FEASIBILITY STUDY

# ARKANSAS STATE CRIME LAB

FINAL

SMITHGROUP

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# INTRODUCTION

# MESSAGE FROM THE DIRECTOR

*The mission of the Arkansas State Crime Laboratory is to provide quality forensic services to the criminal justice community and the State of Arkansas in a time frame amenable to our customers.* In order to be successful in this mission and provide the services that the citizens of Arkansas deserve, we must invest in forensic science, which is a critical part of the criminal justice system.

I became a Forensic Scientist 31 years ago with the State of Arkansas, dedicated to public service. Through the years I have been given the opportunity to implement and lead the first DNA and database section for the State as well as oversee all disciplines of the laboratory. Over the past 14 years, I have had the privilege and honor to lead an outstanding staff as the Director.

Our Forensic Scientists and Medical Examiners conduct critical scientific analysis that directly impacts Arkansans. On a daily basis, Forensic Scientists examine and analyze evidence submitted from law enforcement agencies across the state. Our Medical Examiners perform autopsies to determine cause and manner of death which is essential to bring resolution and closure to families of loved ones. Our staff provides objective findings obtained using the scientific method that can assist in the investigation and prosecution of perpetrators of crime or equally important, may assist in absolving an innocent person suspected of a crime.

As Director, I am ultimately responsible for ensuring that we have the resources needed to be successful while also having a vision for the future. The State of Arkansas needs a strategic plan to address the facility limitations of the laboratory and as you will see with this report, our current laboratory lacks the physical space and necessary infrastructure to handle additional personnel as well as the capacity to accommodate new technologies and instrumentation.

This laboratory feasibility study is the first step in addressing the current and future infrastructure needs that will provide a framework to solve today's challenges and meet the demands that the criminal justice system requires and deserves for decades to come.

Director Kermit B. Channell, II

# EXECUTIVE SUMMARY

The Arkansas State Crime Laboratory (ASCL) is an internationally accredited laboratory providing forensic science services to all 75 counties of Arkansas. The laboratory provides services to both state and federal law enforcement agencies, county Coroners, prosecutors, defense attorneys and other members of the criminal justice system. The laboratory also partners with tissue procurement agencies to maximize opportunities for organ and tissue donation that help save lives.

The existing facility experienced a lengthy renovation that began in 1997 and was completed in 2002. The building as it exists today is continuously affected by outdated mechanical, electrical and plumbing systems, inadequate structural capabilities, and inflexible spaces. These challenges impact workflow optimization efforts, the ability to increase section productivity (through additional instrumentation and equipment) and in some cases pose a safety and security risk (decedent intake, ventilation, and electrical systems).

This study has determined what the projected space needs are for the ASCL by analyzing population and crime trends for the state and projecting anticipated caseload and quantity of staff required to address the needs of the criminal justice system. Square footage needs were developed by reviewing typical square feet per staff requirements against peer facilities and national guidelines to develop a gross square foot projection for a facility to accommodate these components. For ASCL, it was projected that a facility of approximately 190,000 gross square feet is necessary to meet the needs of the state through year 2051.

## KEY FINDINGS

- The ASCL employs a dedicated staff of scientists, pathologists, investigators, technicians and supporting staff that are performing at some of the highest output levels in the country. It is noted that the ASCL, in the last consecutive three years, has been recognized as one of the top performing forensic laboratories in the world operating at 90% or better of peak efficiency.
- The existing ASCL facility is at capacity with no practical options for on-site renovation or expansion.
- A new facility and location are required to provide reasonable space and adequate systems to meet the needs of the State of Arkansas both today and to year 2051.

Completion of a new facility is expected to require 15 months of design (including programming) followed by a 24-month construction period. Based on national cost trends, the total project cost at a potential midpoint of 2024 construction period is roughly $182M (~$136M construction cost).

SECTION 02

# BACKGROUND INFORMATION

# HISTORY OF THE ASCL

The Arkansas State Crime Laboratory (ASCL) was established by Act 517 of 1977, Act 864 of 1979, and Act 45 of 1981. The laboratory is internationally accredited, providing services to local, state and federal law enforcement agencies in forensic pathology, toxicology, physical evidence (serological and trace evidence), drug analysis, latent fingerprint identification, firearms and toolmarks, digital evidence, and DNA for the entire state of Arkansas. The laboratory also participates with several federal agencies in the collection of data in the areas of DNA, through the Combined DNA Index System (CODIS); latent fingerprints, though the Integrated Automated Fingerprint Identification System (IAFIS); and firearms, through the National Integrated Ballistic Information Network (NIBIN).

Prior to 1977, the functions of the laboratory were carried out by several state agencies, including the Arkansas Department of Health, the Arkansas State Police, the Department of Public Safety, and the University of Arkansas for Medical Sciences (UAMS). The Arkansas State Crime Laboratory opened its doors in August 1981 in a building it shared with the headquarters of the Arkansas State Police. The original laboratory occupied the basement and third floor of the State Police building. The basement housed the State Morgue, as it still does today. In 1997, the State Police relocated to Southwest Little Rock leaving the Arkansas State Crime Laboratory as the sole occupant.

To expand the laboratory space in 1997, the State undertook a $10.3 million renovation of the facility. The renovation was used to modernize the infrastructure, work space, and add security features to the laboratory. The renovation was completed in the spring of 2002 and has served the state well over the past 19 years.

In 2019, the Arkansas State Crime Laboratory was placed under the newly created Arkansas Department of Public Safety (DPS), along with other agencies such as the Division of Arkansas State Police (ASP), the Division of Emergency Management (ADEM), Arkansas Crime Information Center (ACIC), the Arkansas Law Enforcement Training Academy (ALETA), and the Crime Victims Reparations Board as part of Act 910 of 2019.

The Arkansas State Crime Laboratory is led by a Director who is appointed by the Governor. An eight-member Board promulgates rules, policies, and regulations. The Board, which is appointed by the Governor, is composed of a member of the judiciary, member of the legal profession, county sheriff, chief of police, prosecuting attorney, and two physicians.

The Arkansas State Crime Laboratory is staffed with approximately 146 personnel. The laboratory provides forensic services at no charge to all state and federal law enforcement agencies throughout Arkansas.

Existing Facility

# CORE VALUES

## CORE VALUES

The Arkansas State Crime Laboratory has defined a set of core values that influence the way we conduct our daily work.

- Quality
- Teamwork
- Safety
- Clear communication
- Accountability
- Professional development


Discussion during Program Workshop 01

SECTION 03

# ANALYSIS

# EXISTING FACILITY ANALYSIS

Since the late 1990's the Arkansas State Crime Laboratory has occupied the entire existing facility which was originally constructed as a police department decades earlier at 3 Natural Resources Drive in Little Rock. The facility is located adjacent to the Arkansas Department of Agriculture and the Arkansas Game and Fish Commission.

As part of this Feasibility Study and Needs Analysis, the design team reviewed plans of the building's design, toured the existing facility and met with engineering and facilities representatives to gain a better understanding of the infrastructure and operational conditions that are inherent in the existing facility. The following is an overview of these conditions from the perspective of different disciplines.

Existing Facility - Exterior

# ARCHITECTURE & PLANNING

Current conditions provide office, laboratory, morgue and autopsy space in order to accommodate operations for each of the sections listed within this document. While the facility has served ASCL's operations well over the years, it has increasingly become an obstacle to operations, negatively impacting opportunities for a more optimized and appropriate approach to services. There are a number of areas in the facility that serve as ongoing constraints both to operations, and to expansion. Points of particular note include:

## BUILDING

At 40 years old, the existing facility is nearing the end of its designed lifespan and is increasingly in need of major maintenance on its systems to maintain functionality. The exterior envelope is in decent shape however the precast concrete panels are in need of re-caulking. The precast concrete panels were last caulked 10-15 years ago. It is also noted that some of the exterior windows have also been replaced years ago. The roof is halfway through its lifespan having been replaced 10-12 years ago, however some drainage issues do exist around the perimeter and there are some mold issues on the interior from a leak.

## SPACE

One of the most obvious issues noticeable when touring the lab is the lack of available space for conducting necessary operations. Growth of staffing and instrumentation within most sections has grown beyond the facilities infrastructure. In order to accommodate the growing needs of the laboratory, additional space will be required.

## FLOW

The pathway that evidence, staff, decedents and outside agencies take through of facility has changed over time in order to improve efficiencies. The existing facility has proved challenging to accommodate updated requirements let alone optimized processes. One example of inefficiencies is that the bullet recovery tank and firing range utilized by the Firearms Section, are located on different floors of the laboratory. This requires the analyst to constantly move between floors to complete casework. In a modern facility these areas would be located directly adjacent to each other eliminating wasted movement.

## TRANSPARENCY

Forensic facilities inherently work on potentially hazardous materials that must be handled in particular ways to avoid placing staff in potentially harmful conditions. While the ventilation system analysis is handled in other parts of this document, appropriate planning and transparency also play a role in staff safety. In many areas of the building there are obstructed or no views into lab areas limiting both observational control and safety.

## COLLABORATION

Forensics requires collaboration which must be appropriately supported by the right mix and location of spaces for interaction. While the facility does have some large conference rooms distributed throughout, there appears to be a lack of overall space at different scales to support the activities of a modern laboratory facility. Additionally, office areas are spread out from each other and localized within each laboratory discipline. This limits interaction between sections and collaboration between staff.

## INFRASTRUCTURE

There are a number of building infrastructure systems that are either rapidly failing or significantly limiting laboratory operations. The elevators are in constant need of repair and on a monthly basis staff find themselves trapped  and in need of assistance. The building's structural framework was not originally designed to accommodate the rigorous vibration and stability criteria that are required by modern laboratories. The building HVAC systems are not designed for a morgue therefore leaks from condensation are a regular occurrence within the space. The morgue cooler, which is original to the facility  is due for replacement.

## SECURITY

Some of the most challenging conditions in a forensic facility occur when staff engage with individuals who work outside of the primary facility staff. The most unpredictable individuals the facility interacts with are those coming to meeting with staff from the Medical Examiner, many who are dealing with the loss of a loved one and are in a unstable emotional state. Currently, those individuals must be allowed in to the main areas of the building for this interaction to occur creating a potential threat in the event of an emotional outburst. Additionally, law enforcement agencies must be allowed onto upper floors of the existing building to perform the necessary steps to submit firearms evidence, creating opportunities for potentially negative encounters.

## SITE

Parking is currently accommodated in two primary areas, one for visitors and the other intended for staff. The staff parking area does not have a secure perimeter which allows anyone in the area full access to staff vehicles creating dangerous situations that need to be diffused by ASCL leadership. Additionally, the location of the decedent  delivery is directly adjacent and visible to the primary street creating opportunities for news media and he general public to observe intake and release of victims denying respect to the decedent and their families.

Existing Facility - Autopsy

Existing Facility - Evidence

# MECHANICAL SYSTEMS

## MECHANICAL OBJECTIVE

The following is an assessment of the major equipment and systems supporting the Arkansas State Crime Laboratory (ASCL) facility. The ASCL facility is centrally located and supports both the crime lab and medical examiner functions for the entire state of Arkansas. As such its continued operation and performance is critical to their ongoing mission. The current location occupies 80,000 SF of the 40+ year-old facility. ASCL began occupying the third floor and basement in 1981 of what was originally the Arkansas State Police building. Several renovations were completed in the 1990s, but there have been no major improvements since that time.

The observation included a site walk on July 28th, 2021 with a general survey of existing equipment spaces and observation of major equipment. Drawings of the 1990's renovation were made available from the owner though other tenant improvements have occurred over the life of the building. The original construction documents were not available at the time of the observation. The building was fully occupied during observation. This assessment is based on the most recent version of the Arkansas State adopted codes: 2014 Arkansas Energy Code (2009 IECC or ASHRAE 90.1-2007), 2012 IBC, 2010 Arkansas Mechanical Code (2009 IMC with amendments), 2006 Arkansas Plumbing Code, 2006 Arkansas Fuel Gas Code, 2017 National Electric Code (NEC), as well as current industry standards.

## RISKS OF COMMON MECHANICAL /ELECTRICAL /PLUMBING (MEP) SPACES

The central plant resides in the basement adjacent to the autopsy suite and incinerator, and houses the chilled water system, heating water system, incoming natural gas service, incoming water service, water treatment, water heaters, fire water entry and fire risers, as well as compressed air and vacuum systems. While this configuration is not uncommon for the time, this room also houses the main electrical service, emergency electrical service, and electrical distribution to the building.

A review of existing documents indicate that the chillers and fire water entry were isolated with walls from the main room in the late 1990s (when there was also a small generator in the central plant). After that, however, a larger exterior generator was installed, the smaller generator removed, and the walls taken down to make room for additional emergency electrical gear bringing us to the present state.

The central plant is ventilated with outside air from louver where the original generator resided and is pulled through the room with a general exhaust fan on the opposite side. A unit heater at the louvered opening maintains the lower limit temperature of the room. In summer months this open louver and ventilation strategy draws humidity into the building and generates condensation on cold surfaces, uninsulated pipes, etc. While it appears that pipe penetrations through the central plant are sealed, it is unclear how well the block walls prevent moisture migration into the building.

The installation does not in all cases meet the 2017 NEC clearances relative the proximity of electrical panels and equipment to overhead piping and ductwork. With both main electrical and emergency electrical distribution together in the central plant, there is the potential for a single event to take out the electrical service including generator power. Examples of such events include the following:

- Significant water leak, fire sprinkler discharge, or flooding that raises water levels on the floor. Activation of a fire sprinkler head will generate an alarm, but a water leak from a broken pipe or flooding can go undetected. Consider adding moisture sensors near main electrical equipment pads to provide early warning of a potential problem.

- Significant natural gas leak. The natural gas is localized away from electrical gear and the room is ventilated, but a significant leak could go undetected. Adding a local detector near the boilers together with a 2-position gas solenoid valve and an emergency power off (EPO) switch at room entrance provides both an alert to elevated gas levels and a means to quickly shut down.

A similar theme emerges as one moves around the building. A typical building floor has two MEP rooms (one in the basement) housing the local air-handling unit, electrical panels, transformers, and telecom distribution serving that portion of the building. Electrical panels typically line the two interior walls with the telecom distribution in the corner of the room. Chilled and heating water piping is routed in the same corner as telecom with overhead duct mains serving the building.

The typical building floor MEP rooms also do not meet the 2017 NEC clearances in all cases. Unlike the central plant, there is no water entry in these rooms and no natural gas piping. The basement MEP room has the potential for flooding, but all other mechanical rooms are above grade. A power outage stemming from an incident in one of these rooms also has a limited impact, specifically to the areas directly served from this room.

Images: Proximity issues of electrical gear and panels from mechanical, plumbing, and fire protection distribution in central plant.

## CHILLED WATER SYSTEM

The chilled water system consists of two water-cooled chillers, a plate & frame heat exchanger, and three variable-speed chilled water pumps on a common skid with a one pump being redundant. Heat rejection is via a dual cell cooling tower with dedicated condenser water pumps (one pump per chiller) with one condenser water pump selectable for either chiller or free cooling via a plate & frame heat exchanger. The total cooling capacity is 314 tons with an installed total cooling demand of up to 447 tons with no diversity not counting demand from local fan coil units (latent prints and others).

The chillers, heat exchanger, and primary pumps were installed in 1998 and appear to be in good condition. The cooling towers and condenser water pumps were existing to remain, though the cooling tower was recently replaced with the cooling tower from the Arkansas Veterinary Diagnostic Laboratory though none of the condenser water was insulated at the time of the installation. The cooling tower media shows some scaling but looks to be in good condition. Given the available drawings coupled with observations from the field, the condenser water pumps appear to be original.

Images: Proximity issues of electrical panels and distribution from mechanical, plumbing, and fire protection systems in MEP rooms.

If the chilled water system met the diversified cooling load at the time of its installation, it is undersized now due to increased equipment loads. Cooling tower sizing appears to be consistent with chiller sizing. Supplemental cooling units have been added to the third-floor instrumentation room and in other locations to help offset this deficiency. The chilled water pump assembly has a redundant pump, but there is no redundancy for the condenser water pumps. A loss of condenser water pump CWP-1 will shut down chiller CH-1. A loss of condenser water pump CWP-2 shuts down chiller CH-2 or the heat exchanger if using free cooling (even though CWP-1 may still be operational).

While the condenser water piping is uninsulated in the basement, there is a significant amount of rust at the heat exchanger connections likely due to its proximity to outside air louver for central plant ventilation. We recommend that given the proximity of the heat exchanger to electrical gear, that the rusty pipe be replaced with new and insulated to prevent condensation in the future. Outdoor condenser water piping should also be insulated, and heat traced to protect against freezing. Note even with these recommendations, a loss of a chiller, cooling tower cell, or condenser water pump will limit system capacity which during peak demand periods will impact operations.

Images: Conditions of water-cooled chillers, cooling tower, plate & frame heat exchanger, and variable-speed chilled water pump skid.

## HEATING WATER SYSTEM

The heating water system has three gas-fired condensing boilers with two variable-speed heating water pumps on a common pipe. The boiler gas valves are interlocked to the chilled water refrigerant monitoring system, which will close the gas valves with detection of refrigerant. The total heating capacity is unknown as is the installed total heating demand (not listed on the available drawings).

The original boiler was replaced with two boilers in 1998 but the existing heating water pumps remained (appears to be configured for redundant pumping at the time). The boilers have since been replaced recently (now total of three), though the heating water pumps appear to be original. Given the likely increased boiler capacity, we suspect that both heating water pumps will operate during peak periods to meet the heating load. The flue vents from the boilers are combined and vented to the outside through the existing boiler flue vent ducting.

Dedicated outside air heat recovery units on the roof preheat outside air to the air-handling units. As a result, the air-handling units do not have heating coils. All building heating is done at the terminal unit heating coils, local unit heaters, and radiators. The boilers and boiler controls are in excellent condition. The type of condensing boilers provided supports a high turndown, allowing the system to operate normally at reduced water flows. The loss of a heating water pump during peak heating periods will limit system capacity during peak demand periods and may impact operations.


Images: Gas-fired condensing boilers, boiler flue venting, and heating water pumps.

## DEDICATED OUTSIDE AIR HEAT RECOVERY UNITS AND FUME HOOD EXHAUST FANS

General laboratory exhaust is exhausted through two dedicated outside air heat recovery units. These heat recovery units utilize fixed metal plates to isolate the exhaust from the outside air. Room temperature exhaust then preconditions outside air which is then routed to the outside air chases that feed the local air-handling units on the floors. This approach eliminates the need for heating coils at the air-handling units but requires general exhaust to be routed on the roof to the recovery units.

The dedicated outside air heat recovery units appear to have been installed after 1998 but have been in place for some time. Given the simplified design with fixed metal plates, the units will continue to operate provided the fans are maintained. Each unit appears to have a single supply fan and a single exhaust fan. The design does not have any redundancy, with each unit dedicated to their portion of the building and associated air-handling units.

Fume hood exhaust fans vent fume hoods independent of the dedicated outside air heat recovery units. Each fan supports a group of fume hoods in the same area of the buildings. The packaged laboratory exhaust fans include a bypass outside air damper, laboratory exhaust fan, and an exhaust nozzle with a dilution wind band to entrain roof air to increase the momentum and effective stack height. The fan operates at a constant airflow with the bypass air damper below allowing for variable exhaust from the building. Note that each location has a single exhaust fan (no redundancy)

Images: Dedicated outside air heat recovery units with fixed metal plates and general exhaust ducted above the roof. Local fume hood exhaust fans with bypass outside air damper and dilution wind band.

## FLOOR-BY-FLOOR AIR-HANDLING UNITS

The building is served by floor-by-floor air-handling units, two per floor with one in the basement. Each air-handling unit has a mixing section fed with tempered outside air from the dedicated outside heat recovery units, a filter section, a cooling coil section, and a supply fan section. There are also duct humidifiers with local electric steam generator in supply ducts to maintain minimum humidity levels. The only exception is the basement which does not have return air (single pass outside air only).

The two air-handling units on the third floor were installed in 1998 while the remaining air-handling units appear to be original. All the units utilize indoor construction and draw outside air from an outside air chase. The outside air chases appear to be lined and have some debris at their base. Tempered outside air is injected at the top of the outside air chases from the dedicated outside air heat recovery units. Outside air louvers along the outside edge of the chase allow for additional outside air.

While still functional, we recommend the replacement of these air-handling units within the next five years. The unit casings are no longer entirely sealed and have undergone various repairs over the years, both to the casings and the spring vibration isolators. Drain pans were unable to be inspected at the time of the site visit. Duct insulation needs repair in numerous locations within the mechanical rooms. The mechanical rooms in general are not well sealed, with numerous penetrations in floors and walls.

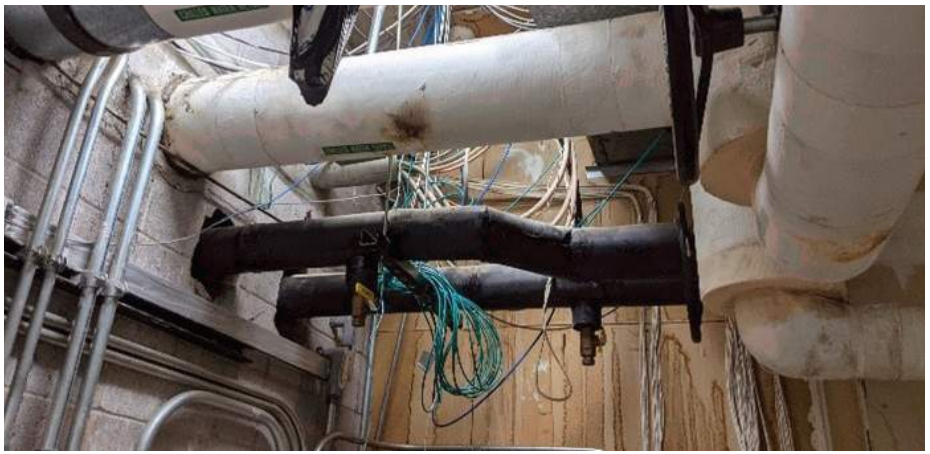
The building function and equipment used has changed from the original design. The air-handling unit serving the autopsy suite was likely installed nearly 40 years ago (drawings not available). In its current state the autopsy and decomp autopsy spaces likely meet the minimum 12 air changes per hour (ACH) required by code, but not much beyond that. The mixing-type air distribution strategy limits the effectiveness of the ventilation provided. The existing morgue dock where decedents are delivered has a unit heater to protect against freezing, but no active conditioning to eliminate moisture. A significant amount of outdoor humidity migrates into the coolers from this route and drips on the floor.

The first and second floors were originally designed to support the Arkansas State Police can only support a limited lab presence.

Supplemental fan coil units were added for latent prints area to support the increased cooling loads. The third-floor air-handling units were installed in 1998 for laboratories, but the size and density of instrumentation has since increased. Supplemental cooling units have since been added, but even with this, a portable cooling unit was observed to further supplement.


Images: Third-floor air-handling unit (1998) with tempered outside air chase from dedicated outside air heat recovery units.





Images: Commonly observed original air-handling unit with compromised supply duct insulation.

Images: Original basement air-handling unit with blocks supporting isolators and large wall penetration gaps around abandoned pipes.


Images: Supplemental cooling unit for instrumentation lab with portable cooler. Walk-in cooler condensation resulting from adjacency to tempered loading area.

## MECHANICAL SYSTEMS SUMMARY

The mechanical systems have served this facility for over 40 years in support of its ongoing mission. While still operational, the demands on these systems have exceeded their original design conditions and during periods or peak demand are falling short. For the most part these systems do not have any built-in redundancy. A failure of an air-handling unit will take down the area that it serves, while a failure of a chiller during peak cooling periods will limit what work can continue. Condensation at the walk-in cooler will continue to be an issue until the areas around it can be conditioned and sufficiently isolated to limit moisture migration.

