation to update the MTdb on a very tight turn-around. These successes made possible the delivery of data with updated information from the U/L operation as inputs into the VDC operation.

- Checking approximately 1,832,825 addresses during DQC or Recanvassing.

- The AOQLs for individual AA workload sizes were met.

- Conducting a comprehensive review of budget parameters and the cost model assumptions to ensure sufficient funding and adequate numbers of supply and training kits for field staff.

- Selecting experienced employees for field staff positions and training them effectively.

- Communicating effectively and continuously to keep senior management and stakeholders aware of progress, costs, potential obstacles, and actions taken to solve problems during the development and implementation of the operation.

- Providing output files on a timely basis, completing a post-census analysis, and addressing all assessment research questions.

7.2 Recommendations

Recommendations provided by the U/L Subteam for future U/L operations are grouped into the following subject matter areas:

- Planning and Development.
- Field Training and Procedures.
- Data Capture.

Planning and Development

- **Automate the U/L operation in 2020.** There was a tremendous amount of writing and transcription of numbers. An automated U/L operation could make use of an automated listing, mapping, and reporting instrument, with only paper questionnaires that would be dropped off at HUs after the Enumerators updated the address list and feature data using an automated instrument. Sending address and map updates directly to the Geography Division via automation would eliminate the time-consuming keying and digitizing operations involved with paper operations. Automation would also enhance the ability to more quickly deliver U/L results to subsequent operations.

- **Document all operational requirements early and communicate them to all stakeholders.**

- **Increase the amount of time dedicated to testing**. Enough time should be built into the schedule to allow for testing of all systems at each stage of development. Increased testing should include all testing from developmental to user testing, including the control system and processing systems.

- **Allocate less mileage for Production and more for QC** and provide more testing opportunity to confirm assumptions.

Field Training, Procedures, and Implementation

- **Find a better way of distributing questionnaires to the door at HUs.** Some occupants did not receive a questionnaire because they became unfastened from the door. This problem resulted in increased numbers of occupants who complained about not receiving a questionnaire, public relations problems, lost pre-printed address information (Title 13) on the forms, and an increased NRFU workload with increased costs.

- **Print specialized forms for Puerto Rico at the Puerto Rico LCOs,** similar to the PBOCS being set up to print Listing Pages at LCOs. This would reduce the possibility of errors in shipments to Puerto Rico (for example, the Add Page, but not including questionnaires).

Data Capture

- **Use a bar coded system to record the processing ID on the questionnaire for HUs added during U/L. Develop a means for the Enumerators and NPC to scan the bar code on the questionnaire for HUs added during U/L.** This will increase efficiency and reduce transcription error of long codes that uniquely identify and track added HUs. In 2010, the processing ID for Adds was 20 digits long and required transcribing them twice: in the field by Enumerators and at NPC. Instead of transcribing and keying, the bar code label could be pulled off a sheet by the Enumerator and adhered to the Add Page, then scanned by NPC. Or the Enumerator could use a hand-held computer with a bar code reader.

- **Research how to process, collect, and update all field actions using automated methods.**

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Appendix A: Update/Leave Results Tables

Appendix A includes additional tables that show different distributions of results of the MTdb Update process from the U/L operation.

Table A-1: Update/Leave MTdb Update Adds by Basic Street Address – Stateside

Size of Structure	Number of Addresses	Percent
Single Unit	340,218	74.7
Multi-Unit	114,964	25.3
2 – 4 units	64,106	14.1
5 – 9 units	11,062	2.4
10 – 19 units	9,310	2.0
20 – 49 units	12,542	2.8
50+ units	17,944	3.9
Total	**455,182**	**100.0**

Source: 2010 Final Tabulation MAFX.

Table A-2: Update/Leave MTdb Update Corrections/Uninhabitable by Basic Street Address – Stateside

Size of Structure	Number of Addresses	Percent
Single Unit	1,514,900	81.1
Multi-Unit	353,421	18.9
2 – 4 units	205,809	11.0
5 – 9 units	38,255	2.0
10 – 19 units	29,450	1.6
20 – 49 units	40,475	2.2
50+ units	39,432	2.1
Total	**1,868,321**	**100.0**

Source: 2010 Final Tabulation MAFX.

