Department of Defense Workbook
In Support of AWS-3 Transition Planning for the 1755-1780 MHz Band
Rev. 8/1/14

The Department of Defense (DoD) has prepared the DoD 1755-1780 MHz Workbook (hereafter referred to as the Workbook) to provide potential bidders in the AWS-3 auction with information about potential impacts to AWS-3 frequency blocks and market areas as DoD incumbent users migrate, in most cases, to other frequency bands or other applications. It provides the refined Protection Zones for coordination of AWS-3 base stations with incumbent DoD operations as specified in the Joint Public Notice, released by the Federal Communications Commission (FCC) and the National Telecommunications and Information Administration (NTIA),announcing AWS-3 coordination details.[1] This adjunct "Read-Me" document is provided to help in the understanding and use of the Workbook. The Workbook may be found at www.ntia.doc.gov/category/aws-3-transition.

As explained in the Joint PN, sharing between AWS-3 auction winners and the incumbent federal operations will occur via a coordination process that will take place during the transition. Transition timelines (i.e., the time it takes a DoD operation to migrate to another frequency or medium) vary between operations and military Services. A limited number of operations will remain in the band indefinitely. Many aspects of the incumbent spectrum uses involve sensitive, non-public information that is redacted in the publicly available Transition Plans. For example, almost all DoD frequency assignments have restrictions on distribution which prevents their public release. The presentation of this information in the Workbook excludes critical RF parameters and usage characteristics such that distribution limitations can be honored. At the same time, the information is presented at a high level of resolution (e.g., at the census tract level) in order to provide bidders additional information about the DoD incumbent use and coordination obligations to plan for the AWS-3 auction.

The value of the Workbook comes from an understanding of how coordination will be implemented in the AWS-3 frequency blocks to allow sharing during the transition period. All of the DoD frequency assignments have an authorized point and radius or area of operation. Working groups associated with the Commerce Spectrum Management Advisory Committee (CSMAC) performed first-cut sharing assessments between most affected DoD systems and expected AWS-3 commercial wireless technologies – these assessments addressed both the potential for interference to federal systems from AWS-3 transmitters and the potential for interference to AWS-3 receivers from federal transmitters. The results of these assessments were tabulated and retained to identify zones between DoD systems and AWS-3 systems within which coordination would be required to avoid harmful interference in a sharing environment. The CSMAC distances represent coordination distances, not exclusion zones. The coordination zones associated with DoD operations with valid frequency assignments are based on the sum of the authorized points and radii or area of operation and the coordination distances calculated for

[1] *See* Coordination Procedures in the 1695-1710 MHz and 1755-1780 MHz Bands, *Public Notice*, GN Docket No. 13-185, DA 14-1023 (rel. Jul. 18, 2014) (Joint PN), *available at* http://www.ntia.doc.gov/files/ntia/publications/pn-aws3-procedures.pdf and https://apps.fcc.gov/edocs_public/attachmatch/DA-14-1023A1.pdf.

the DoD operations in question. Figure 1 illustrates the concept of a center location, authorized area of operation, and the inclusion of a coordination distance.