As the original building was not built for its current use, there are inherent limitations as to how much redundancy could be added in the future. Even if redundant cooling capacity could be added at the building air-handling units, there is insufficient ceiling plenum height to get these services in place. This becomes most evident when looking at the exhaust ductwork routed above the roof for the third-floor laboratory program. The ceiling plenum, originally design for an office, simply cannot support a full laboratory program with supply and exhaust.

The collocation of the central plant with building electrical services is problematic. A significant water leak, flooding, or large natural gas leak has the potential to shut down building operations including the emergency power system. Increasing chiller sizes and capacities to meet the cooling demand only makes this condition worse and reduces already tight clearances. Overhead piping and ductwork in proximity to electrical equipment does not 2017 NEC requirements and trying to remedy this condition will be costly and, in some cases, not practical.

The central heating and cooling systems are for the most part in good condition, though the building air-handling units are approaching their end of life. In their current state and with regular inspection we expect that the air-handling units will be able to support the building until a replacement facility can be constructed. The air-handling unit locations in the building do not support ready replacement without a significant disruption, which is likely why previous renovations avoided this work.

Given the age of the systems, the current risks to building operations, limited cooling and air-handling unit capacities, the increased need for program area and mechanical systems to support, and the critical nature of this program, we recommend that a new facility is pursued with purpose-built infrastructure and systems to support this program both now and into the future.

# PLUMBING SYSTEMS

## PLUMBING OBJECTIVE

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## SANITARY SEWER SYSTEM

While the drawings provided are not complete, the non-laboratory spaces, basement, restroom cores, mechanical rooms, etc. are served by an existing sanitary sewer. The sanitary sewer system appears to be routed from the south portion of the building to the north through the utility tunnel, where they combine with piping from the north side of the building and exit the building to the north. Any sanitary waste from the basement is then pumped up to this main and outside the building. The sanitary sewer service size to the building appears to be 6-inch.

While we did not notice any deficiencies in the system, observations highlight the limited number of floor drains to support the building program with a limited amount of standing water in the central plant. Relief drains, fire protection inspector test drains, and others were not positioned near a floor sink and instead drain to the floor (presumably in the direction of a floor drain). In some locations a hole was cut in a floor drain to act like a floor sink. While we were not able to observe the sanitary sewer piping materials, the age of the building combined with the last major renovation in the late 1990s suggest that the material is cast iron. Cast iron is durable and we do not foresee any issues with its continued use.

## ACID WASTE SYSTEM

A separate acid waste system is dedicated to the laboratory program on floors one through three. Acid waste risers are installed in the northeast corner of the building (just south of the central plant) and in the southwest corner of the building just south of the mechanical room. The bulk of the acid waste system appears to have been installed in 1998 with the laboratory renovations. The acid waste is collected in the northwest corner of the central plant before directed out of the building to the west. While not observed, we assume that the acid waste line connects into the sanitary sewer line outside of the building to the north. The Acid waste appears to be 4-inch.

The original acid waste system utilized glass piping in the building, though the current program to our knowledge does not pour chemicals down the drain. The team did not observe any neutralization system. If this was originally provided, this has since been removed. Note that portions of broken acid waste piping were observed at the north where it had recently been repaired. The repaired sections utilized cast iron piping, which supports the no chemical discharge understanding.

As the glass piping is fragile, we expect there will be more breaks and repairs in the future when other work is being done in the area. Given the age of the system, we do not recommend replacement at this time unless it corresponded with a major renovation in the area. Where portions of the system are replaced, we recommend consideration for other more durable piping materials that meet plenum ratings (where applicable). Without treatment, at minimum a sampling port needs to be provided before connecting to the primary sanitary line so that the acid waste stream can be periodically inspected to ensure compliance with the no chemical usage policy.

Images: Gas-fired domestic hot water heater next to the heating water boilers with uninsulated domestic hot water piping.

Images: Portions of broken acid waste piping and piping repairs in shaft utilizing cast iron instead of glass.

## DOMESTIC COLD-WATER SYSTEM

A 4-inch domestic cold water system services enter the building from the north in the northeast corner of the basement central plant. The cold-water piping is then routed along the north wall to a 4-inch backflow preventer. The domestic cold-water system then serves domestic cold water, domestic hot water, reverse osmosis water system, 1-1/2-inch cooling tower piping, and 3/4-inch make-up water pipes for the chilled and heating water systems (each with local backflow preventors). The system also serves the bullet recovery tank with a separate local backflow preventor.

The domestic cold-water piping is copper. There is no separate industrial cold-water system. Laboratory plumbing faucets observed were the gooseneck type with no backflow prevention. While we did not observe the building pressure, there have been no reports of inadequate building pressure or flow. While calculations were not provided for the current installation, the system appears to be adequately sized for the current building program.

At a minimum we recommend vacuum breakers are added where missing at laboratory sinks to protect the domestic cold-water system from potential contamination.

## DOMESTIC HOT WATER SYSTEM

The domestic hot water system consists of a single gas-fired hot water heater and circulation pump. The recirculating system was installed in 1998, but both the water heater and the recirculation pump were recently replaced along with the heating water boilers. The recirculation system supports the entire building. The system appears to be in excellent condition in the basement, though the system distribution dates to 1998 and earlier and was unable to be inspected.

The domestic hot water piping is copper. While there have been no reports of inadequate hot water, the domestic hot water system is missing insulation at the water heater. Note that the single domestic hot water heater and recirculation pump represent a single point of failure in the system. Given the recent installation, however, no modifications are recommended at this time other than to provide insulation for the uninsulated portions of the domestic hot water system in the basement.

Note that the domestic hot water heater extends slightly beyond the equipment pad. Recommend installation is inspected to ensure no issues with the installation. If the equipment pad is acceptable but the current installation is potentially unstable, then perhaps the water heater could be stabilized with a strap and wire to structure above.

Images: Domestic cold-water entry in the basement central plant and a typical lab sink with gooseneck faucet but no vacuum breaker to protect domestic water source.

## REVERSE OSMOSIS (RO) WATER SYSTEM

A 1-1/4-inch recirculating reverse osmosis (RO) system is provided in the west side of the central plant. The reverse osmosis system consists of water softeners together with pre-filters and RO filters. Reverse osmosis water is then collected in a tank where it is then recirculated to the laboratory zones. The RO system utilizes plastic piping. The installation in the basement appears to be adequately maintained and sufficient for the current program's needs.

Reverse osmosis water is then available at fume hoods and a feed water to local pure water polishing units for laboratory use. These local polishers are mounted on the walls near sinks and provide point-of-use pure water at the desired water quality.



Images: Gas-fired domestic hot water heater next to the heating water boilers with uninsulated domestic hot water piping.

Images: Recirculating reverse osmosis system in the basement complete with water softeners, RO filters, storage tank, and recirculation pump. Local pure water system (bottom) above lab sinks on wall.

## ROOF DRAINAGE SYSTEM

The roof drainage system is original to the 40+ year old building and does not appear to have been modified as part of the last major building renovation in 1998. The roof drainage system appears to be a primary drain system only with no secondary overflow drains or scuppers. All the strainers observed were clean and in good condition.

There is a concern that without the overflow drains that portions of the roof will be susceptible to standing water with a clogged strainer. The frequency of roof drains, however, appears to limit the amount of standing water with a clogged drain. There were no indications of water ponding or staining, indicating that the system is inspected regularly, and any debris removed.

Per the 2006 Arkansas Plumbing Code (based on the 2006 IPC) Section 1107.1, secondary drainage is required. Secondary (emergency) roof drains or scuppers shall be provided where the roof perimeter construction extends above the roof in such a manner that water will be entrapped if the primary drains allow buildup for any reason. If the intent is to remain at this facility, this deficiency will need to be corrected and secondary roof drains (or scuppers) added.

Image: Regular spacing of primary only roof drainage system (red circles) with no overflow drains or scuppers.

## CONDENSATE DRAINAGE SYSTEM

Condensate drains are provided at air-handling units and fan coil units. Condensate traps were observed at air-handling unit connection with piping routed by gravity to the nearest floor drains with an air gap.

## NATURAL GAS SYSTEM

A 1-1/4-inch low pressure natural gas service enters the building at the north end of the central plant in the basement. The carbon steel natural gas piping is then distributed to the heating hot water boilers and the domestic hot water heaters. Natural gas piping distribution does not appear to be extended beyond the central plant. The total heating load is not listed in the reference documents provided, though the capacity appears adequate for the building needs.

## SPECIALTY LAB SYSTEMS

### COMPRESSED AIR SYSTEM

A centralized compressed air system is provided for the building and is at the West end of the central plant. The system consists of a single belt-driven compressor with spare motor, refrigerated air dryer, particulate filter, and a receiver tank. The compressed air system supports compressed air outlets generally at fume hoods. The compressed air system piping is 1-1/4-inch to the laboratory floors.

The system configuration is consistent with the 1998 laboratory renovation when it was installed. The system is small but appears to be adequately maintained. As the system has a single compressor and refrigerated dryer, these are single points of failure. Having the replacement compressor motor on-site limits system downtime. There were no reports in insufficient capacity or operation of the system.

Note that there is a local compressor on the third floor with a receiver tank serving a nitrogen generator. The installation is more recent and appears to be match to the current needs. No modifications are recommended at this time to the central or local systems unless as part of a major building modification to improve performance, capacity, and provide increased resilience.

## PROCESS VACUUM SYSTEM

The process vacuum system pre-dates the 1998 laboratory renovation and consists of a vacuum tank and a single vacuum pump. 1-1/2-inch vacuum pipe is then extended up to the fume hoods in the laboratory floors. We were unable to inspect vacuum piping above the ceiling during the site visit. The installed system appears to be original, and it is unclear to the extent that the central vacuum system is utilized. No modifications are recommended at this time. If there is a major laboratory renovation in the future, we recommend evaluating the need and condition of the centralized system at that time.

## NITROGEN GENERATOR SYSTEM

The nitrogen system consists of a nitrogen generator on the third floor together with a local oil-free air compressor. A local dedicated air compressor supports the nitrogen generator. The nitrogen generator is provided based on the high nitrogen demand to limit the number of nitrogen cylinders required. While the system does not have redundant capacity, local nitrogen cylinders can be utilized with a system outage to allow for continued operation while the system is repaired. The nitrogen generator and associated components are in an open area adjacent to the laboratory zones.

## HELIUM SYSTEM

A manifolded helium system consisting of eight helium cylinders and an automatic changeover manifold is provided near the nitrogen generator in an open area adjacent to the laboratory zones. The helium is then piped to the adjacent laboratory zone to support the increased demand for helium from these instruments. While the current location is not ideal from a cylinder replacement perspective, the location does limit distribution and meets the current program need. Recommend confirming that an oxygen monitoring and alarm system is provided near this area for safety.



Images: local compressor supporting nitrogen generator

Images: Central compressed air system in the basement (left), and central process vacuum system in the basement (right).

Image: Manifolded helium system. The medical air system (blue box) in the image is intended to be connected to local cylinders and is currently disconnected.

## FIRE PROTECTION SYSTEMS

The building is served by an 8-inch wet pipe fire protection service. The backflow preventer is in an above grade hot box, just north of the building on the east end. From there the fire main enters the building in the northeast corner of the central plant. The building has two primary fire risers serving the basement through third floors. While protected in the basement central plant, the fire risers are in the back corner behind the chillers. In the event of a fire at the chillers, access to the fire risers would be blocked until the fire could be contained. Similarly, a refrigerant release at the chillers will limit access to the fire risers without self-contained breathing apparatus (SCUBA) gear. The current location is not ideal but is original to the building.

A challenge with the current two fire riser configuration is that while adequately sized for the 80,000 square foot building, the water flow at a given fire riser only indicates a side of the building on which the fire water is flowing, but not a specific floor. Fire department, security, or staff will need to determine the fire location with a given alarm. Note that there are no floor drains in the vicinity of the fire risers or at the locations of remote inspector tests (floor-by-floor mechanical rooms). With any maintenance or testing, water will spill to the floor on its way to the nearest floor drain.

We are not aware of any dry-pipe or pre-action systems at this facility.

Images: Aboveground backflow preventor in hot box (left), and remote inspector test in mechanical room with drain to floor (right).

Image: Fire risers in back corner of central plant behind chillers and condenser water pump

## PLUMBING SYSTEMS SUMMARY

Except for the nitrogen generator system, helium system manifolds, and the recent gas-fired water heater / circulation pump, the balance of the plumbing distribution has been in place for over 20 years. The systems appear adequately sized and are providing acceptable performance for the program needs.

Recommendations include evaluating the current water heater installation for stability, providing hot water pipe insulation where missing, adding vacuum breakers where missing at lab sinks, and providing independent secondary roof drains (or scuppers) as required by the current code but not currently installed. Note that the addition of secondary roof drainage will be very disruptive, and likely will require revisions to other systems to accommodate minimum slope. Confirm that an oxygen monitoring and alarm system is provided at the nitrogen generator and helium cylinder manifold.

As noted above, in general the current plumbing systems sizing appears adequate for the demand, but will require verification of capacity, redundancy, and resiliency needs with major modifications. Given the age and material of the acid waste system, this system will likely be replaced in

its entirety with any significant modification.

Given the critical nature of this facility and its program and knowing that this program will only increase in the future, we recommend that a new facility is pursued with purpose-built infrastructure and systems to support this program both now and into the future.

# ELECTRICAL SYSTEMS

## ELECTRICAL OBJECTIVE

The following observation report is provided as an assessment of the existing major equipment. It is to provide a review of the quality of the equipment and provide recommendations for future modifications. Future recommendations include a full replacement of the distribution with limited re-use of specific equipment.

The observation included a site walk on July 28th, 2021 with a general survey of existing equipment spaces and observation of major equipment. The building was originally built for Arkansas State Police as a Police Headquarters and then renovated for the current tenant. Existing drawings based on the 1990's renovation were made available for reference from the owner. Additional tenant improvements have occurred in phases over the life of the building. The original construction documents were not available at the time of the observation. The building was fully occupied during observation. It is not known what version of National Electrical Code or International Building Code the original design is based on. This assessment is based on the most recent version of the Arkansas State adopted codes: 2014 Arkansas Energy Code (IECC 2009 or ASHRAE 90.1-2007), IBC 2012, NEC 2017, as well as current industry standards.

## SITE UTILITIES

The site is served by Arkansas Power & Light (AP&L), currently Entergy Arkansas (EA). It is assumed that the site is provided MV power to the local underground vault housing the utility transformer.

The utility transformer vault is located on the exterior adjacent to the building. The vault appeared accessible only by the removing the grate cover. The utility cover is perforated to allow ventilation but also allows exposure to weather and standing water. The vault cover appeared to be in good condition from the exterior. The utility transformer condition is unknown, but it was vibrating and producing significant humming sounds. Transformer humming can occur for various reason ranging from normal loading to power quality issues or physical connection issues.

The utility transformer vault was not accessible for internal inspection and prior to reuse of the utility transformer the equipment should be tested and reviewed by EA. A power quality study should also be completed to analyze the intensity of the humming to the internal balancing of the utility transformer. Additionally, the vault equipment should also be tested and replaced as needed, including sump pump and monitoring equipment.

It is understood that the weather in the area can create snow piles or standing water on or at the utility vault. Depending on the assessment of the internal vault there is a potential that the equipment be relocated to an area with less weather exposure.

The building utility connection serves the Crime Lab which energizes the State Audio/Radio Shop building down the street with a 480V/3ph/4w feeder. The Audio/Radio shop was not inspected as a part of Crime Lab site assessment.

## POWER DISTRIBUTION

(1) 2,000A, 480V/277, 3-phase Service Entrance Sections (SES) is provided for the building with a rated power quality capacitor. The Main SES feeds the original SES distribution board that has been intercepted. Distribution equipment is not manufactured by a single manufacturer. Much of the distribution equipment is provided by Eaton, Square D, Westinghouse, and General Electric (GE). Westinghouse is no longer in business. GE was purchased by ABB Industrial in 2018 but is still producing electrical distribution equipment with ABB Industrial.

It is unknown why the original SES distribution board had the main breaker replaced and subsequently the new SES main disconnect and distribution provided. In this transition it appears that the new cover was

not available as a replacement for the breaker. The distribution board was provided a sheet metal cover which is riveted to the existing housing. While preventing access this method is not recommended and potentially poses a safety risk with the housing. Housings and covers are typically tested for arc-flash and withstand along with listed for physical protection, and it is unclear that this metal panel would maintain the enclosure safety.

Similarly, the Motor Control Center (MCC) serving the main mechanical room appears to have been updated but the cover plates not available by the manufacturer. There is one instance where a junction box cover was used on the distribution equipment. There is another instance where a plastic-like panel is installed where there is remaining open space. These field created covers are a safety issue where the enclosure has gaps in the listed physical protection of the field personnel in the event of a fault.

It is recommended that all field modified enclosures be replaced, wholly or in part to maintain all safety listings.

A significant portion of the originally installed equipment is existing. It is recommended that equipment beyond the recommended lifespan be replaced to provide optimal safety performance and efficiency.

In addition to existing conditions, it is recommended that all systems be validated and brought up to code, including but not limited to a full coordination study with Arc-Flash labeling, Energy Reduction devices, 1000A and above ground fault protection, infrared scanning, and others as appropriate. If the existing building was to be repurposed it would be recommended that a contractor be hired to as-built the existing to remain system devices in detail since there is not a consolidated one-line diagram available.

The core and shell of the building did not provide isolated or dedicated electrical closets. Most of the electrical equipment is housed in the mechanical rooms. While locating electrical equipment in mechanical spaces isn't uncommon it is often recommended that the electrical equipment be rated above NEMA 1 due to potential fluctuations and water use in the space. The existing equipment is rated NEMA 1 for indoor dry installations.

Image: Site Utility Vault Cover

Images: Previous SES with metal panel cover installed (Left). MCC with plastic cover and standard junction box cover installed (Right).

Due to air and humidity issues in the mechanical space over the life of the building there are weathering issues with the electrical equipment in those spaces. Many electrical enclosures have mechanical signs of corrosion to the mechanisms, including panel hinges and panel locks. It is unclear what impacts the weathering in the space has had to the breakers located in the weathered panels. It is recommended that the manufacture do a field assessment to all the panel and breakers located in the mechanical spaces with the potential recommendation to replace, upgrade the enclosures or relocate the electrical equipment. Additionally, there was a safety issue that even when the panelboards were unlocked they were inaccessible because the latches had corroded in the closed position making the breakers inaccessible.

There were various instances of distribution boards missing the interior safety panel. It appears they were lost. It is recommended that replacements be provided. Because of the missing interior cover and mechanical weathering of the space it is also recommended that the interior of the boards with any missing covers be thoroughly cleaned by a qualified electrician or manufacturer. Once it was realized that the interior protection of the board was missing then the panel door was immediately closed due to safety concerns of the field team and lack of proper PPE for the exposure of live parts.

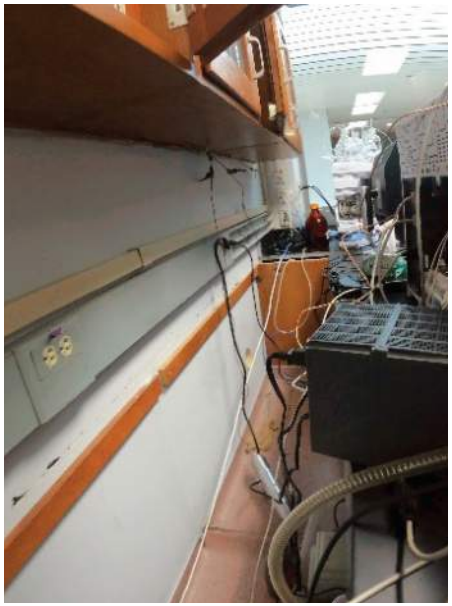
The electrical areas are organized but with various code violations as applied by the 2017 National Electrical Code. There are multiple locations where the front working space for electrical equipment is not maintained, foreign systems pass through the overhead electrical clearance zones out of compliance with the current NEC.

There is no space in the Electrical areas for future equipment and it is recommended that all the equipment with accessibility and clearance issues be relocated to a code compliant location. Additionally, because the equipment is located in the Mechanical space that has fluctuated in temperature and humidity over time due to maintenance and weather, it is recommended that the electrical equipment not longer reside in a space that is not temperature controlled. The ambient temperature in the mechanical spaces were higher than expected. It is recommended that all electrical closets be provided with appropriate ventilation. In some locations the exposure to mechanical equipment chemicals have corroded the metal conduit.

Images: Foreign systems passing through the overhead electrical equipment clearance zones (left). Missing interior cover of a distribution board, exposed live parts (right).

Images: Working space and clearance conflicts in the Electrical Area.

Image: Corroded metal conduit in main mechanical room.



Images: Raceway behind sink (Left) and raceway at the end of its life (Right).

Images: Mechanical Room light switch with missing cover and exposed wires (Left). Example of a damaged cover plate (Right).

The new laboratory space on the first floor appears to be in good condition with a new electrical closet located in that suite. All recent and existing laboratory spaces appear to have less general power receptacles than expected for a modern laboratory operating at an equal performance.

In some locations there is surface raceway located behind sinks that have unclear GFCI protection as required by the NEC. It is recommended that all receptacles within 6’ of a sink be provided the protection as specified by the NEC.

Some of the original renovation surface raceway is still existing. It is often appearing worn and ready for replacement.

Specialty equipment appears to be functioning but often with limited working space and/or clearances.  Occasionally there are limited safety measures in place for occupants and/or samples. For example, the bullet recovery tank is provided a residential quality sharpie painted battery power safety light that can be controlled from the corridor when in use.


Images: Sharpie painted warning light outside the bullet recovery tank (left). Decomp Room ceiling configuration (right).

There was limited availability to inspect the autopsy areas due to active procedures during the time of the observation. In general the autopsy area is not in medical grade condition. The Autopsy suites do not have sealed penetrations and the Decomp room is fully exposed allowing insects to infiltrate and corrode the electrical devices. Overall it appeared the power configurations are appropriate but electrically of commercial grade.

It would be recommended that Autopsy Suites be thoroughly demolished, exterminated, and cleaned prior to a renovation of the existing space for any use due to the quantity of insects and insect management required.

## BACKUP EMERGENCY POWER

The 135kW generator appears to have been removed in the original renovation. Based on the field conditions there is a Caterpillar Generator installed outside the Basement level Mechanical room that appears to have been installed in the last 10 years. The rating of the equipment is not labeled in the field. The size of the fuel tank was also not labeled on the unit. It is the understanding from the owner that the generator was sized to provide backup for the entire building which may match the existing configuration of the transfer switches. There are two transfer switches located in the main mechanical room that appear to have been installed at the same time as the generator. There is a sign indicating "Generator Disconnect Located at Main Switchboard". The annunciator panel is located at the security desk in the lobby.

The generator and ATS units are currently in good condition. The rating of the equipment is not labeled in the field. Based on the as-built drawings the smaller unit located next to the original service board is rated 600A/480Y277/?P/4W, it appears the unit has been replaced since the as-built documentation. It would be recommended that the space be better conditioned to optimize the performance and life span of the units. It is assumed that the ATS units provide NEC 700 Life Safety, NEC 702 Optional Stand-by loads.

- NEC 700 Life Safety systems provides electrical capability to "processes where current interruption would produce serious life safety or health hazards, and similar functions" (NEC 700.2 Informational Note). This includes Egress lighting, security elements, and Fire Alarm.
- NEC 701 Legally Required systems are "processes, that, when stopped during any interruption of the normal electrical supply, could create hazards or hamper rescue or fire-fighting operations" (NEC 701.2 Informational Note). This includes the Atrium Smoke Exhaust system.
- NEC 702 Optional Stand-by systems are loads that "when stopped during any power outage, could cause discomfort, serious interruption of the process, damage to the product or process, or the like" (NEC 702.2 Informational Note).