Table A-3: Update/Leave MTdb Update Deletes by Basic Street Address – Stateside

Size of Structure	Number of Addresses	Percent
Single Unit	298,487	78.0
Multi-Unit	83,971	32.0
2 – 4 units	40,162	10.5
5 – 9 units	8,731	2.3
10 – 19 units	6,770	1.8
20 – 49 units	9,983	2.6
50+ units	18,325	4.8
Total	**382,458**	**100.0**

Source: 2010 Final Tabulation MAFX.

Table A-4: Update/Leave MTdb Update Empty Mobile Home Sites by Basic Street Address – Stateside

Size of Structure	Number of Addresses	Percent
Single Unit	47,023	62.6
Multi-Unit	28,076	37.4
2 – 4 units	3,906	5.2
5 – 9 units	2,420	3.2
10 – 19 units	5,137	6.8
20 – 49 units	8,408	11.2
50+ units	8,205	10.9
Total	**75,099**	**100.0**

Source: 2010 Final Tabulation MAFX.

Table A-5: Update/Leave MTdb Update Duplicates by Basic Street Address – Stateside

Size of Structure	Number of Addresses	Percent
Single Unit	55,335	70.4
Multi-Unit	23,304	29.6
2 – 4 units	15,860	20.2
5 – 9 units	1,871	2.4
10 – 19 units	1,582	2.0
20 – 49 units	1,724	2.2
50+ units	2,267	2.9
Total	**78,639**	**100.0**

Source: 2010 Final Tabulation MAFX.

Table A-6: Update/Leave MTdb Update Nonresidential by Basic Street Address – Stateside

Size of Structure	Number of Addresses	Percent
Single Unit	33,563	81.9
Multi-Unit	7,396	18.1
2 – 4 units	4,549	11.1
5 – 9 units	1,022	2.5
10 – 19 units	670	1.6
20 – 49 units	694	1.7
50+ units	461	1.1
Total	**40,959**	**100.0**

Source: 2010 Final Tabulation MAFX.

Table A-7: Update/Leave MTdb Update Verifies by Basic Street Address – Stateside

Size of Structure	Number of Addresses	Percent
Single Unit	6,745,862	85.1
Multi-Unit	1,180,214	14.9
2 – 4 units	596,435	7.5
5 – 9 units	150,736	1.9
10 – 19 units	120,735	1.5
20 – 49 units	165,687	2.1
50+ units	146,621	1.8
Total	**7,926,076**	**100.0**

Source: 2010 Final Tabulation MAFX.

Table A-8: Update/Leave MTdb Update Adds by Basic Street Address – Puerto Rico

Size of Structure	Number of Addresses	Percent
Single Unit	104,960	88.8
Multi-Unit	13,263	11.2
2 – 4 units	8,340	7.1
5 – 9 units	1,736	1.5
10 – 19 units	799	0.7
20 – 49 units	643	0.5
50+ units	1,745	1.5
Total	**118,223**	**100.0**

Source: 2010 Final Tabulation MAFX.

Table A-9: Update/Leave MTdb Update Corrections/Uninhabitable by Basic Street Address – Puerto Rico

Size of Structure	Number of Addresses	Percent
Single Unit	451,495	81.5
Multi-Unit	102,384	18.5
2 – 4 units	67,901	12.3
5 – 9 units	8,420	1.5
10 – 19 units	3,699	0.7
20 – 49 units	4,407	0.8
50+ units	17,957	3.2
Total	**553,879**	**100.0**

Source: 2010 Final Tabulation MAFX.

Table A-10: Update/Leave MTdb Update Deletes by Basic Street Address – Puerto Rico

Size of Structure	Number of Addresses	Percent
Single Unit	53,182	79.9
Multi-Unit	13,375	20.1
2 – 4 units	8,181	12.3
5 – 9 units	1,368	2.1
10 – 19 units	810	1.2
20 – 49 units	482	0.7
50+ units	2,534	3.8
Total	**66,557**	**100.0**

Source: 2010 Final Tabulation MAFX.

