Minimum Essential Characteristics (MEC)
Illumina NextSeq 1000 Sequencing System

General: To support the mission of the Armed Forces Medical Examiner System (AFMES) and the Defense POW/MIA Accounting Agency (DPAA), AFMES-DNA OPS with the identification of missing service members from World War II, Korea, Vietnam, and the cold war as part of DoD's past accounting missions. To meet the National Defense Authorization Act (NDAA) 2010 mandate for 200 annual identifications, AFMES- DNA OPS has developed, validated Next-Generation Sequencing (NGS) methods on Illumina platforms.
Due to the end-of-life status of the current NextSeq 550 systems and a significant increase in mission sample workload, a direct replacement is required. To support these increased demands and maintain mission continuity, one (1) Illumina NextSeq 1000 Sequencing System is needed. This will allow for the seamless transfer of existing validated assays and provide the increased throughput necessary for identifying fallen service members.

1. NextSeq 1000 Sequencing System

Purpose: The NextSeq® 1000 Sequencing System is a next-generation sequencing (NGS) platform designed for high-throughput sequencing in an integrated benchtop unit. Its fast, integrated DNA-to-analysis workflow allows for the rapid sequencing of targeted panels, whole mitochondrial genomes, and supports single nucleotide polymorphism (SNP) analysis in a single run. The system utilizes Illumina's latest XLEAP-SBS™ chemistry, which provides faster run times and higher data fidelity. The system must be backward-compatible with existing validated forensic assays to avoid the prohibitive cost and mission stoppage associated with a full re-validation effort.

Specifications:

- Must be a next-generation sequencing (NGS) based platform incorporating cluster generation and sequencing into a single, integrated workflow with onboard data analysis.
- Must utilize XLEAP Sequencing by Synthesis (SBS) chemistry, which is 2.5x faster and provides higher fidelity than previous SBS versions. This is essential for compatibility with currently validated laboratory assays.
- Must ensure superior data quality, achieving a metric of ≥90% of bases higher than Q30 for common read lengths.
- Must support flexible read lengths, including 2x50 bp, 2x100 bp, 2x150 bp, and 2x300 bp, utilizing Illumina reagents.
- Must provide a flexible output of up to 120 Gb per run to accommodate increasing sample throughput demands.
- Must support a high read capacity of up to 400 million single reads per run.
- Must have run times between approximately 8 and 42 hours, depending on the specific assay and read length configuration.
- Must be designed with an integrated reagent cartridge that includes all fluidics and waste, eliminating the need for instrument wash cycles between runs.
- Shall incorporate a modern touchscreen interface and use RFID tracking for all consumables.
- Must feature a direct, on-site architectural upgrade path to a NextSeq 2000 System to ensure future scalability without requiring a new instrument.
- Instrument Control Computer (Internal) must be equivalent to or better than:
    - A 2U Microserver with a Linux Operating System
    - 288 GB of memory (RAM)
    - 3.8 TB SSD Hard Drive
- Must have overall dimensions no greater than 55 cm W x 65 cm D x 60 cm H (22 in x 26 in x 24 in).
- Gross total weight of no more than 141 kg (311 lbs). Must meet at a minimum the following read length, time, and output for high and mid outputs.