There are also labels that indicate there is a life safety system in the building. It is assumed that this system has been maintained in the renovations. Based on existing documentation the equipment connected to the 700 Life Safety system are in relation to the Fire Alarm, Egress systems. It is unclear if there are additional loads connected.

It is assumed that there are no 701 Legally Required systems in the building regardless of the lobby atrium. If determined as required by the architectural and mechanical evaluation the atrium exhaust system is recommended to be connected to a 701 system as required by the current building codes. A new 701 ATS may be needed, requiring modification to the existing generator system, potentially.

It is unclear without a chemical list if the exhaust system is also provided and/or required to be on the emergency system because of the hazardous rating of the system. In review the of the Legally Required system, it is recommended to coordinate the chemical list with any exhaust requirements.

Much of the distribution equipment is in the same condition of the power distribution. The same recommendations apply.

An emergency performance test was not performed during the site visit due to the building being in normal operation. It is recommended that the owner request building emergency performance records and that they be reviewed and performance tested to confirm operation prior to any future renovations.

The receptacles in the building are labeled as red and have not been labeled to indicate an back-up power connection. It is recommended that the equipment and devices be labeled to reflect the existing conditions.

In addition to existing conditions, it is recommended that all systems be validated and brought up to code, including but not limited to implementing a temporary generator connection or an alternate generator for maintenance per NEC .700.3

## UNINTERRUPTIBLE POWER SUPPLY (UPS)

A central UPS system was not discovered during the observation.

The as-built drawings indicate that a 5kW/208/120 Centralized UPS system was installed in Latent Prints for that department.

It is recommended that the Latent Prints UPS be observed for performance by the manufacturer. There are receptacles in other areas of the building are labeled as orange and have not been labeled to indicate an UPS power connection. This orange indicator would typically indicate a centralized UPS system or Isolated ground connection. It would be recommended that clarification be provided with the recommended as-built documentation.

Most of the equipment utilized localized UPS units which is typical for a Crime Lab or Autopsy building.

It is recommended that the system be labeled to reflect the existing conditions.


Images: Current generator (Left) and Disconnect sign (Right).



Images: Current ATS units (600A unit on the left).

Image: Current generator monitoring panel.

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## METERING

It appears that metering is not incorporated into the new Electrical Service Entrance Sections. The location of the EA meter was not discovered during the field walk. The original service board has an analog meter but it is unclear if this meter includes all building loads or if it is functioning accurately.

Load information was not available before the observation. The 12 month and 30 day Peak Demand can be requested by an Authorized Owner representative from EA Key account manager.

No other additional meters were observed.

Image: Metering the original service equipment.

## GROUNDING

The grounding and bonding system was not clearly observed. Grounding buss bars are not provided in all electrical equipment locations and rooms.

Based on the as-built drawings of the renovation the existing grounding system was utilized.

It is recommended that prior to future renovations that the grounding system be included in any future as-built documentation report.

## LIGHTNING PROTECTION

There is not a lightning protection system installed in this building.

Based on the approximate dimensions of the existing building, value of

the components of the building, and location VAISALA National Lightning Protection Network analysis for Little Rock, the recommendation is that a lighting protection system should be installed in this facility.

## LIGHTING

The following describes the existing lighting and lighting control system condition with potential recommendations.

### EXTERIOR ILLUMINATION

No nighttime observation was conducted.

Exterior ground level parking is provided approximately 20'-0" pole mounted Metal Halide fixtures. The poles appeared to be in quality condition.

Exterior wall mounted fixtures appeared to be CFL type bulbs with full cutoff shield. They appear to be reaching the end of life and could be ready for replacement.

Based on the as-built drawings it is assumed that the exterior lighting is controlled through a time-of-day relay panel.

There is potential energy and maintenance efficiencies with providing a full LED system that should be considered for any future exterior or parking lighting updates. Future renovations of the exterior or parking garage would likely require LED lighting along with additional occupancy sensing and dimming.

### INTERIOR ILLUMINATION

As-built documentation indicates that the lighting was updated in the 1990's renovation as fluorescent and blub-type lighting.

Lighting in the office and conference room areas appeared to be adequate illumination. The most recently renovated office areas have implemented LED light fixtures. Based on the observation of the space it appeared that the use of daylight was being manually optimized as much as possible by the occupants.

Lighting in the stairwells, except for the top landings, were appropriate for non-emergency use. The egress system was not tested during observation.

The locations of the light fixtures are in a difficult location to access. It would be recommended that to relocate the lighting in future renovations of the stairwell where a step-ladder could be used in order to prevent any injury while maintaining the light fixtures.

Images: Parking lot pole.

Image: Location of stairwell light fixture.

Image: Open laboratory lighting.

Image: Laboratory support lighting with portable cooling unit and heat rejection "duct".

Lighting in the open laboratories appeared to be at an adequate illumination level at the work plane. Lighting in the smaller laboratory support spaces are recommended to have increased light levels and more uniform lighting.

Bullet recovery lighting was not adequate and not uniform. This this area being a space of high safety concern it would be recommended to update the lighting and warning system for when a person is maintaining the firing area.

It is recommended due to safety concerns that interlocking warning lights be installed outside the bullet recovery tank room and the firing range with the ability to monitor the room remotely.

The evidence storage areas are providing adequate illumination, however the high-density evidence storage areas could improve illumination levels based on the configuration of the shelving.

As noted in the Power Distribution section, the Autopsy suite areas are not at a medical grade quality. It appears that the lighting was updated to LED in order to improve the illumination, but due to the commercial quality of the fixtures the insects have infiltrated the housings. It would be recommended that in future renovations that the fixtures be replaced with a wet or IP listed fixture that is fully gasketed with all pathways and penetrations sealed to prevent future infiltration.

The light levels in the Autopsy suite are not fully appropriate and it would be recommended that surgical level light levels of 100FC Avg be provided for general illumination and the ability to reach 500FC Avg be provided at the surgical table with or without the use of task lighting. Due to the sensitive nature of the space and it being in active use while observing, limited photos of the suite are presented.

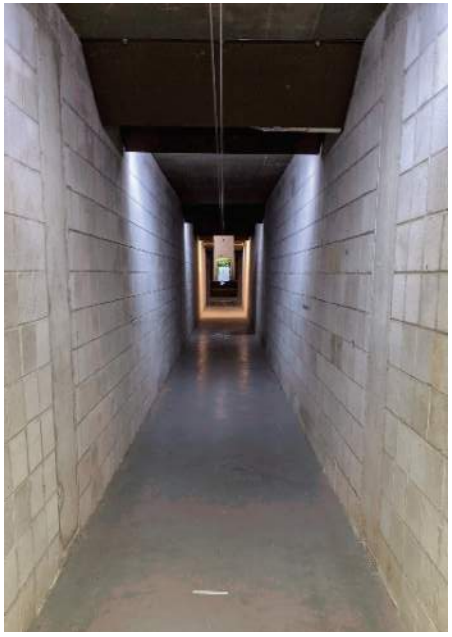
It is recommended that task lighting be provided at the occupied working spaces throughout the building.

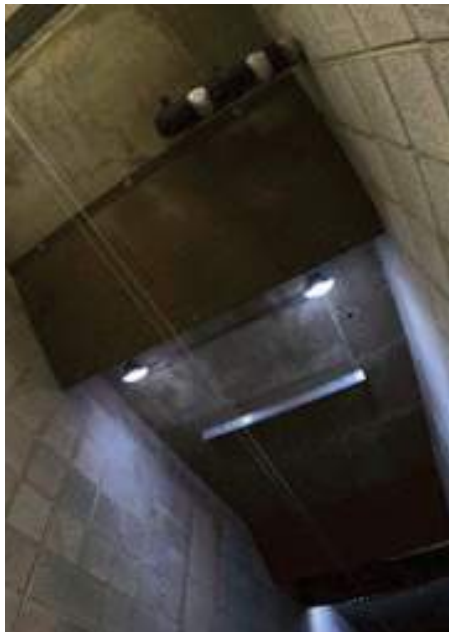
Lighting in the utility areas in inconsistent. There are locations where the lighting is appropriate and others where the lighting is minimal.

If there were to be a renovation, there would be an opportunity for energy and maintenance efficiency, as well as increased illumination by replacing the existing fixture locations with LED.

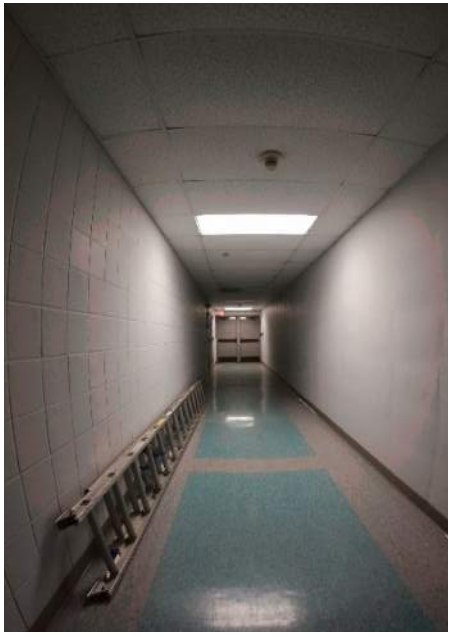
Image: Evidence Storage Lighting.

Image: Autopsy suite lighting.





Images: Overall illumination (left) of firing range and lighting (right).



Images: Utility corridor lighting (left) and typical utility area lighting (right).

### CONTROLS

As-built documentation indicates that the lighting controls provided in the 1990's renovation as manual control on/off for normal and emergency.

Throughout the building utility areas there are damage switches that require replacement.

Daylight access is available in various locations throughout the building. Documentation indicates Daylight Harvesting is not provided in typical areas. Areas where daylight harvesting is not provided may require updating in future renovations to meet current energy codes.

Occupancy sensors are provided throughout the building in select or recently renovated areas. It is not clear that vacancy sensing is provided. Areas where occupancy sensing is not provided may require updating in future renovations to meet current energy codes.

Dimming throughout the building is provided through manual switching of lamps. No current code multi-level dimming was observed and would require updating in future renovations to meet current energy codes.

It would be recommended that the lighting control system be brought up to current energy codes, commissioned, and any faulty devices be replaced with any maintenance improvements.

Additionally, providing these code improvements would increase the efficiency of the building providing a more sustainable system.

### EGRESS

It is assumed egress lighting is provided by the generator emergency system. The system was not reviewed during emergency operation.

The egress stair light levels were not uniform during the day but appeared to provide minimum required light levels. If the stairs were to be renovated additional lighting would be recommended. The stairs were not observed after daylight hours.

Some exit signs were not in good condition and are recommended to be replaced.

Based on existing documentation, it appears that Laboratories and Open Offices are provided with appropriate egress light levels during a normal power outage. Future renovations may require additional emergency system support during a normal power outage based on the needs of the tenant.

## FIRE ALARM SYSTEM

The Fire Alarm system appears to be a range of providers over the life of the building. The renovation system manufacturer was not documented in the as-built drawings. The system is installed in conduit. The FACP is in the Main Mechanical Room, which is not normally occupied or monitored by the security staff. It was not discovered during the site visit the location of a remote annunciator panel or if the FACP reports remotely.

No issues were reported during observation. For any future renovations a documented modification by a Fire Protection Engineer should be provided

Images: FACP in Mechanical Room.


Images: Damaged exit sign(left) Server rack mounted with no working space at an unusual height in the mechanical room (right).

Images: Owner server room (left) and local conditioning unit (right).

## TELEPHONE/DATA AND SPECIAL SYSTEMS

The core and shell and 1990's renovation of the building did not provide dedicated MDF or IDF closets. Telecom systems are housed in the mechanical rooms, similar to electrical.

The current installation of the backbone data distribution equipment is not appropriate for the building type and is not provided the adequate quality of space expected for the equipment. There are locations where the racks are inaccessible or provided no working space. In addition, the mechanical rooms are not conditioned to the standard typically provided for the data equipment.

Throughout the life of the building the owner has re-purposed existing spaces to house data equipment that requires limited access or was not able to fit within the mechanical space. These closets have been provided local mechanical units to address the heat load, but as the system grows is expected to have continual ventilation issues. It is recommended that as a part of any future renovations space and exhaust planning for the future of these spaces be provided.

## CARD READER AND SECURITY SYSTEMS

Security systems are housed in the mechanical rooms and appear to have a variety of providers over the lift of the building, including Secutron inc and Avigilon.

Access control provided throughout the building appropriately and security cameras appear to have been updated in the last 10 years. In certain locations wires and boxes are exposed and it would be beneficial to the security of the system to be concealed. It is recommended that additional cameras be provided to the firearms department for safety monitoring during testing.

Image: Security equipment in the mechanical room.

## AUDIO/VISUAL AND PAGING SYSTEMS

The main conferencing suites are provided AV equipment. It is assumed that the A/V system is functional but was not fully tested during observation. The AV system appears to be installed in the last 10 years.

There is a paging system provided in the 1990's renovation of the building. It was not observed as operational during the visit. It is assumed that the system is operations but in limited use. The system manufacturer was not documented on the as-built drawings.

## MISCELLANEOUS

There is a concern about the operation of the elevators and them locking in place. It should be considered in future renovations to provide a local battery system with the elevator to prevent the occupants from being trapped in place.

Future renovations should consider the ability to increase the building efficiency including sustainability options and alternative power sources.

## ELECTRICAL SUMMARY

It is recommended that the electrical systems be replaced throughout the building, except for the generator, capacitor, ATS units, and newest main disconnect provided that they can be implemented into the new system with the current code requirements. Additionally to be brought up to the current code the generator system should be provided a connection in compliance with NEC 700.3.

If any additional devices or systems are determined to remain, in particular from the mechanical room, that the manufacturer assess clean and recommission in compliance with providing systems up to the required codes.

It is also recommended that the existing to remain devices and systems be thoroughly as-built by a qualified electrical contractor.

In general the building has had extensive modification since its original renovation and all electrical equipment is observed to be original to the renovation of the building and not recommended to be reused. Detailed systems planning should be incorporated into and future renovations. If the building was to be modified in the future, energy efficiency updates would be required to comply to current codes, including updating to LED lighting and renovating the control system.

# SITE CRITERIA


The existing facility for the Arkansas State Crime Lab (ASCL) is located on a state campus in Little Rock. The central location within the state provides timely services to the surrounding counties and population of Arkansas. A 100-mile service radius is typically used to evaluate the service area of a facility of this type and as can be seen this radius well encompasses the state. It would be wise to maintain this central service location within the state with the new location or the ASCL.

Beyond the centralized service advantage of maintaining a central location within the state, maintaining a close proximity to the existing facility can have a number of advantages including:

- Ease of transitioning equipment and services between the existing and new facilities
- Remain adjacent to other state-maintained facilities
- Future use of the existing facility as a backup or overflow facility
- Reduced disruption to staff commutes

Existing Facility

Pedestrian Circulation

Preserve Natural Vegetation

Healthy Work Environment

Preserve Open Green Space

## SUSTAINABLE SITE CRITERIA

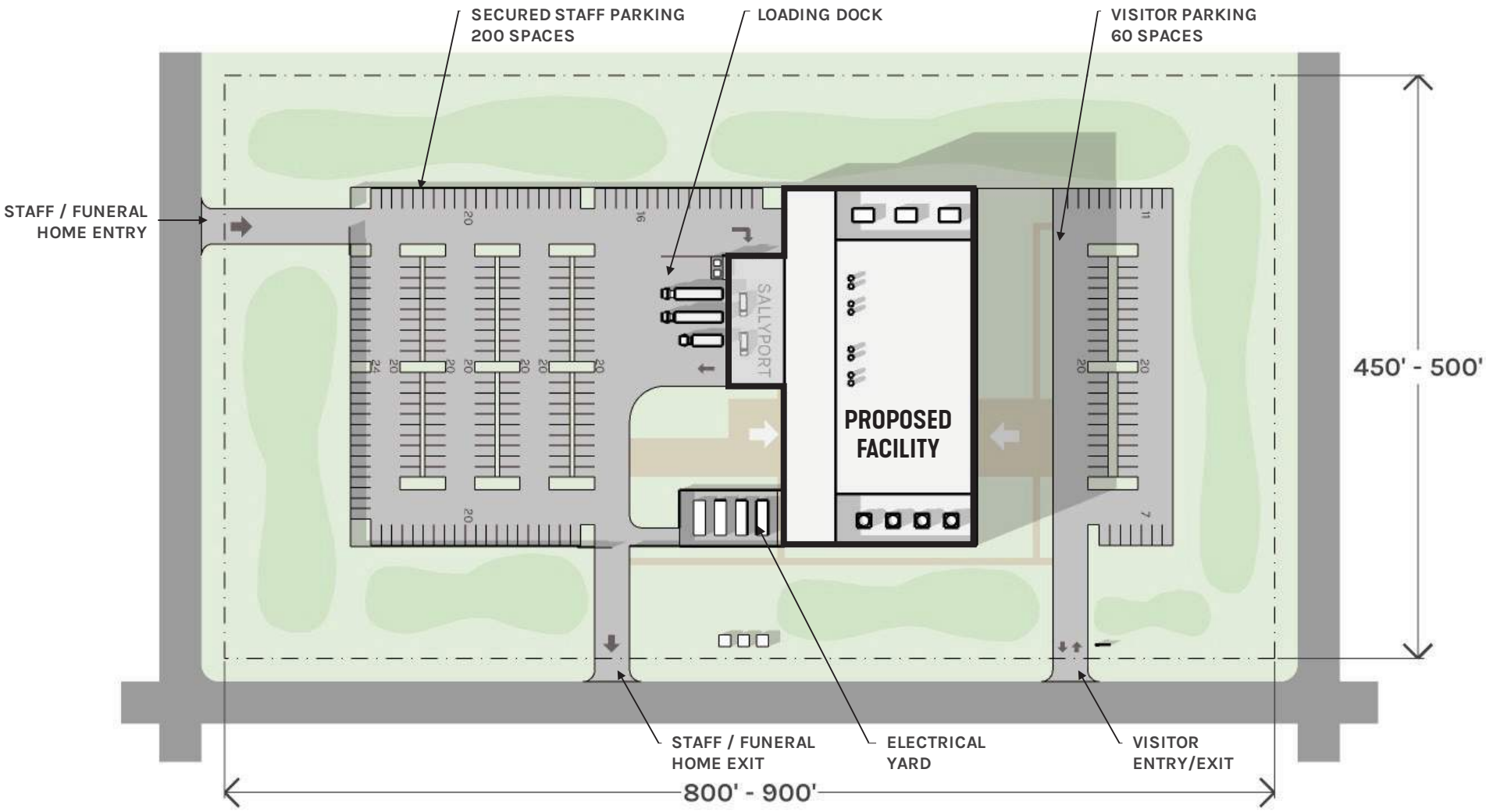
It is important to keep in mind the sustainable aspects of site selection in regard to stewardship of natural resources, preservation of undeveloped land and the wellness of staff and visitors. The site development should be compact, have access to alternative transportation and have a connection to amenities for staff to use offsite and onsite. Proximity to mass transit for visitors and staff, that lessens vehicular trip generation and access to a network of bike and walking paths can promote a healthy working environment.

A priority should be given to previously developed sites over greenfield sites to preserve existing ecosystems and native landscape for resident and migratory species. The existing campus and surrounding area are heavily wooded, a habitat for native species and a carbon sink; therefore, an effort should be made to document, preserve and/or transplant, or harvest and salvage the lumber from the trees. The site should be sized with room to preserve open green space that can be vegetated with low water use native plantings. An evaluation of ground water recharge and infiltration should be assessed, and on-site retainage should be considered. These retention areas can incorporate low maintenance xeriscape that do not require potable water irrigation and create habitat for native species and pollinators.

## LANDSCAPE

The landscape should incorporate the use of drought tolerant plants, mulching and limited use of irrigated turf. Ground cover, shrub and accent plantings will be focused along high visibility entries such as building and site entries. Street trees shall be provided along the street frontage and in landscape islands within the parking area for shade. Additionally, parking areas shall be screened by low level plantings, berms or site walls.

# IDEAL SITE


SECURED STAFF PARKING
200 SPACES
LOADING DOCK
VISITOR PARKING
60 SPACES
STAFF / FUNERAL
HOME ENTRY
SALLYPORT
PROPOSED
FACILITY
450' - 500'
STAFF / FUNERAL
HOME EXIT
ELECTRICAL
YARD
VISITOR
ENTRY/EXIT
800' - 900'

## PROGRAMMATIC SITE CRITERIA

The size of the site is driven by the programmatic needs of the Crime Lab and Medical examiner operations of the ASCL. In addition to the building footprint the site includes the following:

- (60) Parking spaces for visitors
- Public entry plaza
- (200) Secure parking spaces for staff, law enforcement and Investigations vehicles.
- Pull-through Sally port for screened receipt and release of decedents
- Evidence receiving and vehicle inspection bays
- Emergency electrical yard
- Setbacks for security, storm water retention and landscaped open space
- Loading Dock for deliveries, mass fatality body coolers and trash collection
- Secure staff entry plaza

The recommendation of this study is a site with a minimum size of 8-10 acres with a minimum width, based on typical block depths around the campus, of 450' – 500'; a subsequent length of 800' – 900' would provide enough space to fit the site program. Irregularly shaped sites would need to be larger due to the inefficiencies of the site layout.

A building massing has been derived based on program discussions with ASCL leadership and an early understanding of each departments' desired proximity to the ground level. Evidence, Autopsy, lobby and public spaces need to be on the first two levels. When evenly divided this results in a roughly 50,000 sf footprint for each of the first two levels. The floor plate for the upper lab floors is based on the square footage of the largest department, Chemistry. The depth of the 38,000sf upper two floor plates is guided by ideal lab and office space depths for efficient workflow, through building views and natural daylighting of the spaces. The transition between the first two larger floor plates of the podium levels and the upper floors creates a roof terrace providing staff the ability to go outdoors and connect with nature during a break or for an informal meeting. This is ideally located in the middle of the building to provide easy access from all departments.

The building includes 4-levels of dedicated laboratory space and a 5th floor to accommodate a roof top mechanical penthouse and screened roof area. The program of the first two floors requires a taller floor to floor of 20'. The upper two levels of lab and office require a more typical 16' floor to floor for a total of 72' to the highest regularly occupied floor. This is below 75' measurement to the fire lane that triggers a number of onerous high rise building regulations. With the penthouse and mechanical roof screen height of 16' the new site should allow for a building height of no less than 104'

The building placement on the site should prioritize an east west orientation to reduce external solar heat loads on the façade and mitigate glare within the building. The building should be located on the site to allow for fire truck ladder access on the majority of the building façades. It should be setback from the street for force protection in the event a mission critical emergency operations function is needed in the building.

The building can also be used to separate the site and create a front for public parking and entry and a back to the site that includes the sallyport, evidence transfer, staff parking and utility yards. An entry plaza at the front of the building with a flag court will welcome visitors into the facility while providing adequate room for circulation, small gatherings and waiting. On the opposite secure side of the building a staff entry will be screened from the public view while allowing adequate circulation for staff arriving to and leaving their place of work. Outdoor gathering and seating areas will allow the staff room to congregate, decompress, eat and converse.

## SITE CIRCULATION

Efficient and safe circulation of vehicles is key to the design of the site. Separate entry and exits for staff, deliveries, visitors, police, and funeral home traffic minimizes the chances of accidents occurring. Site signage aides in this safe circulation; including monument signage at the street and way finding signage distributed around the site for deliveries, police, and funeral home traffic.