Table A-11: Update/Leave MTdb Update
Empty Mobile Home Sites by Basic Street Address – Puerto Rico

Size of Structure	Number of Addresses	Percent
Single Unit	119	93.7
Multi-Unit	8	6.3
2 – 4 units	6	4.7
5 – 9 units	1	0.8
10 – 19 units	0	0.0
20 – 49 units	0	0.0
50+ units	1	0.8
Total	**127**	**100.0**

Source: 2010 Final Tabulation MAFX.

Table A-12: Update/Leave MTdb Update
Duplicates by Basic Street Address – Puerto Rico

Size of Structure	Number of Addresses	Percent
Single Unit	9,539	76.2
Multi-Unit	2,984	23.8
2 – 4 units	2,502	20.0
5 – 9 units	212	1.7
10 – 19 units	86	0.7
20 – 49 units	31	0.2
50+ units	153	1.2
Total	**12,523**	**100.0**

Source: 2010 Final Tabulation MAFX.

Table A-13: Update/Leave MTdb Update Nonresidential by Basic Street Address – Puerto Rico

Size of Structure	Number of Addresses	Percent
Single Unit	4,519	71.6
Multi-Unit	1,793	28.4
2 – 4 units	1,209	19.2
5 – 9 units	247	3.9
10 – 19 units	192	3.0
20 – 49 units	93	1.5
50+ units	52	0.8
Total	**6,312**	**100.0**

Source: 2010 Final Tabulation MAFX.

Table A-14: Update/Leave MTdb Update Verifies by Basic Street Address – Puerto Rico

Size of Structure	Number of Addresses	Percent
Single Unit	740,976	78.7
Multi-Unit	200,701	21.3
2 – 4 units	132,294	14.0
5 – 9 units	15,629	1.7
10 – 19 units	6,363	0.7
20 – 49 units	9,580	1.0
50+ units	36,835	3.9
Total	**941,677**	**100.0**

Source: 2010 Final Tabulation MAFX.

Appendix B: 2010 Update/Leave Lessons Learned

HQ staff from all stakeholder divisions participated in several meetings to identify and analyze lessons learned for U/L. Lessons learned are grouped into the following subject matter areas:

- Budget Planning and Cost Modeling.
- Data/Systems Requirements and Testing.
- Operational Implementation.
- Cost and Progress Reporting.
- Training.
- Management and Staff Communications

Budget Planning and Cost Modeling

- Examine the process for requesting cost estimates from participating Divisions and ensure it is efficient, effective, and understandable by all stakeholders.
- Ensure that costs and metrics for data capture are built into the cost model assumptions for each operation.
- Break out budgets for the various operations requiring post field processing and track charges by participating divisions for processing activities by using task codes.
- Ensure that progress for post field processing is tracked and measured against established goals.
- Do not wait too late to implement changes to the cost model regarding decisions that are made months or years prior to the start of the operation. For example, the decision to combine U/L and UU/L workloads was made in 2008, but the combined workload was not reflected in the cost model until December 2009.
- Reevaluate the method of budgeting for the Crew Leader Assistant position and accounting for CLA work completed.

Data/Systems Requirements and Testing

- Determine data requirement needs for assessing and evaluating the operation early in the planning process.
- Ensure that *all* requirements are documented (such as AA reconciliation, Time and Motion, disposition of materials). Employ the use of tools to validate all requirements that were captured (such as workflows) and that all parties understand the requirements as documented (such as walkthroughs).
- Back end data capture (keying and scanning) should be tested in a production environment (such as Dress Rehearsal) to ensure system readiness and allow staff an opportunity to work through issues.

- Clearly define the process for requirements development, system modification, and testing ATAC in support of the operation.
- The change from the FDCA to the PBOCS control system resulted in a compressed development schedule that did not provide adequate time for building and testing an efficient control system.