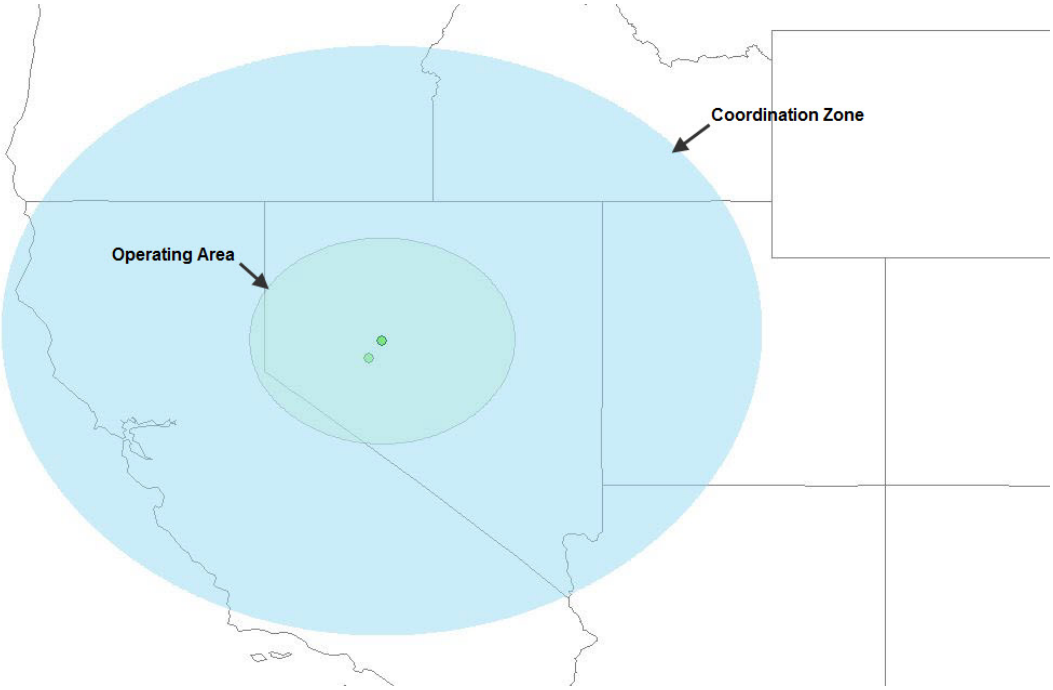


Figure 1. Example of operating area and coordination distance.

Coordination zones for approximately 1400 DoD operations were determined and mapped into a Geographic Information System (GIS) application.[2] Files containing US census tracts were also mapped into the GIS tool – approximately 75,000 census tracts. (As mentioned above, the use of census tracts was chosen to provide a high degree of fidelity in representing the impact of DoD operations on geographic areas. A crosswalk of census tracts to FCC licensing areas is also provided at www.ntia.doc.gov/category/aws-3-transition.) The GIS tool was used to determine the overlap of DoD coordination zones and census tracts for each of the five 5 megahertz segments within the 1755-1780 MHz band. Figure 2 shows one such intersection of a coordination area with census tracts. Census tracts totally or partially within a particular coordination zone are considered to be impacted by that DoD system. Any one census tract may be impacted by more than one DoD system, as specific local areas typically support many types of DoD operations. Sharing during the transition period requires coordination through the Defense Spectrum Organization (DSO) 1755-1780 MHz Band Coordination Portal prior to deployment.

[2] Analysis was based on mobiles and portables transmitting up to 20 dBm Effective Isotropic Radiated Power (EIRP).