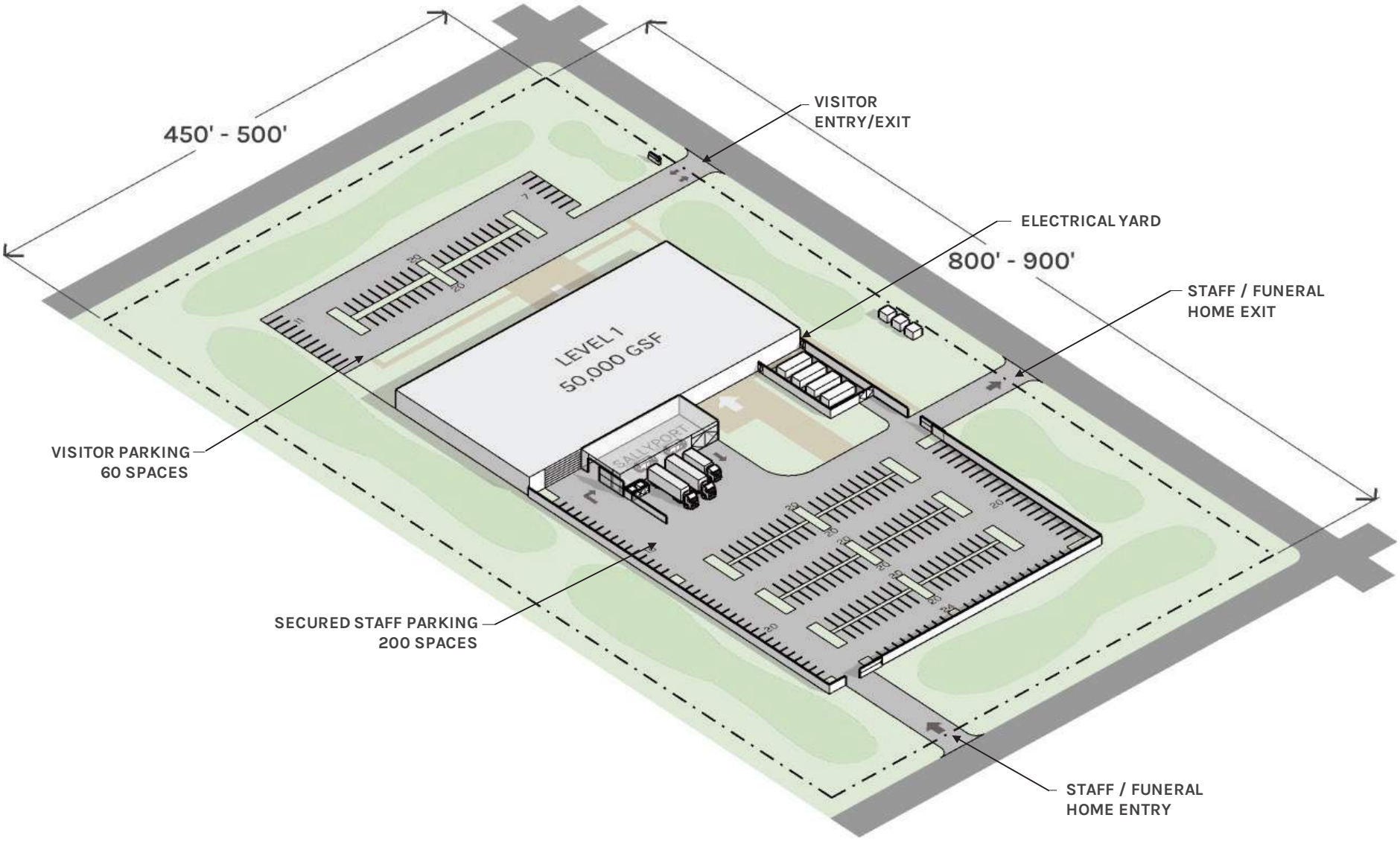
## PARKING

Defining the secure and unsecure parking is an important driver for the site layout and design. Arriving at a sustainable and appropriate parking quantity for the site is a top priority. By not over-providing for the building usage the team is able to maintain more of the sites natural green space and minimize the site development costs. Part of the site design process will include an analysis of parking requirements based on the final building square footage, occupancy, staff count, hours of operation and overlap of shifts. As a starting point the site test fit is accounting for (200) secure staff and (60) visitor parking spaces with (4) loading dock berths for mass fatality trailers, deliveries and trash.

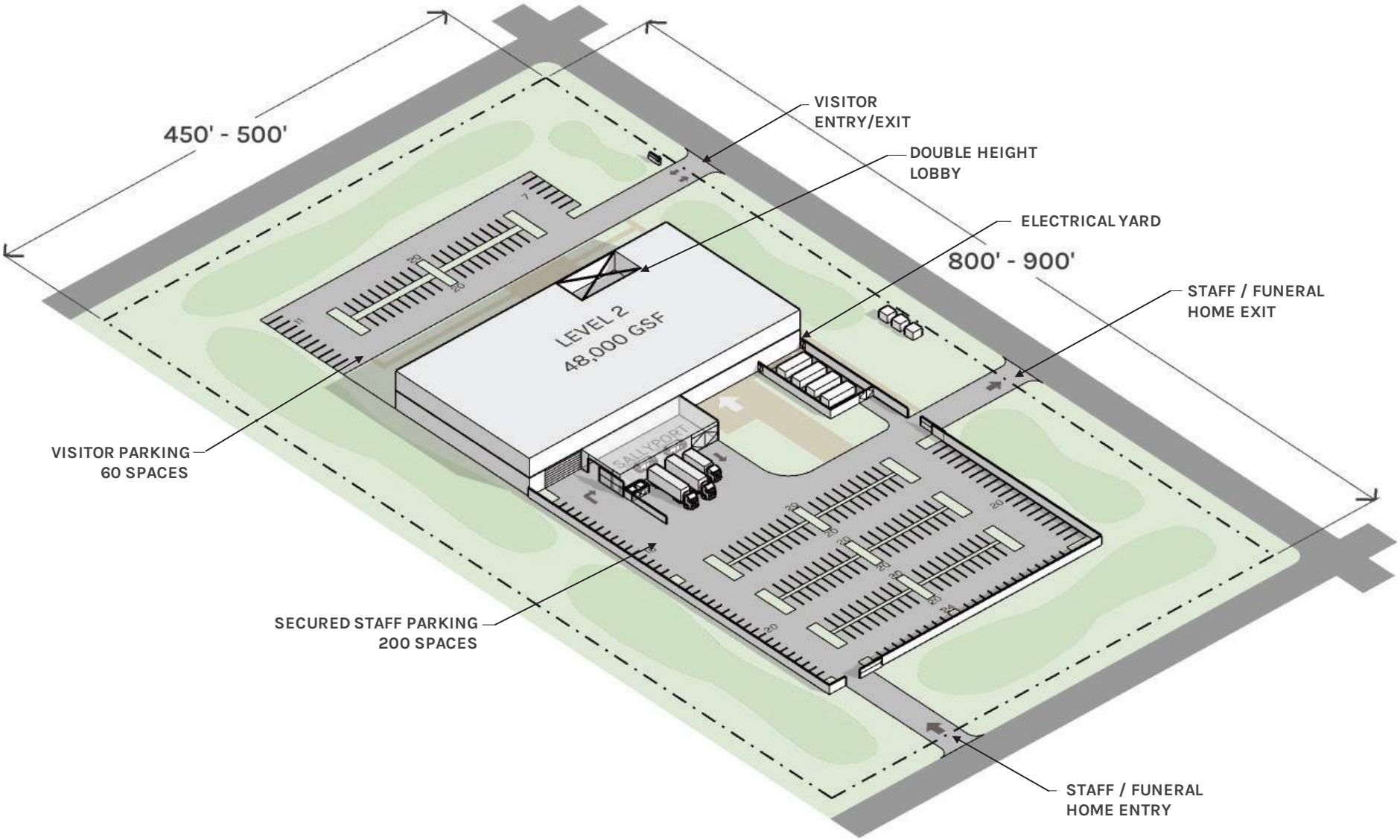
## SECURITY

Separate public and secure parking prevents unintended altercations between visitors and staff while also giving staff the peace of mind while working late and having to walk to their car. A perimeter wall or fence with landscaped screening with gated access is required around the secure parking. This provides a physical and visual barrier from the street for the staff vehicles and ASCL operations. An evaluation of view angles from adjacent buildings around the prospective site should be performed to ensure that views into the sallyport are obscured.

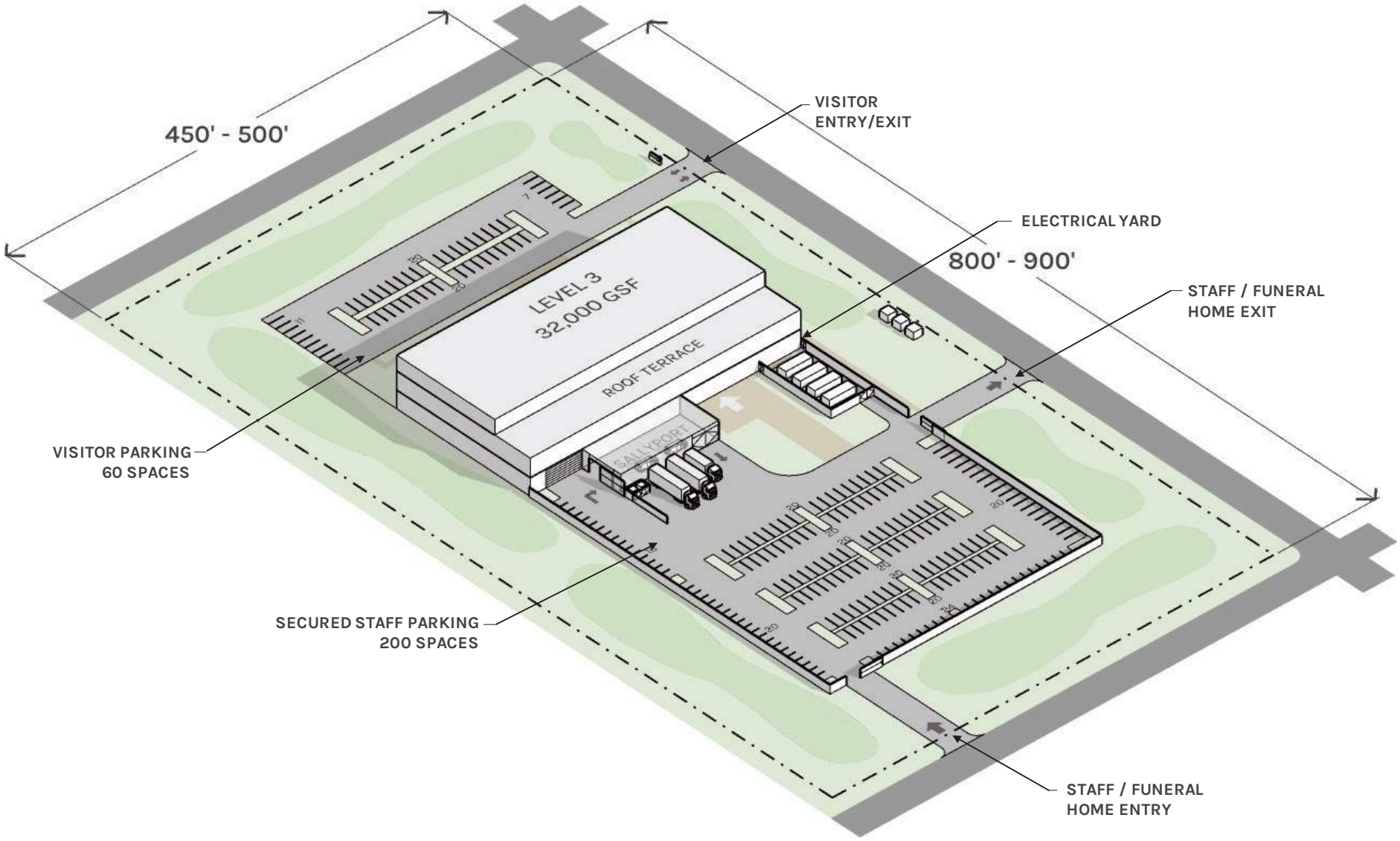
# LEVEL 1


450' - 500'
VISITOR
ENTRY/EXIT
ELECTRICAL YARD
800' - 900'
STAFF / FUNERAL
HOME EXIT
LEVEL 1
50,000 GSF
SALLYPORT
VISITOR PARKING
60 SPACES
SECURED STAFF PARKING
200 SPACES
STAFF / FUNERAL
HOME ENTRY

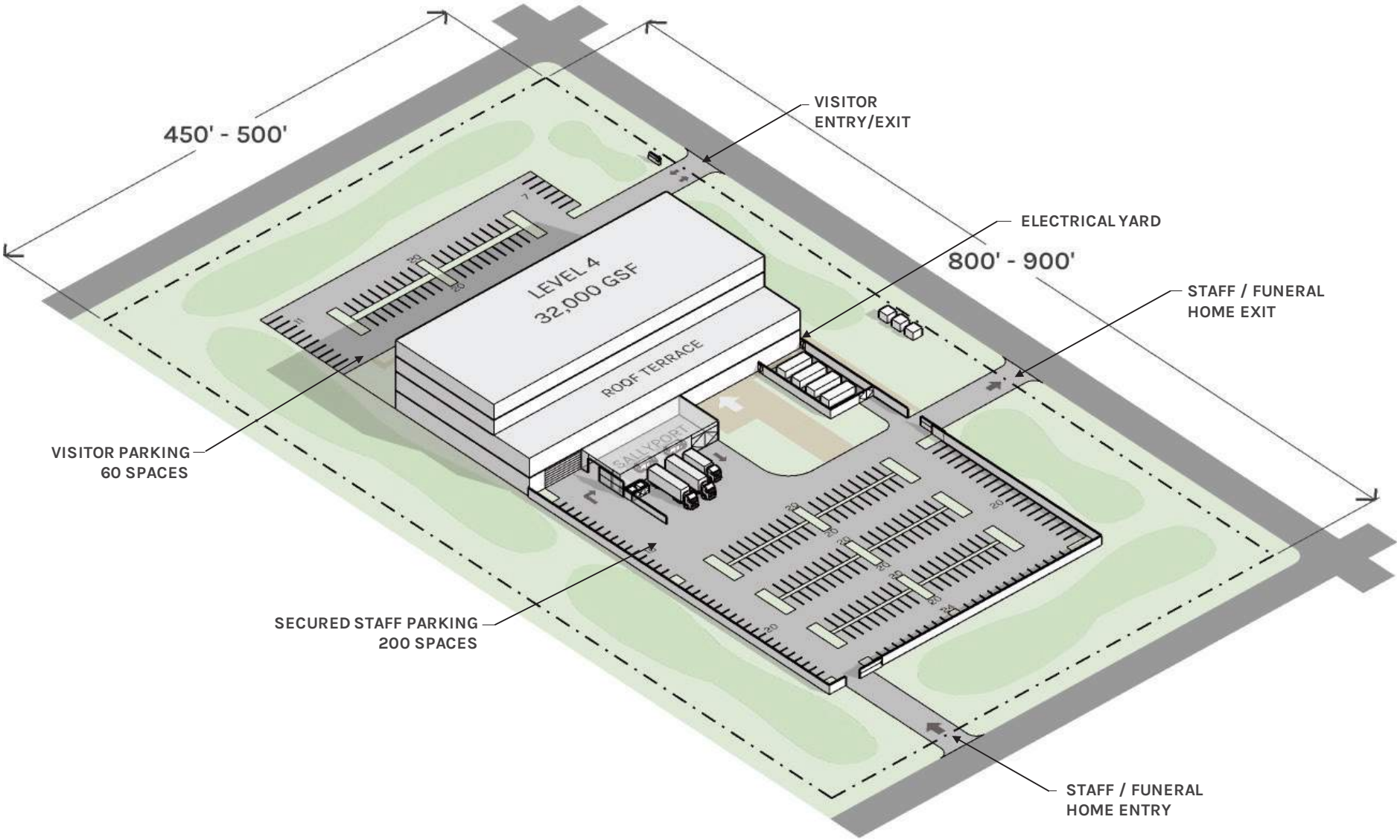
# LEVEL 2


450' - 500'
800' - 900'
VISITOR
ENTRY/EXIT
DOUBLE HEIGHT
LOBBY
ELECTRICAL YARD
STAFF / FUNERAL
HOME EXIT
LEVEL 2
48,000 GSF
SALLYPORT
VISITOR PARKING
60 SPACES
SECURED STAFF PARKING
200 SPACES
STAFF / FUNERAL
HOME ENTRY

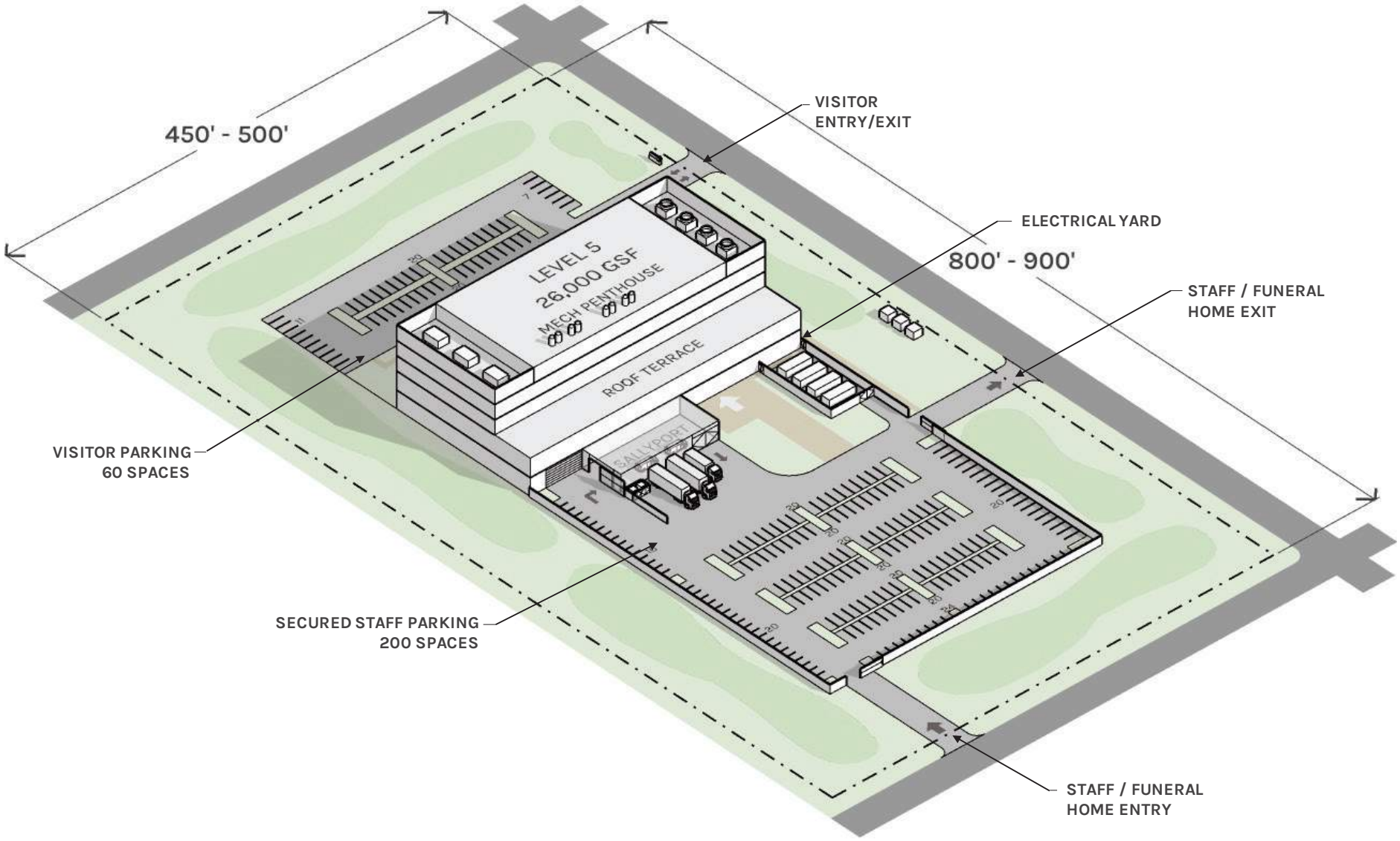
# LEVEL 3


450' - 500'
800' - 900'
VISITOR ENTRY/EXIT
ELECTRICAL YARD
STAFF / FUNERAL HOME EXIT
LEVEL 3
32,000 GSF
ROOF TERRACE
SALLYPORT
VISITOR PARKING
60 SPACES
SECURED STAFF PARKING
200 SPACES
STAFF / FUNERAL HOME ENTRY

# LEVEL 4


450' - 500'
800' - 900'
VISITOR ENTRY/EXIT
ELECTRICAL YARD
STAFF / FUNERAL HOME EXIT
LEVEL 4
32,000 GSF
ROOF TERRACE
SALLYPORT
VISITOR PARKING
60 SPACES
SECURED STAFF PARKING
200 SPACES
STAFF / FUNERAL HOME ENTRY

# ROOF / PENTHOUSE



# SITE INFRASTRUCTURE CRITERIA

## ELECTRICAL

It is estimated that the facility will require a minimum of (3) 3,600A, 480V277, 3ph, 4w. electrical services. A screened generator yard within the secure parking area will provide full building back-up, equivalent to (4) 1,750kW generators. It is not anticipated the ASCL requires redundant utility feeds.

## COMMUNICATIONS

The site will require access to the local fiber network.

## MECHANICAL

To preserve site area and provide a more efficient mechanical design all the mechanical equipment is assumed to be on the roof of the building or within a mechanical penthouse. However, an area at grade should be provided for a roll up rental air-cooled chiller to supplement systems in the event of a system outage or during a chiller replacement,

## NATURAL GAS

The gas connection shall be designed and sized based on the proposed building needs. ASCL may elect to have the backup generators on natural gas.

## POTABLE WATER

The new ASCL building will be supplied by a new water main entering from the street into a water entry room. Two water meters will be required, a meter for the building potable water and the other meter for the irrigation system. The irrigation supply shall have a back flow preventer.

## FIRE PROTECTION

The building is planned to be fully sprinklered. A fire department connection will be provided in the fire riser room with signage directing the fire department to the exterior entry. The fire protection supply shall have a back flow preventer.

The site will require fire hydrants along the main street frontage to satisfy the 300-foot maximum hose length requirement around the building. Once the site design is finalized additional fire hydrants may be required around the building and secure parking area to meet the hose length requirement. A fire flow test should be conducted to determine if a fire pump is necessary to provide the volume and pressure to the fire protection system in the event of a whole building fire.

## SANITARY SEWER

It is not anticipated that the building will have a below grade level therefore there is no need for an ejector pump. A sewer invert elevation in the street at a sufficient depth will allow for gravity drainage from the building. Due to the functions of the building program an additional monitoring port at the building waste outflow may be required by the municipality.

## STORM WATER

Capacity should be available in the street to accommodate the storm water drainage needs for the site. Depending on the site's hydrology, different strategies can be employed to lessen the burden on the storm water system; by providing prefiltering of water through bioswales, metering outflow using drywells and by allowing more water to infiltrate on the site using on-site retainage and pervious paving systems.

Site Infrastructure

Trailer Connection

Electrical Services

Water Management

Paving Strategies

# STAFFING & INVESTIGATIVE PROJECTIONS

Comparisons of peers to the ASCL and utilizing current operating levels can be used to better approximate the projected facility size. One of the primary forensic crime laboratory comparison tools is Project FORESIGHT. The metrics provided withing this business-guided evaluation allow for greater ability for each laboratory to gauge how they perform in comparison to other laboratories across the world. The John Chambers College of Business and Economics at West Virginia University manages the program, but data is self-reported from ISO/IEC 17025 accredited laboratories and brings a greater understanding of the industry's performance.