Operational Implementation

- Explore methods to secure questionnaire packages to the doors of residences during the "Leave" phase of the operation.
- Develop a plan/process for reconciliation of AA Address Binders that will provide sufficient tracking of shipping and receipt from the LCO to NPC to ensure that all binders have been received, and have the ability to determine from system reports any missing binders and the ability to trace their source and status.
- For efficient progress tracking, consider adding an area on the outside of the binder to display the current status of the AA without opening the binder.
- Examine the creation of an automated system to support Initial Observation forms.
- Develop a system to track and manage the Office Review forms.
- NPC's check-in system was designed to manage work at the LCO/AA level. The system was not required to account for missing pages within an AA. Examine a method to more effectively track and manage data below the AA level.
- Develop the capability to allow stakeholders to create custom reports out of the Operations Control System.

Cost and Progress Reporting

- Explore more efficient methods/mechanisms to make the C&P system available to stakeholders when the system is released into production.
- Ensure the timing of report generation is reflected on all reports when multiple systems are being statused during the operation.
- Conduct testing of reporting systems with production data to ensure correct and consistent reports are being generated.
- Better coordinate reports to track and manage processing of data to avoid stakeholders having different reports for the same task producing different results.
- Ensure that the budgeted and actual costs for CLAs are developed and tracked separately from the Enumerator position for all CLA training and field work.

Training

- Explore alternative methods to train staff (such as video and hands-on exercises) which ensure all staff receive consistent information.

- Reevaluate the utility and timing of a separate 'Admin Day' for U/L.
- Examine bringing on and training NPC staff (technician, supervisors, and QC staff) earlier to better equip them with the skills required to support the operation.
- Examine investing of funds in facilities at NPC to support training large numbers of staff in a more friendly/effective environment.
- Systems need to be designed and tested earlier to allow time for training writers to create examples for use in training manuals.
- Reinforce in training (and in Office Review) that field staff *cannot* alter the bar codes. Modifying the barcodes could result in unintended consequences on the backend, such as incorrectly stored AAs in the NPC Census Library.

Management and Staff Communications

- Elicit feedback from senior level stakeholders (such as ALDOIT) by documenting and reporting out recommendations, decisions, and other documentation.
- Develop strategies for knowledge transfer from experienced to junior staff (as well as subject matter experts to system developers), such as, but not limited to, best practice meetings, interviews, information exchanges, job aids, job rotation, and mentoring.
- Review roles, responsibilities, and expectations of team members on a quarterly basis.
- Develop a Decennial Master Activities Schedule earlier in the decade that integrates with stakeholder schedules allowing for improved program management.
- Develop a system to track and manage supply orders.
- Continuously evaluate risks and plan contingencies for the entire lifecycle of the program (for example, preaddressed questionnaires).
- Develop a clear understanding of all systems involved in the program, specifically as it relates to the logistics for shipping materials used by the LCO staff and the check-in/management system at NPC.
- Implement the use of a defect tracking system that is continuously updated and available to all stakeholders.
- Ensure that all stakeholders are adequately resourced and that participating Divisions have succession plans in place in case key resources are lost during the development and implementation of the operation.

Appendix C: Comparison of Census 2000 and 2010 Census Update/Leave Enumeration Procedures

Table C-1: Comparison of Census 2000 and 2010 Census Update/Leave Enumeration Procedures

Category	2000 U/L	2010 U/L
Interviewing at an HU	• Enumerators asked for occupant name and phone number, and entered it on the Address Listing Page	• The occupant name and phone number were dropped from both the Enumerator introduction of purpose of the visit and from Listing Page procedures.
Handling Special Place/Group Quarters (SP/GQ)	• If an address was listed on the Address Listing Page, Enumerators verified the information by observation and completed an INFO-COMM if the listed SP/GQ did not exist. • No interview script was provided for newly discovered SP/GQs.	• There were no SPs, only GQs. If a GQ address was listed on the Address Listing Page but did not exist, Enumerators took no action. If an address for a GQ was listed on the Address Listing Page as an HU, it was treated by the Enumerator as an HU. Newly discovered GQs were listed on an OLQ Add Page, which was handed over to the GQE operation at the LCO. • An interview script was provided for newly discovered GQs. There were no SPs, only GQs.
Updating Address Listing Page	• Enumerators did not link duplicate units, but did provide linking information on the label of the unused questionnaire. • Enumerators completed a column indicating if the revised entry was a city-style address or a road name and location description.	• Enumerators entered linking information on the Address Listing Page for duplicate units, but not on the label of the unused questionnaires.
Assigning New Map-Spot Numbers	• Enumerators assigned the next highest map spot number in the block.	• Enumerators assigned an alpha suffix to the previously worked map-spot number, starting with 'A'. For example, if three units were missing between map spots 7 and 8, they would be labeled 7A, 7B, and 7C.
Add Page for HUs	• Enumerators completed a field indicating if the entry was a city-style address or a road name and location description. This information was not keyed. • The Enumerator entered a location address prior to the interview and a mailing address, the occupant's name and telephone number, and type of HU code after the interview.	• This field was dropped. • Enumerators were not required to enter both location and mailing address information. Occupant name, phone, and HU code fields were dropped.