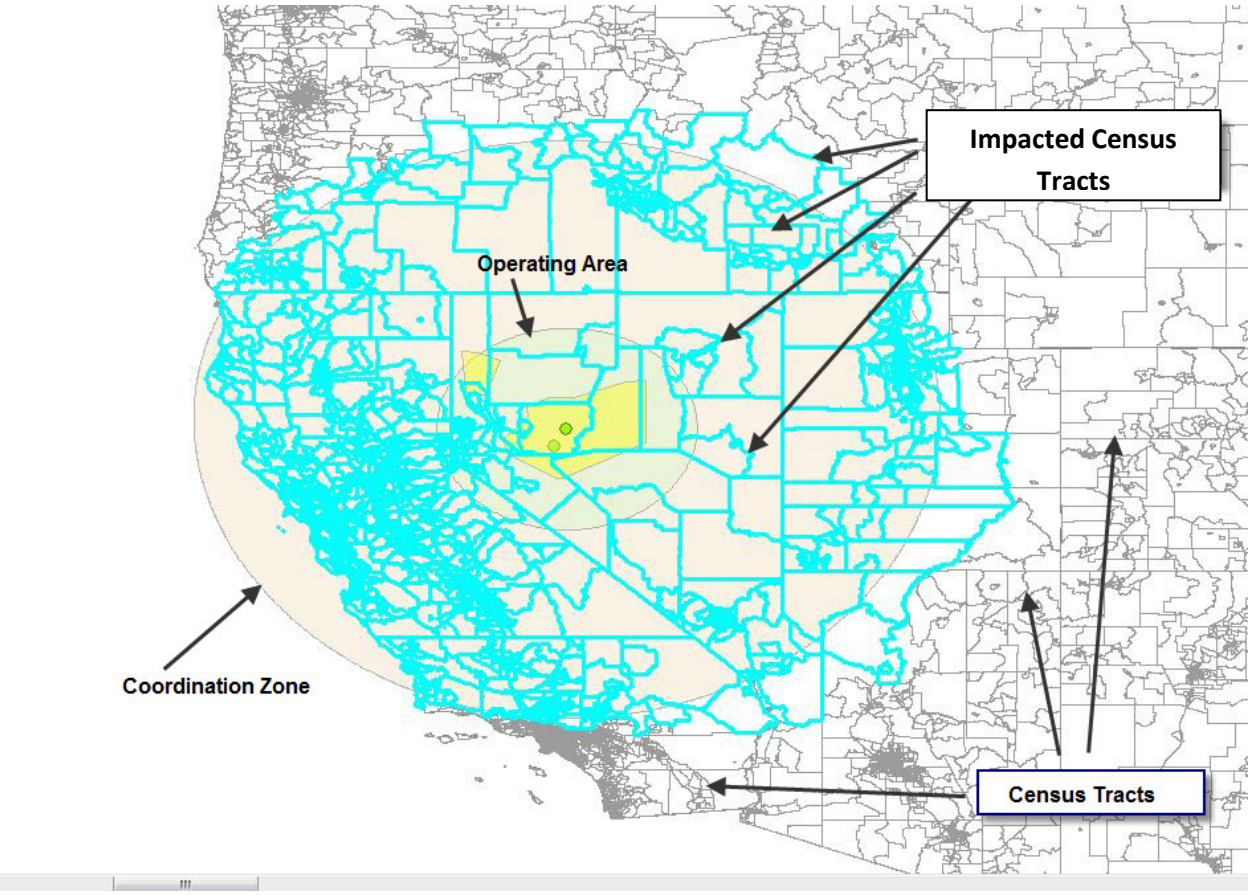


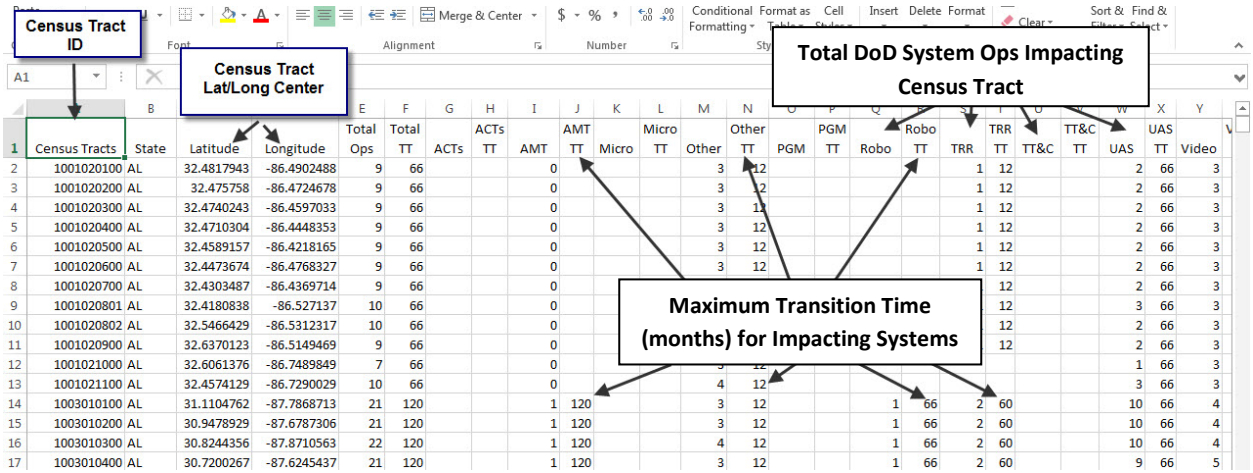
Figure 2. Intersection of census tracts and coordination area.