The ASCL participates in the FORESIGHT program and the data included within this needs analysis has been reviewed to determine how the current performance and staffing levels will be impacted by the population change. Based on the typical operational lifespan of a forensics facility and a fiscally responsible approach to constructing such an intensive program, a planning horizon of 30-years has been chosen for evaluation. The population growth over this period will contribute to a greater load on the laboratory and staffing levels have been adjusted based on that change along with realistic operational expectations by laboratory section.

By understanding the quantity of staff that would be needed based on the expected increase in caseload, a comparison can be made between the needs of the ASCL and peer facility space requirements. Included within the analysis by section is a comparison of Net Assignable Square Footage (NASF) that the specific peer facility required. These programmatic comparisons allow for an understanding of the quantity of space dedicated to the section and can be applied as a factor to the quantity of staff that the State Lab requires, building a total NASF requirement for the facility.

This net area does not contain building support spaces that are unassigned to a given user group. These spaces include horizontal and vertical circulation, restrooms, and utility rooms for example. Because the facility is dramatically different in the quantity or size of these support spaces when compared to the traditional office building, a grossing factor that is appropriate for this building type is added to get to a total building size.

| | | | | | | Facility Metrics Based on Population | | |
|---|---|---|---|---|---|---|---|---|
| | | FORESIGHT Data | | | Year | 2051 | | |
| Section | Current Staff | Cases/100K | Cases/FTE | Peer NASF/FTE | Population | 3,546,843 Cases | Staff | NASF |
| **CRIME LAB SECTIONS** | | | | | | | | |
| Administration | 9 | | | 298 | | | 13 | 3,874 |
| Evidence Receiving * | 10 | 752.67 | 2305 | 49 | | | 11 | 7,546 |
| Latent Prints | 5 | 39.07 | 167 | 375 | | 1,386 | 8 | 3,000 |
| DNA | 21 | 88.1 | 94 | 479 | | 3,125 | 33 | 15,807 |
| CODIS | 6 | 456.51 | 1946 | 479 | | 16,192 | 8 | 3,832 |
| Toxicology (Ante Mortem) | 6 | 82.73 | 350 | 510 | | 2,935 | 9 | 4,590 |
| Toxicology (Post Mortem) ** | 7 | 73.1 | 350 | 510 | | 2,593 | 7 | 3,570 |
| Chemistry *** | 26 | 657.51 | 448 | 564 | | 23,321 | 39 | 21,996 |
| Firearms and Toolmarks | 9 | 31.55 | 96 | 623 | | 1,120 | 12 | 7,476 |
| Physical Evidence (Serology) # | 8 | 62.42 | 140 | 479 | | 2,214 | 12 | 5,748 |
| Physical Evidence (Trace) | 2 | 3.79 | 108 | 719 | | 135 | 2 | 1,438 |
| Section Subtotal | 109 | | | | | | 154 | 78,877 |

**NOTES:**

* Evidence Receiving staff currently at the Lowell facility and evidence processed there not included in total.

** Caseload is an average of last 5-years of cases received. Current facility is approximately 5,700 NASF.

*** Staff total for Forensic Toxicology have been captured under a single row to avoid misrepresentation of quantity of ante and post mortem.

# Today's staffing load for the Chemistry section is identified in total for the state. The Lowell lab would be limited to (13) total staff. A reduction in the cases/staff has been applied due to greater complexity of cases.

# STAFFING & INVESTIGATIVE PROJECTIONS

| Section | Per 1K in Population | Per 1K Autopsies | NASF / unit | Autopsies | Staff | Autopsy Positions | NASF |
|---|---|---|---|---|---|---|---|
| **MEDICAL EXAMINER SECTION** | | | | | | | |
| Medical Examiner Autopsies ## | | 0.6 | | 2,128 | | | |
| Forensic Pathologists | 7 | 5.2 | 200 | | 11 | | 2,213 |
| Autopsy Techs | 7 | 5.2 | 30 | | 11 | | 332 |
| Medical Investigators ### | 6 | N/A | 200 | | 10 | | 2,000 |
| Admin Staff ### | 8 | N/A | 200 | | 11 | | 2,200 |
| Histology Staff | 2 | N/A | 300 | | 3 | | 900 |
| Autopsy Stations | | 0.0028 | 350 | | | 10 | 3,507 |
| Body Storage Positions | | 0.0397 | | | | 141 | |
| *Body storage on gurneys* | | | 51 | | | | 2,012 |
| *Body storage racks, 5-high* | | | 18 | | | | 441 |
| Section Subtotal | 30 | | | | 46 | | 13,605 |
| Morgue/Autopsy Support | | | 85 | | | | 3,921 |

**NOTES:**

## Future staff needs in Serology for the Physical Evidence discipline has been adjusted downward based on expected future demand from historical trends.

### Investigations and administrative staff levels have been adjusted based on expected transitions in staffing utilization under a greater autopsy load as not all functions would increase at the same rate.

| | | | | | | Facility Metrics Based on Population | | |
|---|---|---|---|---|---|---|---|---|
| | | FORESIGHT Data | | | Year | 2051 | | |
| Section | Current Staff | Cases/100K | Cases/FTE | Peer NASF/FTE | Population | 3,546,843 Cases | Staff | NASF |
| **SECTION TOTALS** | | | | | | | | |
| Crime Lab Sections | 109 | | | | | 154 | | 78,877 |
| Medical Examiner Section | 30 | | | | | 46 | | 17,526 |
| Section Subtotal | 139 | | | | | 200 | | 96,403 |
| **ADDITIONAL BUILDING COMPONENTS** | | | | | | | | |
| Colaboration NASF | | | | 10 % | | | | 11,210 |
| Support NASF | | | | 4 % | | | | 4,484 |
| Additional Component Subtotal | | | | | | | | 15,694 |
| **Facility Totals** | | | | | | | | |
| Total NASF | | | | | | | | 112,097 |
| Grossing Factor | | | | 60% | | | | |
| **Gross Building Area** | | | | | | | | **186,828** |

SECTION 04

# SECTION PLANNING

# OFFICE & ADMINISTRATION

The office and administrative spaces within the ASCL are as varied and specialized as the laboratory and autopsy spaces of the crime lab and medical examiner's sections. Proximity of these spaces to the lab and autopsy spaces increases the efficiency of workflow; office space is therefore distributed throughout the building with the department offices adjacent to the department's lab space. Internal glazing between the offices and lab creates view corridors to and from lab space for communication, and safety.

Open office planning prioritizes shared views and daylight penetration. This is accomplished by locating open workstations toward the perimeter of the floor with private offices and conference rooms located towards the interior. By providing glass fronts to the private offices and conference rooms and limiting the height of the workstations, all users can have views to and daylight from the exterior.

With work primarily performed on computer monitors, tight control of the lighting and daylighting levels are important. Glare on computer monitors can be controlled with the proper use and placement of direct / indirect pendant light fixtures which bounce light off the ceiling to give better quality lighting. Ghost aisles along the perimeter glazing are created by holding the workstations off the glass a few feet and away from direct sunlight. In addition, light filtering retractable fabric shades are specified that maintain views while only letting a small percentage of the direct daylight through. Blackout shades can also be used to maintain confidentiality and privacy for ground floor glazing and presentation spaces.

Acoustic comfort and privacy are uniquely important in buildings of this typology where confidential, case sensitive information is being discussed and concentration on detailed analysis is ongoing. Ceiling systems are specified with a high Noise Reduction Coefficient (NRC) to absorb sound and provide occupant comfort within the space. Modular carpet systems with integrated padding dampen footfall within the open office and along circulation pathways. A high Sound Transmission Classification (STC) of partition and ceiling systems provides privacy for confidential conversations. Active white noise generating systems may also be considered to provide further sound privacy and acoustic comfort.

The departmental and administrative office spaces include:

## OPEN OFFICE

Modular planning in the open office environment is key to an efficient workstation layout that facilitates the unique workflow of each department. It is important to design for flexibility, with future densification of workstation size or reconfiguration inevitable, allowing for growth of staff beyond the projected 30-year staff count that the building is designed for. Systems furniture can be customized to fit the needs of each user with various storage options, sit/stand ergonomic desks and separation panels for private confidential work. Early coordination is needed between the systems furniture layout and the placement of power and data floor boxes as well as the pendant lighting fixtures.

## PRIVATE OFFICES

These standard sized rooms are designed to be flexibly used as small huddle rooms or private offices to provide flexibility in the growth of positions for senior staff, pathologists, lead investigators and crime lab administration. Glass fronts on the offices are recommended to maintain visibility, accountability, and views, and depending on the level of privacy required, either swing or slide doors are specified. Furniture solutions can be customized to meet the needs of the user with a variety of storage, meeting, and sit / stand options.

## CONFERENCE ROOMS

A mix of small, medium, and large conference rooms are recommended to provide the right sized room to fit the meeting. These rooms are distributed along with the departmental office spaces while some of the larger conference rooms are centrally located for shared use. The rooms are tailored to fit the client's needs with fixed or movable powered tables, large format display or projected displays and writable surfaces.

## STORAGE & SUPPLY

Secure long term file storage is centralized within the building with actively used files stored in file rooms adjacent to the office space or in lateral files incorporated into the systems furniture layout. Print and supply rooms are spread throughout the building to reduce travel paths from the office areas.

## MULTI-PURPOSE ROOM

Flat-floor seating is recommended for convenient conversion between lecture, meeting and instructional configurations with table and chair storage in an adjacent storage room. An array of floor boxes with power and data are designed to be accessible to the powered tables in a number of different layouts. Projection screens or large format displays can be evaluated based on the room geometry, viewing distances, and viewing angles.

## BREAKROOM & COLLABORATION SPACES

Kitchenettes on every floor are strategically located near conferencing space to provide the dual role of supporting meetings and staff needs. A centralized breakroom gives staff an escape from the workday while an outdoor space adjacent to the breakroom can give staff some much needed respite and connection to nature. Areas for collaboration are carved out throughout the planning along hallways and at stairs and elevators to give staff opportunity to informally connect and stay engaged.

Hamilton County Crime Lab

Hamilton County Crime Lab

# EVIDENCE RECEIVING

The Evidence Receiving Section has the primary objective of securing, processing, and routing all evidence submitted to the laboratory, and maintaining a complete chain of custody while in the laboratory's possession. The section is responsible for releasing evidence submitted by the Federal, State, County and Municipal agencies in the state when the appropriate analyses are completed.

The evidence section receives over 30,000 cases each year of various size and complexity.  Due to growing needs for scientific environments, space dedicated to evidence storage has been reduced over the years, with high-density solutions and organization helping to reduce strain on the section.

San Diego County Crime Lab

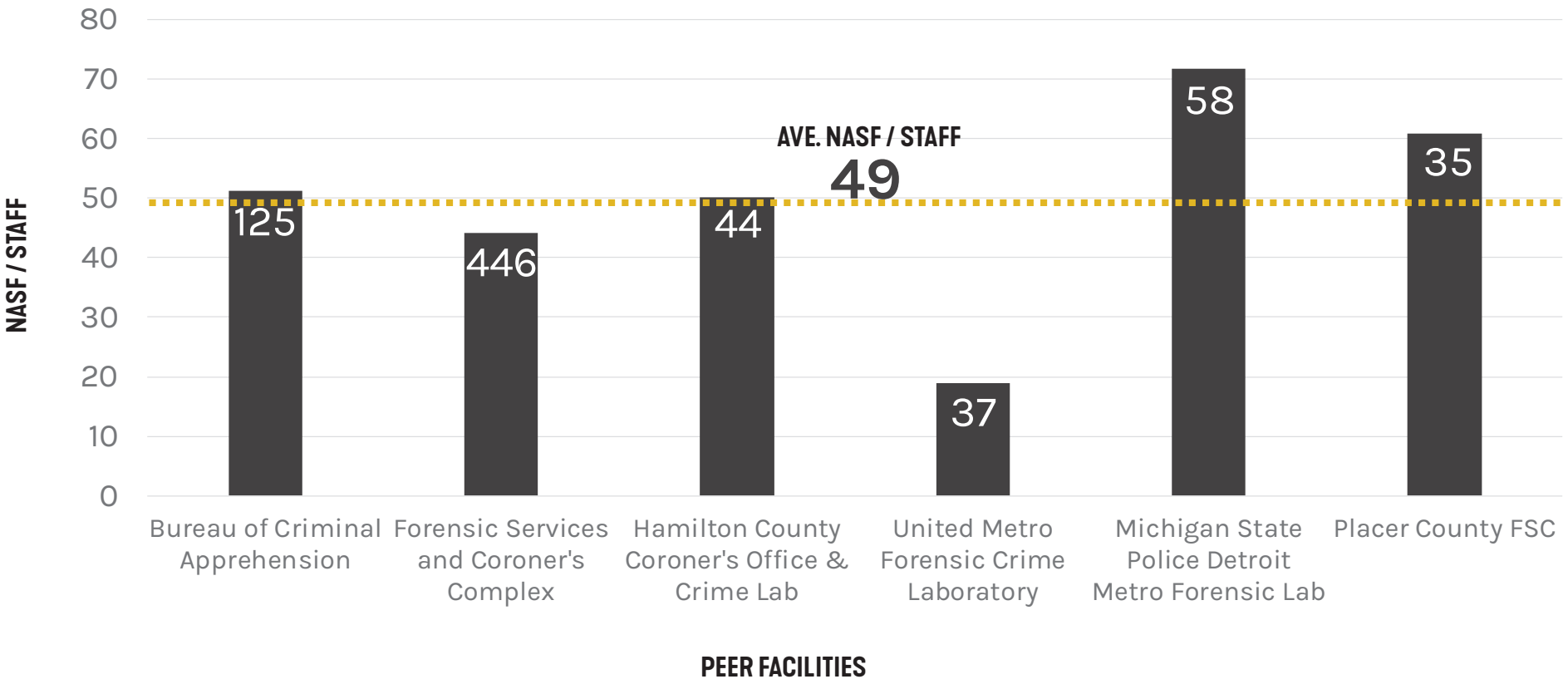
San Diego County Crime Lab

San Diego County Crime Lab

San Diego County Crime Lab

# EVIDENCE STORAGE BENCHMARKING

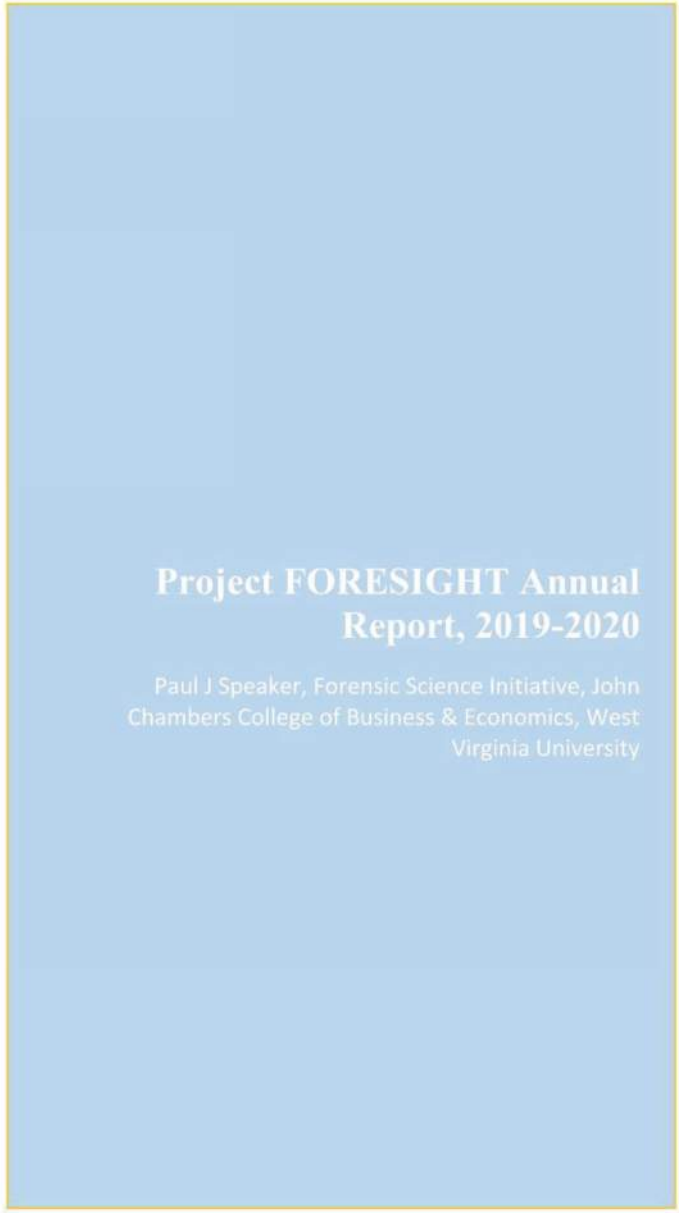
## NET ASSIGNABLE SQUARE FEET / STAFF



# PROJECT FORESIGHT

One hundred sixty-eight laboratory or laboratory systems across the world have provided data to the Project FORESIGHT program in hopes that the information provided will empower laboratory managers in appropriate requests for staffing, resource allocations, development of efficient strategies, and establish the value of the services provided. The intent of Project FORESIGHT is to consistently quantify workload allowing for comparison of one forensic laboratory to another. In this way, proven operational functions can be preserved and inefficiencies can be eliminated.

The data identified within the laboratory sections below provides a benchmark for use for determining overall caseload on the ASCL. It is helpful to use the data in relation to the state's projected population growth as the type of crime and quantity of cases is linked to the population size of a given region.




FORESIGHT—Arkansas State Crime Laboratory Annual Report (US$)

# LATENT PRINTS

Unintentional Impressions can be left behind on various surfaces during the act of a crime. The Latent Prints section searches for these impressions including fingerprints, palm prints, and foot impressions in hopes that their findings will help to identify an individual. Because friction ridges on an individuals skin are present and consistent throughout nearly the extent of a person's entire life, unique characteristics allow the forensic scientists to identify an individual with even a small portion of a print.

Techniques for the physical development of a print can use many chemical or physical processes so that a print is able to be visualized. When a print has been developed, it can be photographed and then compared to recorded prints within the Automated Fingerprint Identification System (AFIS). This national system is invaluable in the identification of potential suspects and is managed by the Criminal Justice Information Services Division of the Federal Bureau of Investigation (FBI).

Maricopa County Crime Lab

Maricopa County Crime Lab


Hamilton County Crime Lab

# FORESIGHT ANNUAL REPORT METRICS

## 2019-2020

Highlighted below are the fingerprint cases registered in the Foresight Annual Report Metrics between 2019 and 2020.

### Cases per 100,000 Population Served

Cases per 100,000 population

| Area of Investigation | Arkansas | 25th percentile | Median | 75th percentile |
|---|---|---|---|---|
| Blood Alcohol | 155.83 | 43.85 | 82.51 | 160.50 |
| Crime Scene Investigation | NA | 1.22 | 7.48 | 67.07 |
| Digital evidence | 6.20 | 5.85 | 7.35 | 13.31 |
| DNA Casework | 88.10 | 46.32 | 81.69 | 133.09 |
| DNA Database | 456.51 | 48.04 | 204.84 | 271.00 |
| Document Examination | NA | 0.68 | 0.75 | 1.29 |
| Drugs - Controlled Substances | 657.51 | 162.52 | 248.26 | 392.98 |
| Evidence Screening & Processing | NA | 26.23 | 72.05 | 587.77 |
| Explosives | NA | 0.07 | 0.17 | 0.23 |
| Fingerprints | 39.07 | 28.17 | 37.10 | 71.33 |
| Fingerprints Database (including IAFIS) | NA | 15.05 | 28.91 | 63.04 |
| Fire analysis | 6.10 | 2.48 | 3.23 | 5.64 |
| Firearms and Ballistics | 31.55 | 12.88 | 20.66 | 38.14 |
| Firearms Database (including NIBIN) | NA | 33.66 | 62.59 | 179.67 |
| Forensic Pathology | 48.90 | 54.16 | 59.25 | 63.49 |
| Gun Shot Residue (GSR) | NA | 2.21 | 3.79 | 8.12 |
| Marks and Impressions | NA | 0.19 | 0.36 | 0.52 |
| Serology/Biology | 62.42 | 25.31 | 39.51 | 66.86 |
| Toxicology ante mortem (excluding BAC) | 82.73 | 44.31 | 63.02 | 126.34 |
| Toxicology post mortem (excluding BAC) | 73.10 | 46.64 | 61.80 | 104.92 |
| Trace Evidence | 3.79 | 0.77 | 1.56 | 3.45 |

### Cases per FTE by Investigative Area

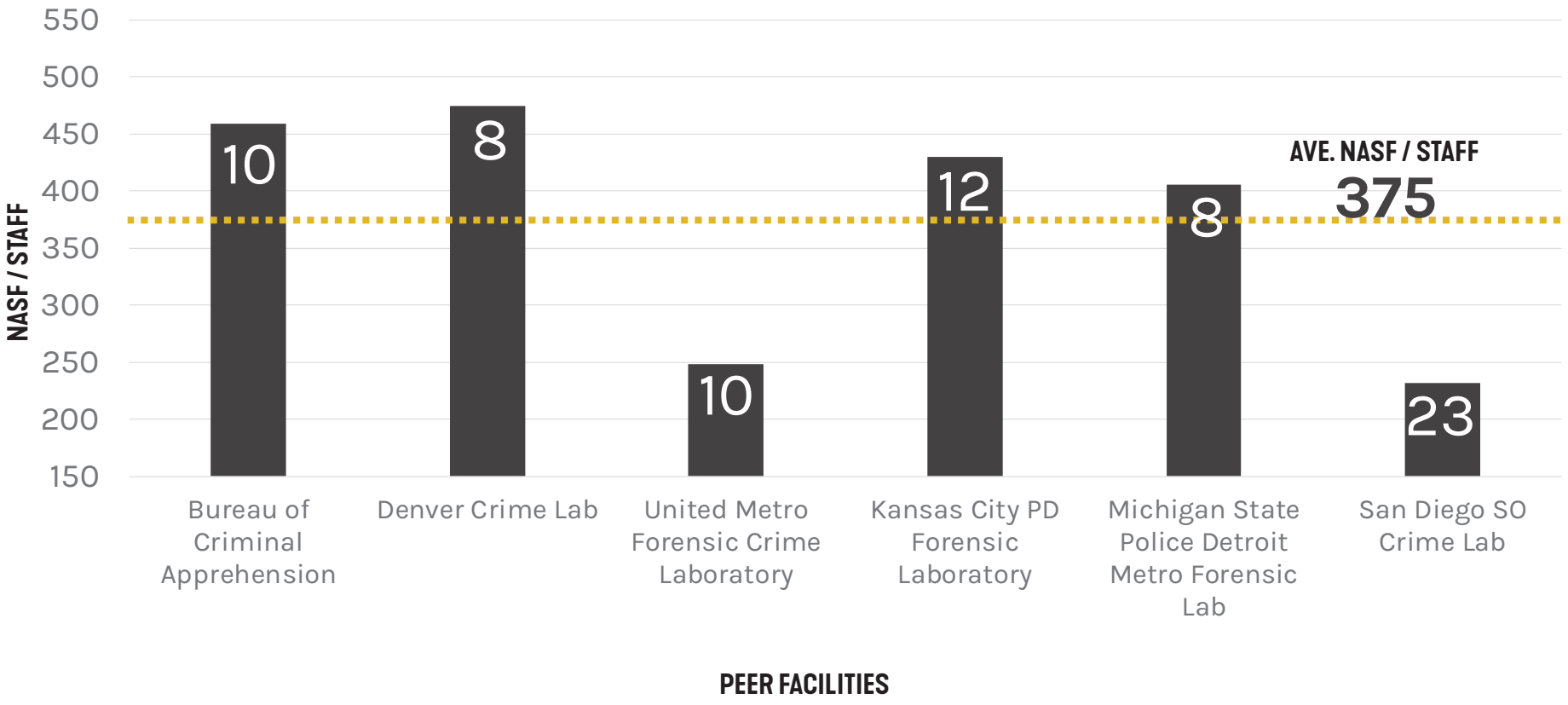
Cases per FTE by Investigative Area

| Area of Investigation | Arkansas | 25th percentile | Median | 75th percentile |
|---|---|---|---|---|
| Blood Alcohol | 1,329 | 461 | 694 | 1,107 |
| Crime Scene Investigation | NA | 32 | 72 | 102 |
| Digital evidence | 66 | 22 | 40 | 47 |
| DNA Casework | 94 | 77 | 102 | 138 |
| DNA Database | 1,946 | 1,634 | 2,618 | 3,702 |
| Document Examination | NA | 19 | 24 | 33 |
| Drugs - Controlled Substances | 467 | 307 | 374 | 477 |
| Evidence Screening & Processing | NA | 128 | 146 | 168 |
| Explosives | NA | 5 | 7 | 10 |
| Fingerprints | 167 | 98 | 142 | 177 |
| Fingerprints Database (including IAFIS) | NA | 91 | 321 | 544 |
| Fire analysis | 173 | 38 | 58 | 81 |
| Firearms and Ballistics | 96 | 47 | 69 | 107 |
| Firearms Database (including NIBIN) | NA | 347 | 770 | 1,315 |
| Forensic Pathology | 208 | 94 | 94 | 180 |
| Gun Shot Residue (GSR) | NA | 30 | 39 | 64 |
| Marks and Impressions | NA | 11 | 16 | 23 |
| Serology/Biology | 140 | 58 | 120 | 151 |
| Toxicology ante mortem (excluding BAC) | 350 | 135 | 174 | 258 |
| Toxicology post mortem (excluding BAC) | 350 | 113 | 138 | 175 |
| Trace Evidence | 108 | 32 | 35 | 40 |

# LATENT PRINTS BENCHMARKING

## NET ASSIGNABLE SQUARE FEET / STAFF

Below is a benchmarking analysis of assignable square feet per latent print analyst in recently completed comparable facilities.