Category	2000 U/L	2010 U/L
Add Page for GQs	• The Enumerator entered the occupant's name, type of GQ, and the occupant's telephone number.	• These fields were dropped for 2010.
Recording Progress on Cover Daily Log	• Enumerators recorded "questionnaires delivered today/to date."	• Enumerators recorded "addresses worked today/to date."
Conducting QC Activities	• Crew Leaders or CLAs conducted DQC. • Crew Leaders selected blocks for DQC by using a random number table. • Recanvassing was conducted by CLAs or qualified Enumerators, and Repair was conducted by qualified Enumerators.	• A separate staff of QC Enumerators conducted DQC, Recanvass, and Repair. • After an AA Address Binder was checked in by the LCO staff, a DQC form was automatically printed. The form provided information on the location of the starting address for DQC work and the total units that had to be worked in the AA for DQC.

Source: FLD Enumerator manuals.

Appendix D: Update/Leave Assessment Acronyms and Initialisms

AA	Assignment Area
AC	Address Canvassing
ADDUP	Address Update File
ALDOIT	Address List Development Operations Implementation Team
AMFO	Assistant Manager for Field Operations
AMQA	Assistant Manager for Quality Assurance
AOQL	Average Outgoing Quality Limit
ATAC	Automated Tracking and Control System
BSA	Basic Street Address
C&P	Cost and Progress System
CIG	Census Integration Group
CLA	Crew Leader Assistant
CLD	Crew Leader District
DAAL	Demographic Areas Address Listing
DAPPS	Decennial Applicant, Personnel, and Payroll System
DMAF	Decennial Master Address File
DMD	Decennial Management Division
DQC	Dependent Quality Control check
DRIS	Decennial Response Integration System
DSF	Delivery Sequence File
DSPO	Decennial Systems and Processing Office
DSSD	Decennial Statistical Studies Division
ESC	Executive Steering Committee
FACHS	Frame Assessment for Current Household Surveys
FLD HQ	Field Division Headquarters
FOS	Field Operations Supervisor
FSCPE	Federal State Cooperative Program for Population Estimates
GEO	Geography Division
GQ	Group Quarters
GQE	Group Quarters Enumeration
GRFC	Geographic Reference File - Codes
HHC	Hand-held computer
HQ	Headquarters
HU	Housing unit
IST	Integrated System Team
LCO	Local Census Office
LQ	Living Quarters
OLQ	Other Living Quarters
MAF	Master Address File
MAFID	Master Address File Identifier
MAFX	MAF Extract
MISC	Miscellaneous
MO/MB	Mailout/Mailback
MTdb	MAF/TIGER database

NPC	National Processing Center
NRFU	Nonresponse Followup
PBOCS	Paper-Based Operations Control System
P.O.	Post Office
PROCID	Processing ID
QC	Quality Control
RCC	Regional Census Center
SBE	Service Based Enumeration
SCEMA	Structure Coordinate Enhancement
SP	Special Place
TEA	Type of Enumeration Area
TIGER	Topologically Integrated Geographic Encoding and Referencing (system)
U/L	Update/Leave
UCM	Universe Control and Management
USPS	United States Postal Service
UU/L	Urban Update/Leave
VDC	Vacant Delete Check