The Workbook is a set of two Excel files comprised of spreadsheets for each of the 5 megahertz segments within the 1755-1780 MHz band (i.e., 1755-1760 MHz, 1760-1765 MHz, ... , 1775-1780 MHz). The two Excel files (DoD Workbook Tab1 and DoD Workbook Tab 2) correspond to the "Tab 1" and "Tab 2" discussion in the *Joint PN*.[3] Tab 1 provides information related to potential harmful interference from AWS-3 transmitters to DoD systems (ProtectDoD) and Tab 2 provides information related to potential harmful interference from DoD transmitters to AWS-3 receivers (Protect Ind). The Tab 1 file depicts, for each 5 megahertz segment, potential interference from AWS-3 transmitters to DoD receivers and identifies areas and frequency segments where coordination with DoD is required if an AWS-3 licensee wishes to deploy prior to completion of DoD's migration out of those areas/frequencies. The Tab 2 file depicts, for each 5 megahertz segment, potential interference from DoD transmitters to AWS-3 receivers and provides notice to prospective AWS-3 licensees that they may receive (and will be required to accept) interference from DoD operations prior to the completion of the migration. Tab 2 is purely informational and does not define Protection Zones where successful

[3] *See* Joint PN at 8-9.

coordination is required (Note: The Joint PN requires coordination with federal earth stations which transmit in the band; a framework agreement is contained in Appendix C of the Joint PN).[4]

Within every Tab, all census tracts are listed as rows in the spreadsheet. The spreadsheet includes columns that focus on individual system uses. There are two columns associated with each of the system use types. At the intersection of a census tract row and the two columns for a system use, the value in the first (e.g., ACTS) column represents the total number of operations of that system use type that impacts that census tract and the value in the second (e.g., ACTS TT) column is the maximum transition timeline (TT = Maximum Transition Timeline in months) of any of the systems as reflected in DOD's Transition Plans. Figure 3 shows an example of a Workbook worksheet.



Census Tracts	State	Latitude	Longitude	Total Ops	Total TT	ACTs	ACTs TT	AMT	AMT TT	Micro	Micro TT	Other	Other TT	PGM	PGM TT	Robo	Robo TT	TRR	TRR TT	TT&C	TT&C TT	UAS	UAS TT	Video
1001020100	AL	32.4817943	-86.4902488	9	66			0				3	12					1	12			2	66	3
1001020200	AL	32.475758	-86.4724678	9	66			0				3	12					1	12			2	66	3
1001020300	AL	32.4740243	-86.4597033	9	66			0				3	12					1	12			2	66	3
1001020400	AL	32.4710304	-86.4448353	9	66			0				3	12					1	12			2	66	3
1001020500	AL	32.4589157	-86.4218165	9	66			0				3	12					1	12			2	66	3
1001020600	AL	32.4473674	-86.4768327	9	66			0				3	12					1	12			2	66	3
1001020700	AL	32.4303487	-86.4369714	9	66			0											12			2	66	3
1001020801	AL	32.4180838	-86.527137	10	66			0											12			3	66	3
1001020802	AL	32.5466429	-86.5312317	10	66			0											12			2	66	3
1001020900	AL	32.6370123	-86.5149469	9	66			0											12			2	66	3
1001021000	AL	32.6061376	-86.7489849	7	66			0														1	66	3
1001021100	AL	32.4574129	-86.7290029	10	66			0				4	12									3	66	3
1003010100	AL	31.1104762	-87.7868713	21	120			1	120			3	12			1	66	2	60			10	66	4
1003010200	AL	30.9478929	-87.6787306	21	120			1	120			3	12			1	66	2	60			10	66	4
1003010300	AL	30.8244356	-87.8710563	22	120			1	120			4	12			1	66	2	60			10	66	4
1003010400	AL	30.7200267	-87.6245437	21	120			1	120			3	12			1	66	2	60			9	66	5

Figure 3. Example Workbook worksheet.

There are several key items to note regarding certain aspects of the Workbook.

- For those System Use types that will remain in the 1755-1780 MHz band indefinitely, this has been represented as "99999" in the Transition Timeline field.
- Due to the approach that has been employed for creating the Workbook from the various DoD Transition Plans, the Workbook represents all DoD operations in the band (as of the date of the submission of the applicable plan). These operations include facilities or systems that use frequencies in the band under experimental licenses. Pursuant to Section 6.4 of the NTIA Manual, experimental classes of stations operate via temporary assignments and on a secondary basis to stations of all other services. While such assignments may be converted to regular assignments to the extent that they support ongoing operations, the experimental assignments represented in the plans and the Workbook will eventually expire and will not require coordination by AWS-3 licenses. Many of these experimental operations exist at locations that also support numerous other regular assignments that have longer timelines and require coordination. Therefore, the inclusion of experimental

[4] *See* Joint PN at 9. Coordination requirements for the 25 federal uplink earth stations are addressed in Section V and Appendix C.

authorizations in the Workbook will likely have only a limited negative impact on AWS-3 bidders' ability to assess the value of specific AWS-3 licenses. There is a possibility that as the DoD continues to perform additional transition planning, it may provide an updated version of the Workbook in advance of the AWS-3 auction that removes all experimental operations from the Workbook.