# DNA

For all but identical twins, DNA is a complex molecule that is unique to each of us. This "genetic fingerprint" or profile can be evaluated to link an individual as being present at the location of a crime. DNA technology has advanced rapidly over the last two decades and has been utilized by crime labs across the county for some time. The goal of the Forensic DNA section is to analyze, interpret, and hopefully identifying or excluding an individual who may have committed a crime.

San Diego County Crime Lab

Hamilton County Crime Lab

Hamilton County Crime Lab

Hamilton County Crime Lab

# FORESIGHT ANNUAL REPORT METRICS

## 2019-2020

Highlighted below are the DNA cases registered in the Foresight Annual Report Metrics between 2019 and 2020.

### Cases per 100,000 Population Served

Cases per 100,000 population

| Area of Investigation | Arkansas | 25th percentile | Median | 75th percentile |
|---|---|---|---|---|
| Blood Alcohol | 155.83 | 43.85 | 82.51 | 160.50 |
| Crime Scene Investigation | NA | 1.22 | 7.48 | 67.07 |
| Digital evidence | 6.20 | 5.85 | 7.35 | 13.31 |
| DNA Casework | 88.10 | 46.32 | 81.69 | 133.09 |
| DNA Database | 456.51 | 48.04 | 204.84 | 271.00 |
| Document Examination | NA | 0.68 | 0.75 | 1.29 |
| Drugs - Controlled Substances | 657.51 | 162.52 | 248.26 | 392.98 |
| Evidence Screening & Processing | NA | 26.23 | 72.05 | 587.77 |
| Explosives | NA | 0.07 | 0.17 | 0.23 |
| Fingerprints | 39.07 | 28.17 | 37.10 | 71.33 |
| Fingerprints Database (including IAFIS) | NA | 15.05 | 28.91 | 63.04 |
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| Firearms and Ballistics | 31.55 | 12.88 | 20.66 | 38.14 |
| Firearms Database (including NIBIN) | NA | 33.66 | 62.59 | 179.67 |
| Forensic Pathology | 48.90 | 54.16 | 59.25 | 63.49 |
| Gun Shot Residue (GSR) | NA | 2.21 | 3.79 | 8.12 |
| Marks and Impressions | NA | 0.19 | 0.36 | 0.52 |
| Serology/Biology | 62.42 | 25.31 | 39.51 | 66.86 |
| Toxicology ante mortem (excluding BAC) | 82.73 | 44.31 | 63.02 | 126.34 |
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Cases per FTE by Investigative Area

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| Evidence Screening & Processing | NA | 128 | 146 | 168 |
| Explosives | NA | 5 | 7 | 10 |
| Fingerprints | 167 | 98 | 142 | 177 |
| Fingerprints Database (including IAFIS) | NA | 91 | 321 | 544 |
| Fire analysis | 173 | 38 | 58 | 81 |
| Firearms and Ballistics | 96 | 47 | 69 | 107 |
| Firearms Database (including NIBIN) | NA | 347 | 770 | 1,315 |
| Forensic Pathology | 208 | 94 | 94 | 180 |
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| Marks and Impressions | NA | 11 | 16 | 23 |
| Serology/Biology | 140 | 58 | 120 | 151 |
| Toxicology ante mortem (excluding BAC) | 350 | 135 | 174 | 258 |
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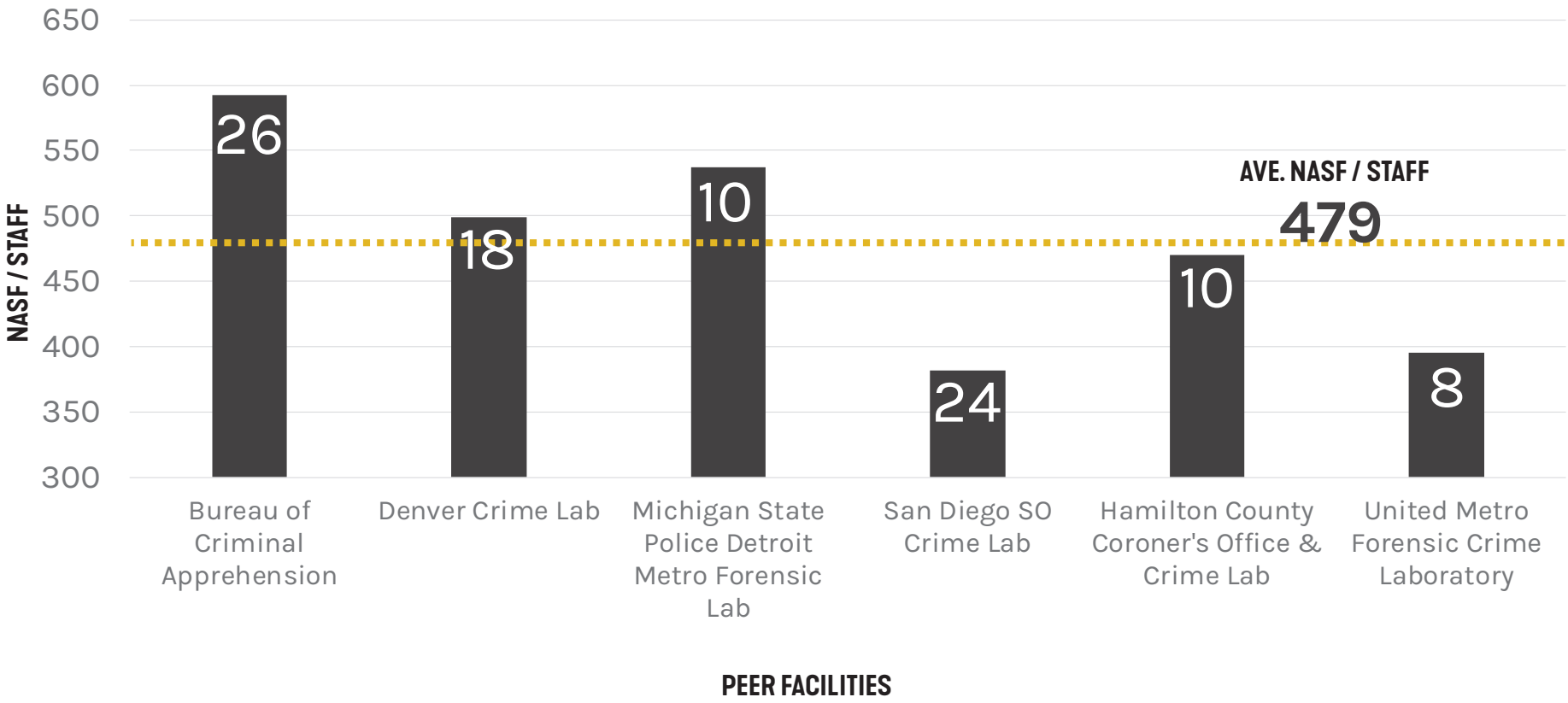
| Trace Evidence | 108 | 32 | 35 | 40 |

# DNA BENCHMARKING

## NET ASSIGNABLE SQUARE FEET / STAFF

Below is a benchmarking analysis of assignable square feet per DNA analyst in recently completed comparable facilities.



# CODIS

The CODIS section is responsible for obtaining and analyzing DNA profiles for the laboratory. Using the Combined DNA Index System (CODIS) national database of DNA profiles allows the section to search for previously convicted offenders in hopes of identifying a match that can be reported to law enforcement. There are over 20 million forensic profiles within the CODIS system, and this investigative system is an invaluable asset for the criminal justice system.

Hamilton County Crime Lab

United Metropolitan Forensic Crime Lab

Hamilton County Crime Lab

Hamilton County Crime Lab

# FORESIGHT ANNUAL REPORT METRICS

## 2019-2020

Highlighted below are the DNA CODIS cases registered in the Foresight Annual Report Metrics between 2019 and 2020.

### Cases per 100,000 Population Served

Cases per 100,000 population

| Area of Investigation | Arkansas | 25th percentile | Median | 75th percentile |
|---|---|---|---|---|
| Blood Alcohol | 155.83 | 43.85 | 82.51 | 160.50 |
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Cases per FTE by Investigative Area

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| Toxicology ante mortem (excluding BAC) | 350 | 135 | 174 | 258 |
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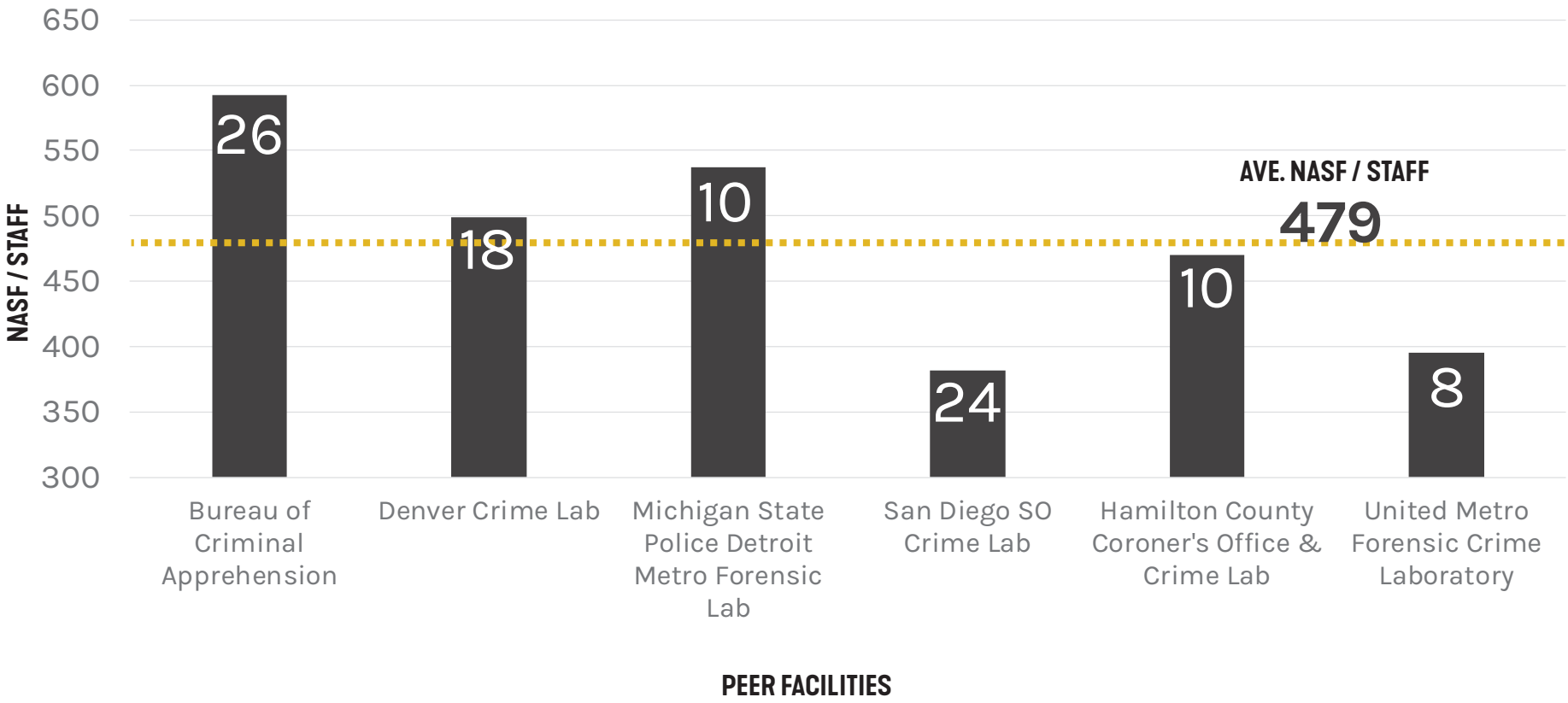
| Trace Evidence | 108 | 32 | 35 | 40 |

# CODIS BENCHMARKING

## NET ASSIGNABLE SQUARE FEET / STAFF

Below is a benchmarking analysis of assignable square feet per DNA analyst in recently completed comparable facilities.



# TOXICOLOGY

The Forensic Toxicology Section serves the law enforcement, medical examiner, county coroners, and court systems of the state of Arkansas. In death investigations samples are analyzed for the presence of drugs and toxins, which may aid in determining a cause of death. In criminal investigations samples are analyzed for the presence of drugs and toxins that may be important in criminal cases such as DUI, DWI, drug-facilitated sexual assault, and many other types of criminal offenses.

The Forensic Toxicology Section uses a variety of testing techniques to analyze the samples including Gas chromatography-mass spectrometry (GC-MS), Tandem liquid chromatography-mass spectrometry (LC-MS-MS), Headspace gas chromatography, UV-visible spectroscopy, enzyme-linked immunosorbent assay (ELISA), and Enzyme multiplied immunoassay technique (EMIT). The analysts will write reports on their examination findings and appear in court for expert testimony.

Travis County Medical Examiner

Hamilton County Crime Lab

Hamilton County Crime Lab

Travis County Medical Examiner

# FORESIGHT ANNUAL REPORT METRICS

## 2019-2020

Highlighted below are the DNA CODIS cases registered in the Foresight Annual Report Metrics between 2019 and 2020.

### Cases per 100,000 Population Served

Cases per 100,000 population

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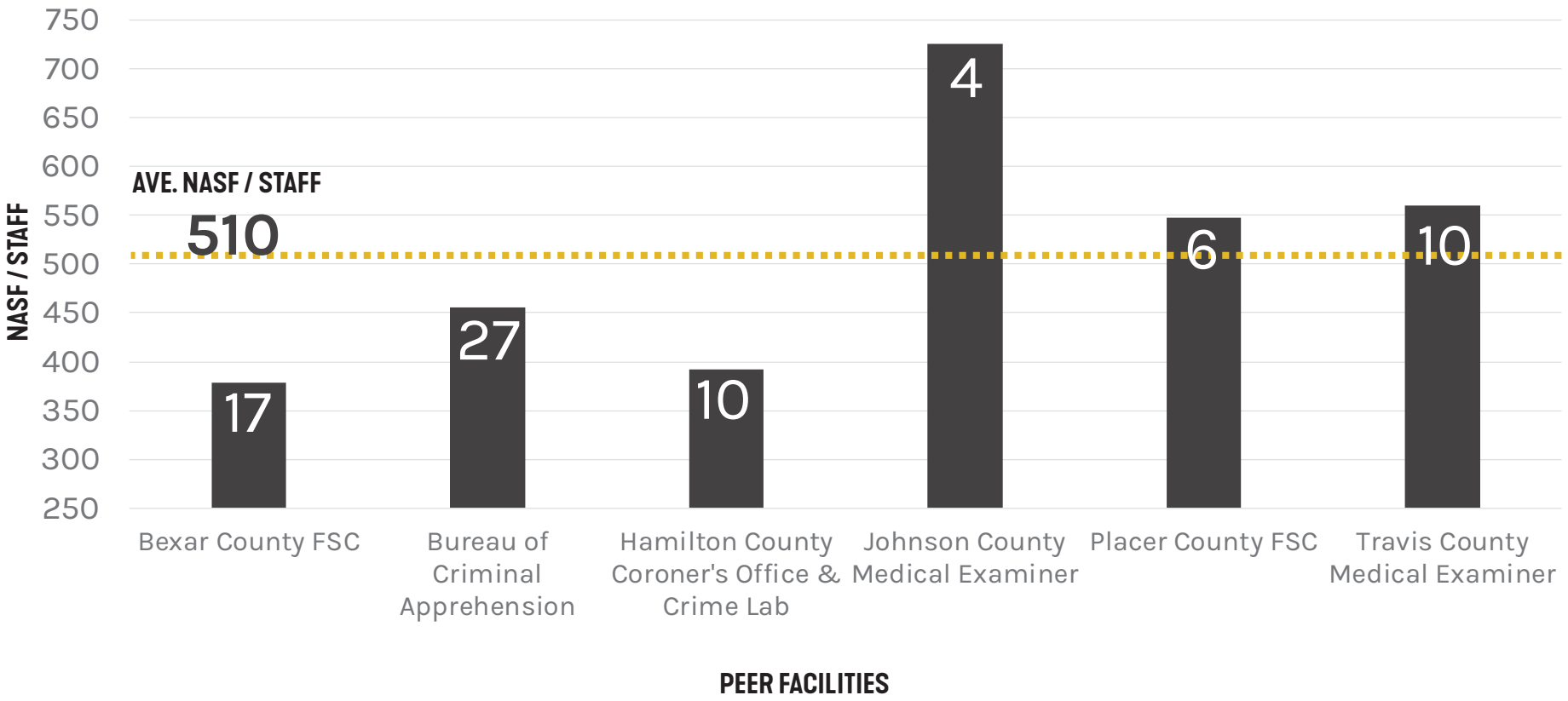
| Trace Evidence | 108 | 32 | 35 | 40 |

# TOXICOLOGY BENCHMARKING

## NET ASSIGNABLE SQUARE FEET / STAFF

The chart below shows the population trend documented by the Arkansas Economic Development Institute between 2016 and 2020.



# CHEMISTRY

The Chemistry Section analyzes controlled substances and chemicals. The evidence arrives in various forms from a solid pill to a powder, liquid, or vapor. The section also investigates chemicals suspected of being used to manufacture a controlled substance. The Techniques used in the forensic chemistry to analyze the samples include Thin-Layer Chromatography (TLC), Energy Dispersive X-Ray Fluorescence (XRF), Gas Chromatography (GC), Fourier Transform Infrared Spectroscopy (FTIR), and Gas Chromatography-Mass Spectroscopy (GC-MS) to qualitatively. Upon completion of the analysis the chemists summarize their analytical findings in a written report for each case.

Denver Police Department Crime Lab

Hamilton County Crime Lab

Unified Metropolitan Crime Lab

Hamilton County Crime Lab

# FORESIGHT ANNUAL REPORT METRICS

## 2019-2020

Highlighted below are the Chemistry cases registered in the Foresight Annual Report Metrics between 2019 and 2020.

### Cases per 100,000 Population Served

Cases per 100,000 population

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# CHEMISTRY BENCHMARKING

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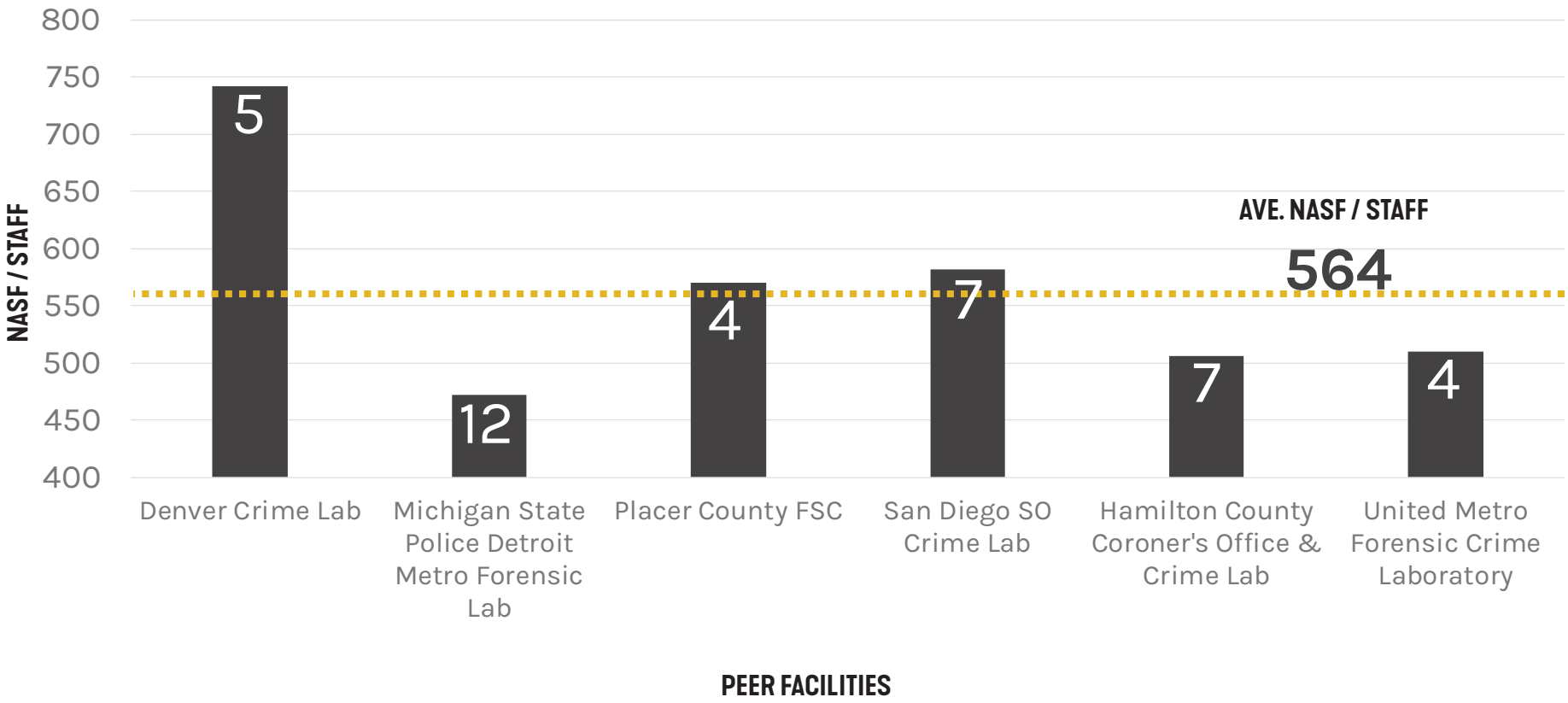

# FIREARMS AND TOOLMARKS

The primary function of the Firearm and Toolmark examiner is to determine whether a bullet, cartridge case, or other ammunition component was fired in or cycled through a specific firearm. The section also performs testing that includes:

- Function testing
- Analysis of rifling characteristics
- Projectile distance determination
- Serial number restoration
- Test firing
- Toolmark examination
- Fracture matches
- NIBIN

The NIBIN (National Integrated Ballistic Information Network) allows the examiners to input images of cartridge cases recovered from the scene of a crime as well as cartridge cases test fired in recovered firearms. As new images are entered, the system will search for possible matches to previously entered cartridge cases. When a possible match is found, a firearms examiner will conduct a microscopic examination of the evidence to determine if there is a match.

Hamilton County Crime Lab

Toronto Centre of Forensic Sciences

Denver Police Crime Lab


Hamilton County Crime Lab

# FORESIGHT ANNUAL REPORT METRICS

## 2019-2020

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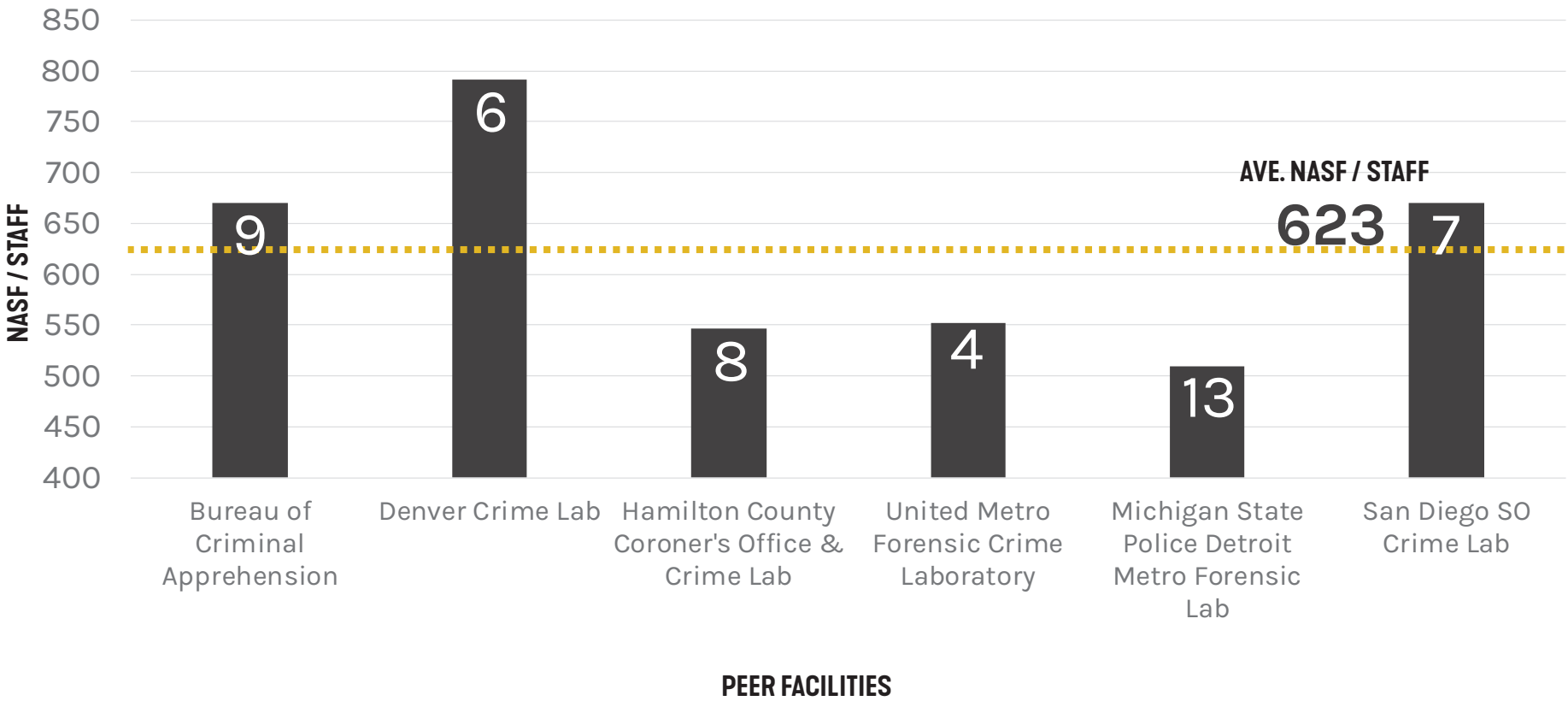
# FIREARMS AND TOOLMARKS BENCHMARKING

## NET ASSIGNABLE SQUARE FEET / STAFF

Below is a benchmarking analysis of assignable square feet per Firearms analyst in recently completed comparable facilities.



# PHYSICAL EVIDENCE

The Physical Evidence Section is divided into two units: Serology and Trace Evidence.

## SEROLOGY

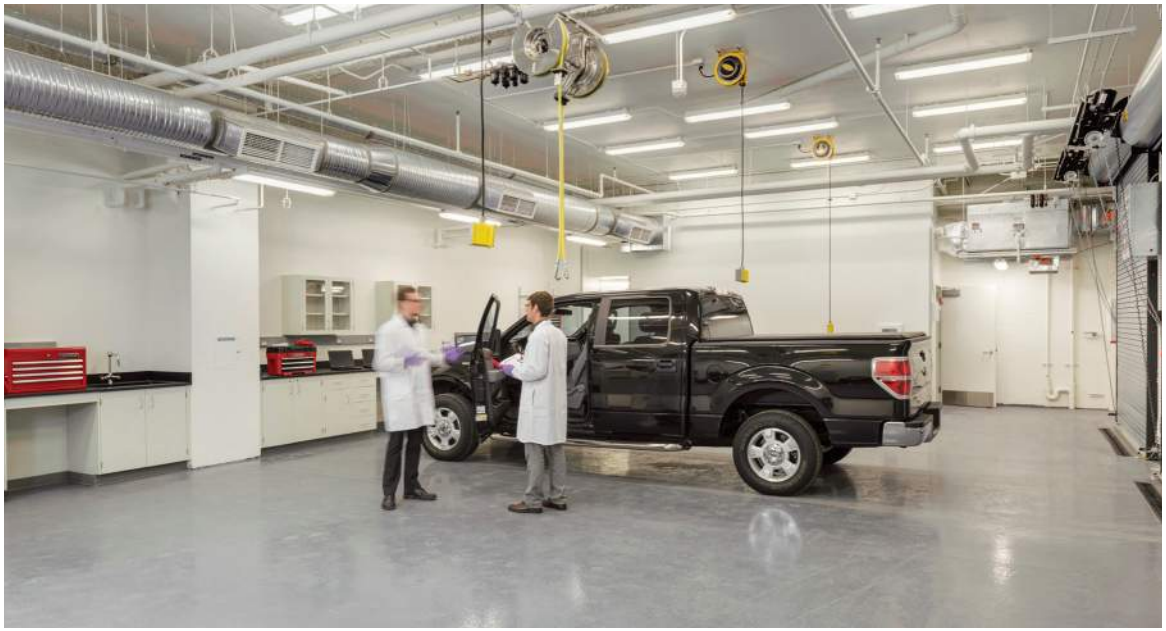
The Serology Unit utilizes visual and chemical tests to examine items of physical evidence for the presence of body fluids, such as blood and semen. Samples may also be collected for DNA analysis by swabbing, cutting, and tape-lifting from the evidence. Serology testing of evidence include visual examination, alternate light source examination, microscopy and other specialized blood and semen testing.

## TRACE EVIDENCE

The Trace Evidence Unit analyzes primer gunshot residue from suspects, analyzes fire debris for accelerants, and performs hair screening for DNA testing suitability. The instruments used for analysis are the stereomicroscope, Scanning Electron Microscope/Energy Dispersive Spectrometer (SEM/EDS), and Gas Chromatography-Mass Spectrometer (GC-MS). The rooms housing this microscopy require stringent environmental and vibration criteria. The analysts will write reports on their examination findings and appear in court for expert testimony.

Hamilton County Crime Lab

Maricopa County Crime Lab



Detroit Metro Forensic Laboratory

# FORESIGHT ANNUAL REPORT METRICS

## 2019-2020

Highlighted below are the Physical Evidence cases registered in the Foresight Annual Report Metrics between 2019 and 2020.

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Cases per 100,000 population

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| DNA Casework | 88.10 | 46.32 | 81.69 | 133.09 |
| DNA Database | 456.51 | 48.04 | 204.84 | 271.00 |
| Document Examination | NA | 0.68 | 0.75 | 1.29 |
| Drugs - Controlled Substances | 657.51 | 162.52 | 248.26 | 392.98 |
| Evidence Screening & Processing | NA | 26.23 | 72.05 | 587.77 |
| Explosives | NA | 0.07 | 0.17 | 0.23 |
| Fingerprints | 39.07 | 28.17 | 37.10 | 71.33 |
| Fingerprints Database (including IAFIS) | NA | 15.05 | 28.91 | 63.04 |
| Fire analysis | 6.10 | 2.48 | 3.23 | 5.64 |
| Firearms and Ballistics | 31.55 | 12.88 | 20.66 | 38.14 |
| Firearms Database (including NIBIN) | NA | 33.66 | 62.59 | 179.67 |
| Forensic Pathology | 48.90 | 54.16 | 59.25 | 63.49 |
| Gun Shot Residue (GSR) | NA | 2.21 | 3.79 | 8.12 |
| Marks and Impressions | NA | 0.19 | 0.36 | 0.52 |
| Serology/Biology | 62.42 | 25.31 | 39.51 | 66.86 |
| Toxicology ante mortem (excluding BAC) | 82.73 | 44.31 | 63.02 | 126.34 |
| Toxicology post mortem (excluding BAC) | 73.10 | 46.64 | 61.80 | 104.92 |
| Trace Evidence | 3.79 | 0.77 | 1.56 | 3.45 |

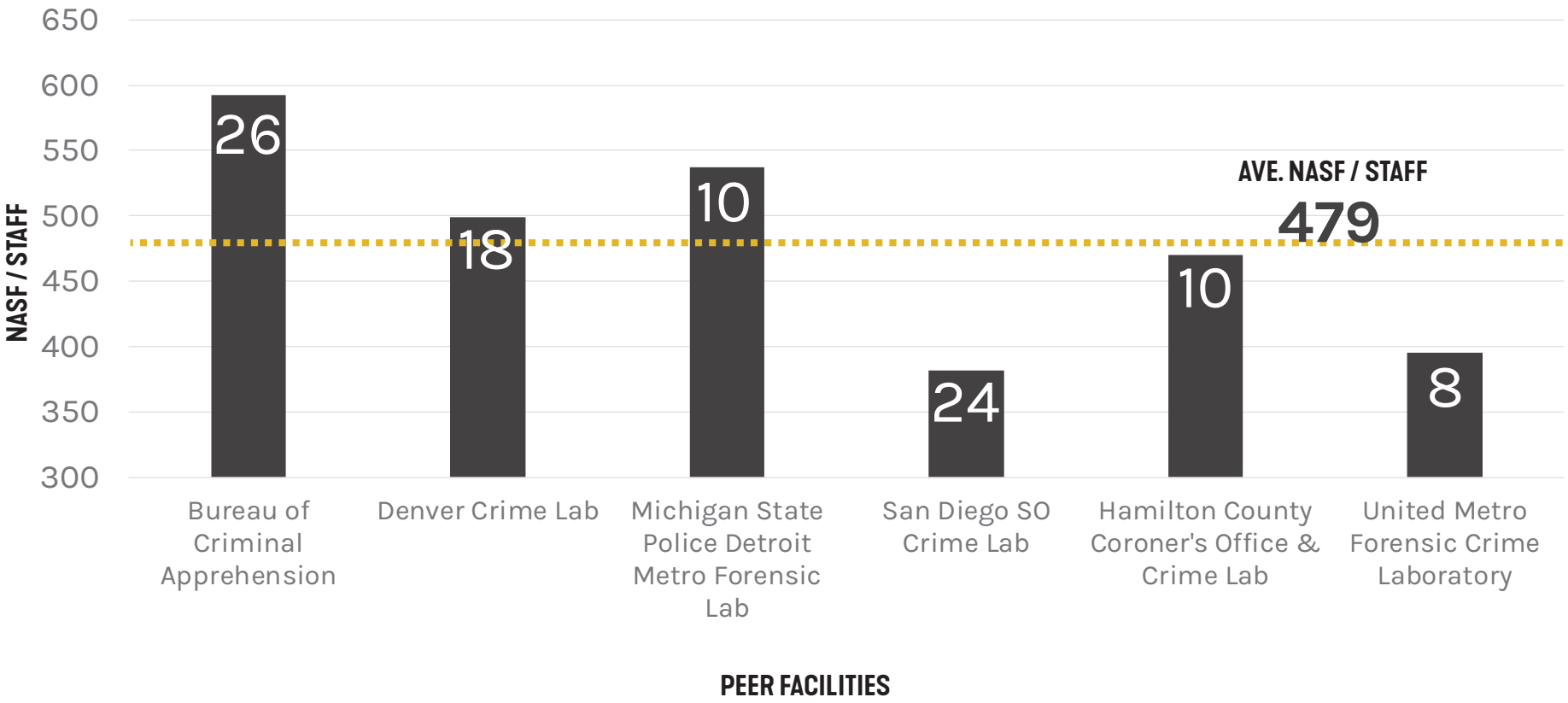
### Cases per FTE by Investigative Area

Cases per FTE by Investigative Area

| Area of Investigation | Arkansas | 25th percentile | Median | 75th percentile |
|---|---|---|---|---|
| Blood Alcohol | 1,329 | 461 | 694 | 1,107 |
| Crime Scene Investigation | NA | 32 | 72 | 102 |
| Digital evidence | 66 | 22 | 40 | 47 |
| DNA Casework | 94 | 77 | 102 | 138 |
| DNA Database | 1,946 | 1,634 | 2,618 | 3,702 |
| Document Examination | NA | 19 | 24 | 33 |
| Drugs - Controlled Substances | 467 | 307 | 374 | 477 |
| Evidence Screening & Processing | NA | 128 | 146 | 168 |
| Explosives | NA | 5 | 7 | 10 |
| Fingerprints | 167 | 98 | 142 | 177 |
| Fingerprints Database (including IAFIS) | NA | 91 | 321 | 544 |
| Fire analysis | 173 | 38 | 58 | 81 |
| Firearms and Ballistics | 96 | 47 | 69 | 107 |
| Firearms Database (including NIBIN) | NA | 347 | 770 | 1,315 |
| Forensic Pathology | 208 | 94 | 94 | 180 |
| Gun Shot Residue (GSR) | NA | 30 | 39 | 64 |
| Marks and Impressions | NA | 11 | 16 | 23 |
| Serology/Biology | 140 | 58 | 120 | 151 |
| Toxicology ante mortem (excluding BAC) | 350 | 135 | 174 | 258 |
| Toxicology post mortem (excluding BAC) | 350 | 113 | 138 | 175 |
| Trace Evidence | 108 | 32 | 35 | 40 |

# PHYSICAL EVIDENCE (SEROLOGY) BENCHMARKING

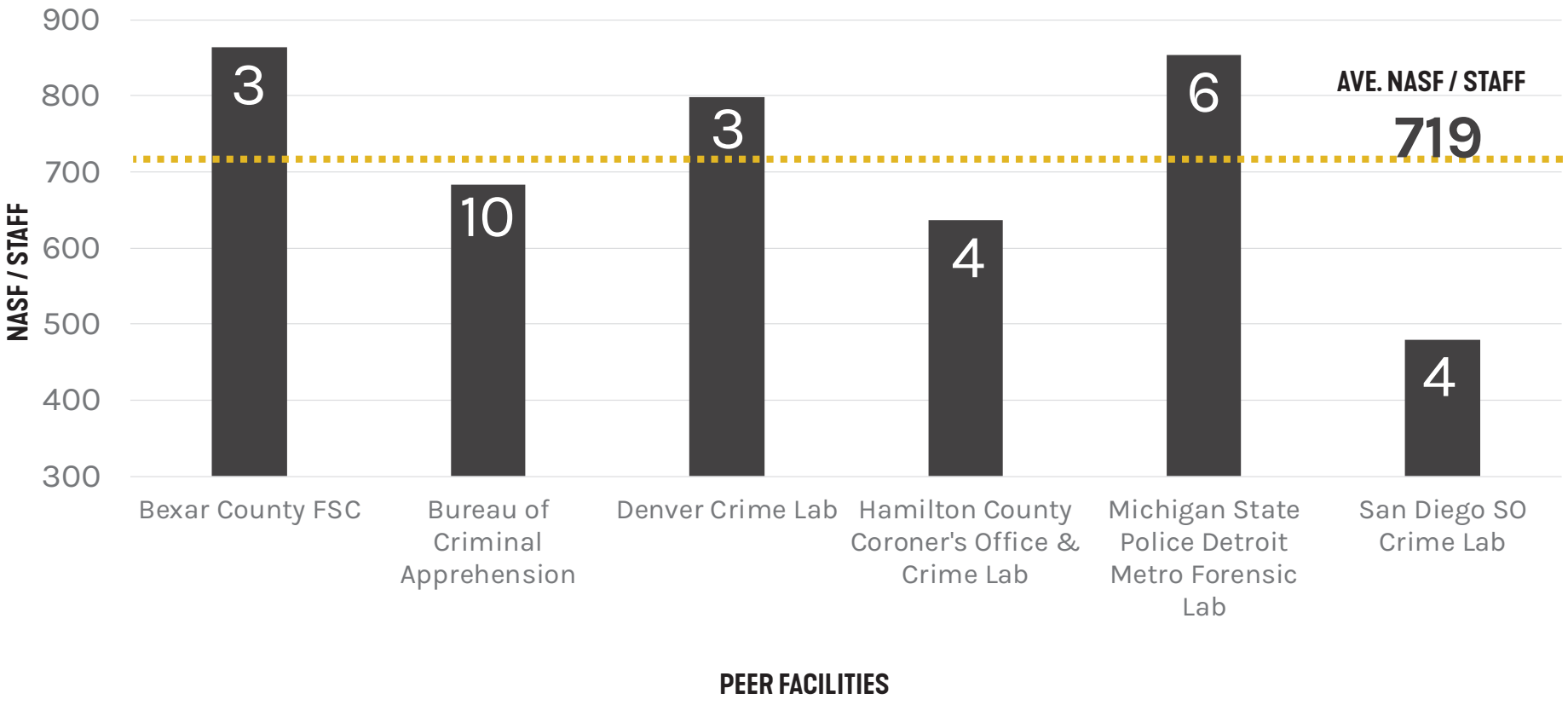
Below is a benchmarking analysis of assignable square feet per Physical Evidence(Serology) analyst in recently completed comparable facilities.



# PHYSICAL EVIDENCE (TRACE EVIDENCE) BENCHMARKING

## NET ASSIGNABLE SQUARE FEET / STAFF

Below is a benchmarking analysis of assignable square feet per Physical Evidence(Trace Evidence) analyst in recently completed comparable facilities.



# MEDICAL EXAMINER

## AUTOPSY RATE

The primary responsibility of the Arkansas State Crime Lab's Medical Examiner (ME) is to complete the autopsy examinations of the 75 counties across the state of Arkansas. Over 1,500 cases are referred to the Medical Examiner's Office each year and include sudden and unexpected deaths due to trauma or natural disease, self-destructive acts such as suicide, accidents within a work environment, motor vehicle accidents, overdose deaths, or where a potential homicide may have occurred.

Facilities providing autopsy services are accredited by the National Association of Medical Examiners (NAME). Accreditation is based on the premise that by following the accreditation system's standards will improve the quality of medicolegal investigation of death in the United States and is an endorsement that the Medical Examiner's Office provides appropriate services to the people of the State.

First accredited in 1976, the facility has undergone minimal modifications since opening in 1981 in the current location. When originally constructed the facility served a population of approximately 2.3 million and was able to operate at a level which maintained accreditation. Over the last 40 years Arkansas has grown 800,000 people, increasing the demand on the Medical Examiner's Office, which is based on the state's population, has put a strain on the aging facility.

Following review of the state population and autopsy demand across the last 5 years, the ASCL ME is seeing an autopsy rate of approximately 0.44 autopsies per 1,000 individuals across Arkansas. This autopsy demand is considered to be low according to NAME and is likely due to a number of causes relating to the decision making processes within the Counties that the Medical Examiner's Office serves.

| | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 |
|---|---|---|---|---|---|---|
| Full Autopsies | 1,253 | 1,325 | 1,330 | 1,263 | 1,343 | ** |
| External Autopsies* | 160 | 191 | 144 | 141 | 61 | ** |
| Total Referred | 1,445 | 1,575 | 1,509 | 1,457 | 1,426 | ** |
| **Total Autopsies** | **1,307** | **1,389** | **1,378** | **1,310** | **1,364** | **1,621** |
| Population | 3,007,001 | 3,026,555 | 3,044,865 | 3,062,041 | 3,078,021 | 3,092,955 |
| **Autopsy Rate** | **0.43** | **0.46** | **0.45** | **0.43** | **0.44** | **0.52** |

* External Autopsies counted at 1:3 per NAME Accreditation

** Quantity of autopsies projected for year 2021

# PROJECTED AUTOPSIES

## AUTOPSY RATE

Across the country, it's typical that an increase in the autopsy rate is observed when a new facility is constructed. The reasons for the increase are generally assumed to include improved efficiency for staff operating in an optimally designed facility, reduced turn-around-times, and greater visibility on the professionalism of the system. The rate will likely not approach the general average national goal of 0.75 autopsies per 1,000, however, it was discussed that a more realistic rate of 0.60 autopsies per 1,000 would be used. This elevated rate will allow for future growth in demand along with greater capacity to accommodate a mass-fatality event. It is also a slight increase in rate based on the most recent observed rate for 2021.

Travis County Medical Examiner

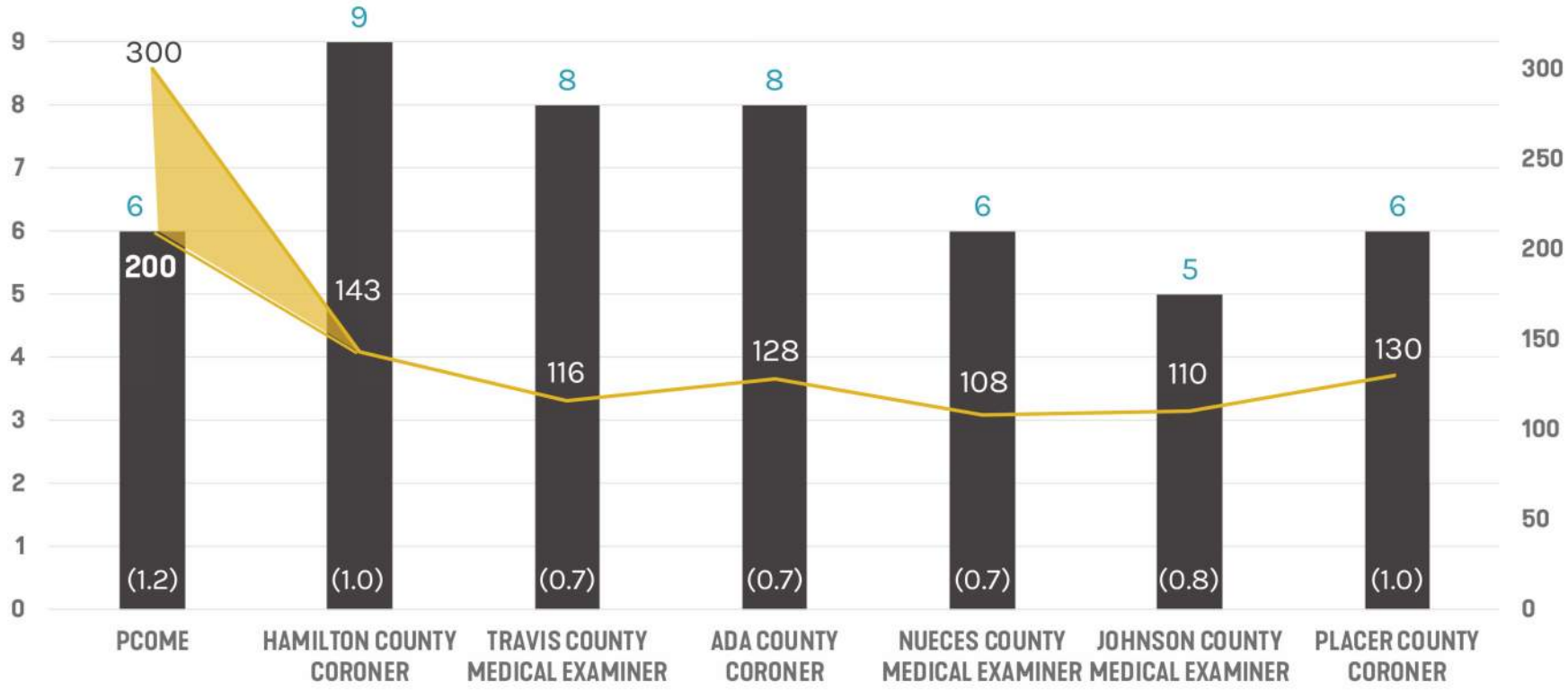
| | 2020 | 2021 | 2031 | 2041 | 2051 |
|---|---|---|---|---|---|
| **Autopsy Rate** | **0.44** | **0.52** | **0.60** | **0.60** | **0.60** |
| Population | 3,078,021 | 3,092,955 | 3,231,051 | 3,372,204 | 3,546,843 |
| **Total Autopsies** | **1,426** | **1,621** | **1,939** | **2,023** | **2,128** |

# MEDICAL EXAMINER BENCHMARKING

## AUTOPSY STATIONS & BODY STORAGE (AUTOPSY RATE/1,000)

A critical consideration for the appropriate sizing of the morgue and autopsy space is related to the total number of expected autopsies. As the population grows and the rate of autopsies within that population increases, more area is dedicated to autopsy stations and decedent body storage. The graph below compares the State to peer facilities across the country.