- Certain DoD operations required unique treatment or have aspects regarding them that are of special note. DoD airborne telemetry (AMT) operations were incorporated into the Workbook development process based on modified Transition Plan information that significantly reduced the impacted geographic areas and therefore the associated census tracts for each 5 megahertz segment. The DoD Satellite Operations (TT&C) systems (ground based uplink earth stations) transmit in this band so they are not represented on the Tabs showing impacts to DoD receivers.
- The following is a key to the System Use abbreviations found as column headings as well as explanations of the various System Use types.

System Use	Workbook Label	System Use Definition
Microwave	**Micro**	Fixed Point-to-Point Microwave: Frequency assignments for microwave operations that have specific sets of coordinates for both transmitter and receiver locations. Excludes Air Combat Training System fixed point-to-point microwave links.
TRR	**TRR**	Military Tactical Radio Relay (TRR): Frequency assignments for microwave operations that are integrated into a transportable platform. This type of system operates within a specified radius of operation with a specific set of coordinates identifying the center of the radius, or the transmitter/receiver may operate within a specific bounded area.
ACTS	**ACTS**	Air Combat Training Systems (ACTS): Frequency assignments in support of military air combat training systems, which include operations that are air-to-ground, ground-to-air, air-to-air operations, and fixed point-to-point microwave links. The fixed point-to-point microwave links that support ACTS are included for system continuity.
PGM	**PGM**	Precision Guided Munitions (PGM): Frequency assignments for air-to-ground munitions receiving guidance commands from an airborne platform.
Video	**Video**	Video Surveillance Applications: Frequency assignments are mobile air-to-ground excluding UAS's, ground-to-air, air-to-air, and fixed ground or transportable operations.
TT&C	**TT&C**	Telemetry, Tracking, and Command(ing) (TT&C) for Federal Space Systems: Frequency assignments for satellite ground station uplink systems which ensure the proper orbit(s) of satellites via telemetry, tracking, and command operations. TT&C assignments in the 1755-1780 MHz band are for earth-to-space links only; as such, telemetry operations are not included.
Telemetry	**AMT**	Mobile Telemetry: Frequency assignments for air-to-ground, ground-to-air and ground-to-ground telemetry operations that are not specifically identified to operate under different functions. Includes Aeronautical Mobile Telemetry (AMT).
Robotics	**Robo**	Land Robotic Functions: Frequency assignments for terrestrial operations that incorporate either the transmission of sensor data from or control information to land based robotic systems. Operations include, but are not limited to, explosive ordnance disposal.
UAS	**UAS**	Unmanned Aerial Systems, Unmanned Aerial Vehicles (UAV), or Remotely Piloted Vehicles (RPV): Frequency assignments for air-to ground, ground-to-air, and air-to-air operations for the purpose of transmitting or receiving information acquired by sensor systems located on the airborne vehicle or controlling the airborne vehicle by a ground based transmitter that is not specifically identified to operate under different functions.

Other	**Other**	Other Systems: Frequency assignments for operations not defined under any of the other system use categories. Systems in this category include systems such as software defined radios (JTRS), airborne Tactical Targeting Networking Technology (TTNT) systems, and systems used for electronic warfare (EW).

- The following is a key to the labeling of the Tabs in the Workbook:
  - ProtectDoD – Impacted census tracts identified based on distances to protect DoD receivers from AWS-3 systems
  - ProtectInd - Impacted census tracts identified based on distances to protect AWS-3 receivers from DoD systems
  - Segment G – 1755 – 1760 MHz
  - Segment H – 1760 – 1765 MHz
  - Segment I – 1765 – 1770 MHz
  - Segment J1 – 1770 – 1775 MHz
  - Segment J2 – 1775 – 1780 MHz

NOTE: The Workbook and the underlying data draws directly from the approved DoD transition plans and Government Master File records. However, it was prepared and processed by DoD and has not been verified or validated by NTIA or the FCC. Additionally, this information release does not supersede any rights and obligations specified by law, rule, or other NTIA or FCC action.