Based on the State's projected demand, it is recommended that the total number of autopsy stations be set at (10) and the body storage positions at (141). Eight of the autopsy stations would be located in a main autopsy room, one dedicated to isolation cases, and the final autopsy station allowing for autopsy observation by law enforcement or students.

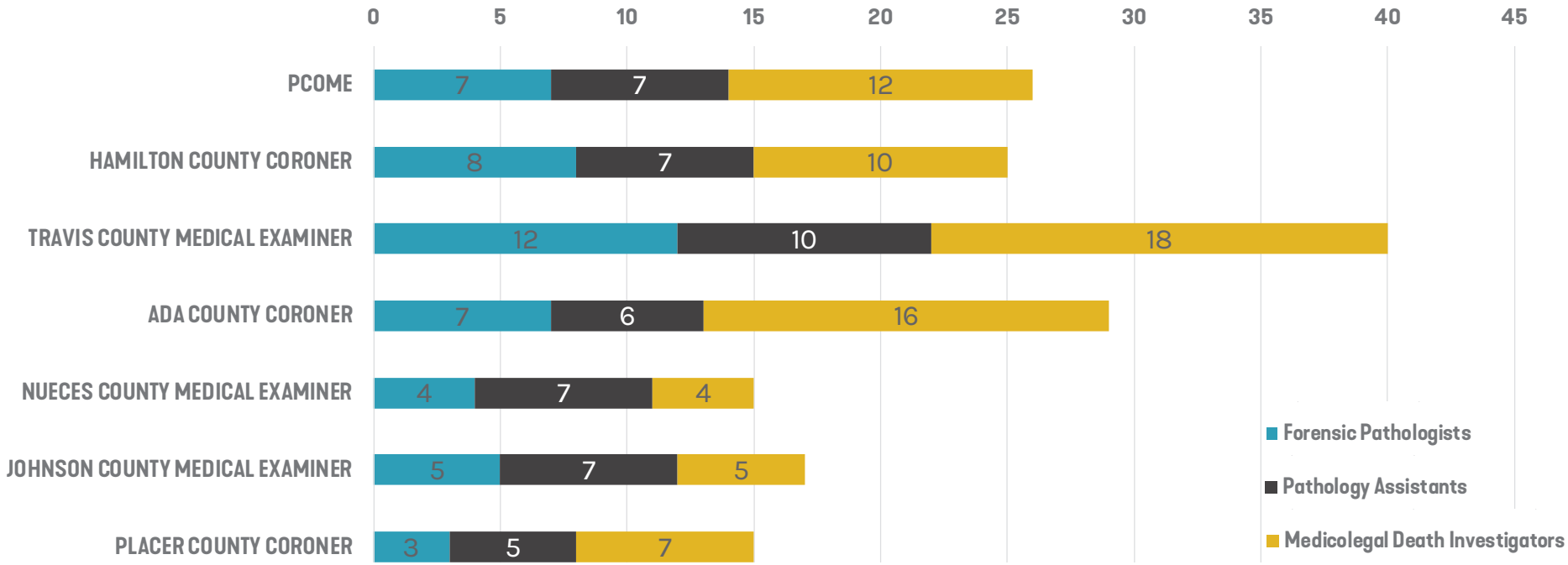


# MEDICAL EXAMINER BENCHMARKING

## STAFFING

To be certain that the Medical Examiner's Office is adequately staffed, the number of forensic pathologists should be identified. Using the NAME accreditation criteria, the ASCL should plan for no less than (11) full-time forensic pathologists within the planning horizon of the year 2051 using the maximum rate of 250 annual autopsies per forensic pathologist. The quantity of decedents investigated per physician can be increased if the Medical Examiner's Office continues to provide external examination of decedents when appropriate based on the individual case. This strategy can be used to add flexibility in the total number of annual decedents processed by the State, raising the total autopsies per forensic pathologist to 325 cases annually, with a lighter load for leadership due to additional administrative duties.

The pathology assistant staff count would continue to be consistent with the staffing level of the forensic pathologists, with the Medical Death Investigators staffing increasing due to the projected increase in decedent load. The graph below compares staffing demands as a relationship between the three primary roles, and identifies that there is consistency with the current staffing strategy.



# EMERGENCY SUPPORT FUNCTION

Mass fatalities may occur as the result of a variety of events, including natural disasters, disease outbreaks and pandemics (i.e., COVID-19), or large accidental incidents. Since a mass fatality event is likely to result from a major incident, law enforcement, Coroners, and the State Crime Laboratory will have a major role in the response.

The Arkansas State Crime Laboratory serves as an Emergency Support Function agency, designated as (ESF #8) under the Arkansas Department of Health. The mission of the laboratory in this function is to assist in the mass fatality management operation. The Forensic Pathologists and support staff apply established forensic standards and best practices to:

- Document, record, investigate, recover, mitigate any hazards, and process decedents in a dignified and respectful manner
- Accurately determine the cause and manner of death
- Perform the accurate and efficient identification of victims
- Support judicial, public health, and investigative objectives and requirements.

This function is critical to conduct rapid return of decedents to their legal next of kin and support the resolution of the mass fatality event.

Currently, the Arkansas State Crime Lab would be challenged to support this essential role. In the event of a mass fatality, a lack of physical space (both exterior and interior) and redundancy in infrastructure or special systems would prevent operational continuity for daily caseload while supporting a tragic event.

Although site area would not likely be exclusively dedicated to a mass fatality event, supporting systems and adequate lay-down space should be planned in the future design. This site program should be secured from public access and provide connections to utilities such as power for temporary trailers. Adjacency to the morgue and segregation from the evidence intake would likely be important so that decedent processing can occur without blocking entrance for crime lab evaluation.

The ideal situation is for accommodations to be made, without the need to implement the mass fatality plan. Although the scope of the event would be unknown, by allocating space and with prudent planning, the ASCL can support the needs of the state during traditional operations and in times of tragedy.

SECTION 05

# IMPLEMENTATION

# PROJECT COMPLEXITY, REGIONAL COST DATA, AND ESCALATION

To adequately project what a forensic facility is expected to cost, there are three issues that must be considered. Project complexity is a foremost concern as it will be the primary driver of overall cost. Once the scope of the project is understood, a regional cost overlay must be applied, allowing for the local conditions to be considered. Finally, timing for the project and the expected change in costs will then need to be adjusted due to the expectations for escalation in the materials and labor markets.

The subsequent cost model is based on the laboratory moving into a new building on a site that the state owns. Forensics facilities are inherently complicated projects due to chain of custody concerns, security, biosafety concerns, and specialty systems. The complexity to renovate an existing facility into a modern, state-of-the-art crime lab would add further complexity and associated project cost. Older facilities can be difficult to renovate for multiple reasons such as existing hazardous materials, outdated code compliance, the need for MEP systems replacement, and space layout problems. An existing facility layout will commonly require a complete interior demolition and encounter structural cost impacts relating to new MEP systems infrastructure and stiffening due to vibration concerns for microscopy equipment. A new addition to accommodate the operational needs of the new crime lab would be an opportunity, however, a significant cost impact for renovating the existing Arkansas facility would include operational continuity during the renovations and intensive phasing strategies, and scheduled system shut-downs. This increased scope of temporary construction impacts the budget due to temporary walls, logistics and dust control, and generally slow down the production of the work, contributing to increased costs. The logistics of retrofitting a facility into this type of specialized environment oftentimes becomes much more costly and impactful to ongoing operations than simply building a new facility which is the recommendation.

Our estimating team has provided estimates on billions of dollars of large, phased, and complex construction projects, many of them in the complex sectors of forensics, medical facilities, and hospitals. Arkansas cities, in general, currently carry city cost indices (from RSMeans) of around 82 which indicates that construction costs in Arkansas are similar to cities where the team can draw on cost data from similar facilities.

The cost estimate on the following pages represents an expected cost for the work in current dollars and is then escalated to allow for cost increases until the midpoint of construction. This midpoint is expected to occur in the 2nd quarter of 2024. Escalation of 6% for the first year and 4% for the next 2 years was incorporated into the expected construction cost. The reasoning for different percentages across the three-year period is that impacts due to the pandemic are expected to be alleviated while projections in escalation for material and labor costs will start to normalize.

# PROJECT CONCEPTUAL ESTIMATE

Total project cost includes all costs and expenses associated with the construction of a new facility. Construction cost is a portion of that total project cost, but will vary based on multiple factors. For this analysis, the total project cost includes construction costs and "soft costs" associated with design, permitting, furniture, and state management. The total project costs assume that site acquisition will not be needed, so if a property needs to be purchased, the costs associated with that transaction should be added to total project cost.

The Design Team shall move forward based on the following assumptions:

## CONCEPTUAL ESTIMATE

| | |
|---|---|
| 187,000 | GROSS SQUARE FEET |
| $636 | PER SQUARE FOOT |

| | |
|---|---|
| $118,950,000 | CONSTRUCTION COST FY21 |
| $17,426,000 | ESCALATION TO Q2 FY24 |
| $136,376,000 | CONSTRUCTION COST FY24 |
| **$181,834,000** | **TOTAL PROJECT COST** |

# PROJECT CONCEPTUAL ESTIMATE

**Arkansas State Crime Lab**
**Conceptual Estimate**
**Smith Group**
**September 22, 2021**

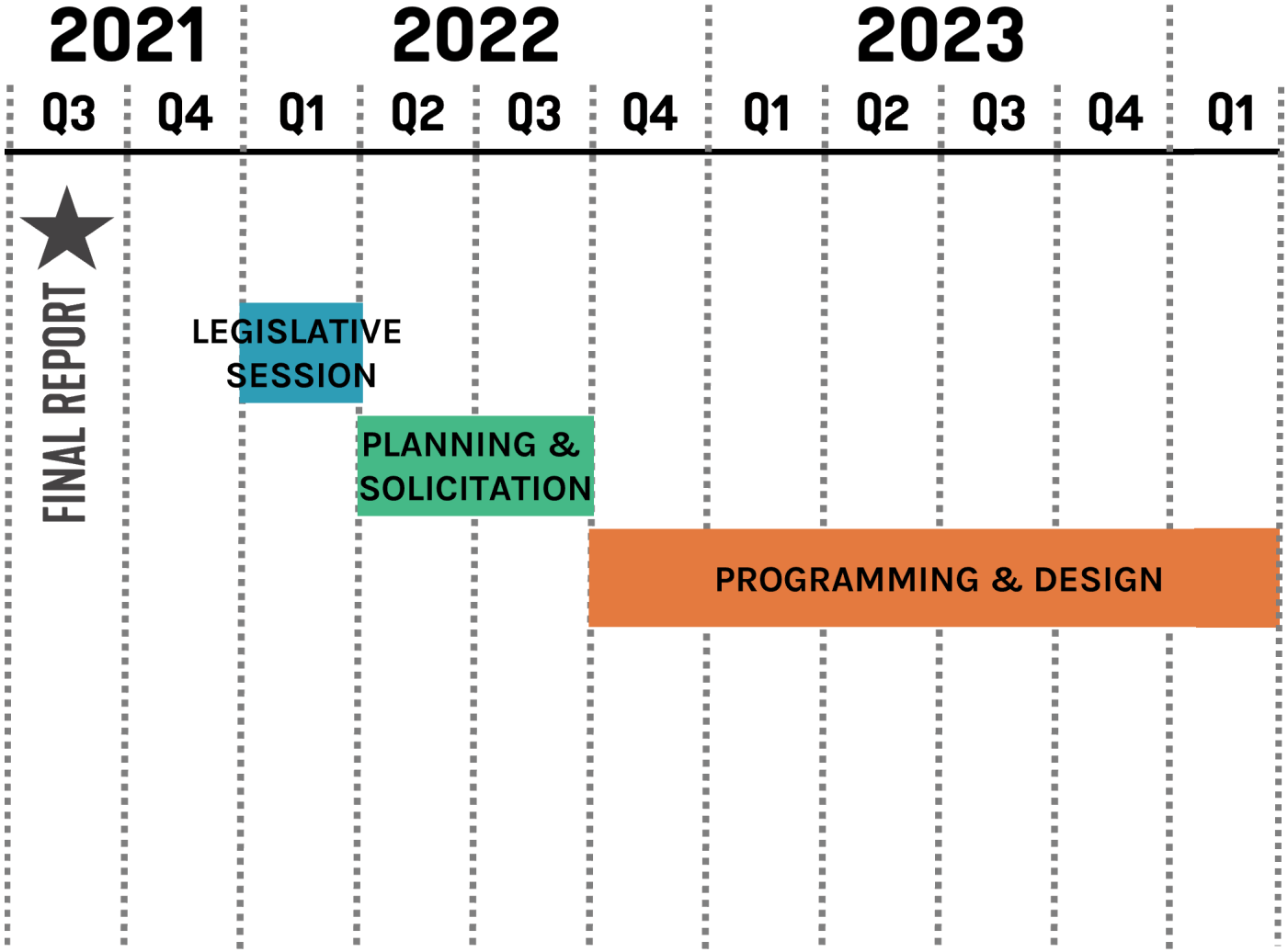
**ESTIMATE**

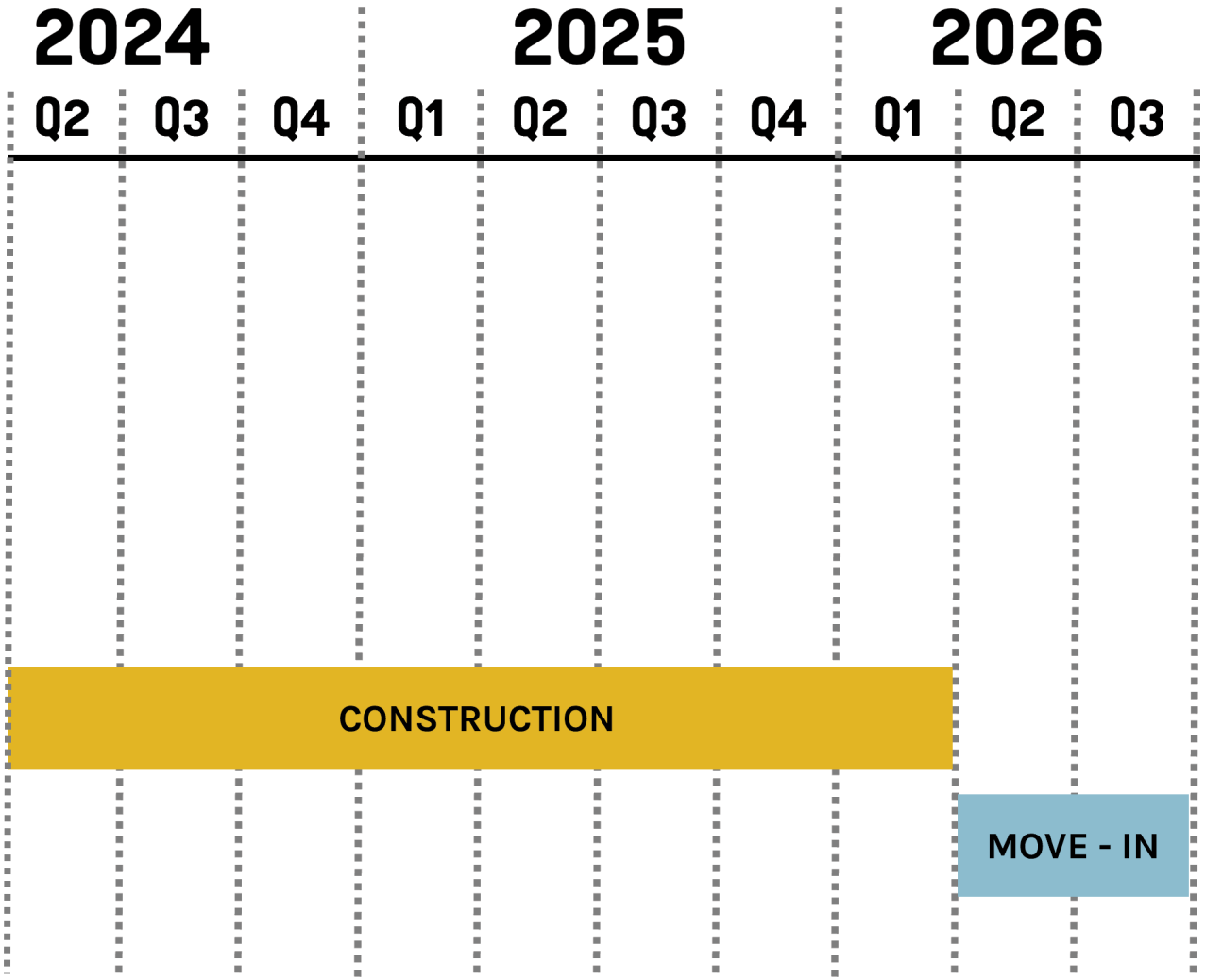
| DESCRIPTION | QTY | UNIT | UNIT COST | EXTENSION | SUBTOTAL | TOTAL |
|---|---|---|---|---|---|---|
| **CORE AND SHELL** | | | | | | |
| Substructure / Superstructure | 187,000 | sf | $ 44.40 | $ 8,303,361 | | |
| Exterior Closure | 187,000 | sf | $ 50.31 | $ 9,408,344 | | |
| Roofing / Insulation / Waterproofing | 187,000 | sf | $ 16.97 | $ 3,172,829 | | |
| Conveying Systems | 187,000 | sf | $ 1.53 | $ 286,017 | | |
| Fire Protection | 187,000 | sf | $ 5.00 | $ 935,000 | | |
| Plumbing | 187,000 | sf | $ 34.25 | $ 6,404,750 | | |
| HVAC | 187,000 | sf | $ 100.35 | $ 18,765,450 | | |
| Electrical | 187,000 | sf | $ 75.92 | $ 14,197,788 | | |
| Communications | 187,000 | sf | $ 12.28 | $ 2,297,015 | | |
| Electronic Safety and Security | 187,000 | sf | $ 10.98 | $ 2,053,634 | | |
| | | **SUBTOTAL CORE AND SHELL** | | | **$ 65,824,187** | *$ 352.00* |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **BUILD OUT** | | | | | | | | | |
| Partitions | 187,000 | sf | $ | 12.22 | $ | 2,284,579 | | | |
| Glass | 187,000 | sf | $ | 6.55 | $ | 1,224,009 | | | |
| Door/Frame/Hardware | 187,000 | sf | $ | 10.09 | $ | 1,886,643 | | | |
| Floors | 187,000 | sf | $ | 7.83 | $ | 1,463,836 | | | |
| Ceilings | 187,000 | sf | $ | 12.64 | $ | 2,362,745 | | | |
| Wall Finish | 187,000 | sf | $ | 13.45 | $ | 2,515,524 | | | |
| Rough Carpentry | 187,000 | sf | $ | 1.43 | $ | 266,475 | | | |
| Millwork | 187,000 | sf | $ | 2.57 | $ | 479,655 | | | |
| Toilet Partitions and Accessories | 187,000 | sf | $ | 1.26 | $ | 236,275 | | | |
| Locker Room/Shower Accessories | 187,000 | sf | $ | 0.33 | $ | 62,178 | | | |
| Miscellaneous Accessories | 187,000 | sf | $ | 3.63 | $ | 678,623 | | | |
| Graphics | 187,000 | sf | $ | 0.62 | $ | 115,473 | | | |
| Window Covering | 187,000 | sf | $ | 1.16 | $ | 216,733 | | | |
| Casework | 187,000 | sf | $ | 13.40 | $ | 2,505,800 | | | |
| Equipment | 187,000 | sf | $ | 34.31 | $ | 6,415,970 | | | |
| | | **SUBTOTAL BUILD OUT** | | | | | **$** | **22,714,516** | *$ 121.47* |
| **SITEWORK** | | | | | | | | | |
| Earthwork | 187,000 | sf | $ | 4.70 | $ | 878,900 | | | |
| Environmental (SWPPP) | 187,000 | sf | $ | 0.10 | $ | 18,700 | | | |
| Landscape / Hardscape / Irrigation | 187,000 | sf | $ | 4.35 | $ | 813,450 | | | |
| Pavements | 187,000 | sf | $ | 6.25 | $ | 1,168,750 | | | |
| Site Fencing and Miscellaneous Site | 187,000 | sf | $ | 8.58 | $ | 1,603,525 | | | |
| Site Utilities | 187,000 | sf | $ | 14.30 | $ | 2,674,100 | | | |
| | | **SUBTOTAL SITEWORK** | | | | | **$** | **7,157,425** | *$ 38.28* |
| | **TOTAL COST OF WORK** | | | | | | | **$** | **95,696,128** |
| | Contractor Mark-Ups | | | | *13.0%* | | | $ | 12,440,497 |
| | Contingency | | | | *10.0%* | | | $ | 10,813,662 |
| | **TOTAL CONSTRUCTION (2021 Dollars - No Escalation)** | | | | | | | **$** | **118,950,287** |
| | | | | | | | *PER SF* | *$* | *636.10* |
| | **TOTAL CONSTRUCTION (Escalated to 2nd Qtr 2024)** | | | | | | | **$** | **136,376,028** |
| | | | | | | | *PER SF* | *$* | *729.28* |

# POTENTIAL IMPLEMENTATION SCHEDULE

The time required to complete a project is related to the overall project cost and abilities of the ASCL to continue to meet the needs of their customers. The adjacent implementation schedule assumes that following the 2022 legislative session, funding will have been secured to move forward with project planning and development of the formal solicitation for design services. After approximately six months, formal programming and design for the new facility can begin. Although the construction delivery method is unknown at this time, construction for the project will likely require two years before facility commissioning an occur. Finally, a staged move will be required as the Crime Lab and Medical Examiner will need to maintain ongoing operations.




2024
2025
2026
Q2
Q3
Q4
Q1
Q2
Q3
Q4
Q1
Q2
Q3
CONSTRUCTION
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