Institute for Canine Forensics

Human Remains Detection Dog Services

Canine Field Survey

Jackson Ranch Church and Cemetery

Hidalgo County, Texas

Prepared for:

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Field Work Conducted on: 11/20/2022

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Summary of Findings

Two teams worked the Jackson Ranch Church and Cemetery, alerting at several unmarked areas. The alerts were flagged and waypoint coordinates recorded.

General Information

Understanding This Report

The following information is key to understanding the report:

- The percentage of terrain accessible to the dogs affects their Probability of Detection (PoD.)
- Hot weather conditions, especially ground temperatures 85°F and higher, very low humidity, and / or near 100% humidity at ground level may dramatically decrease the dogs' PoD.
- The GPS tracks reported are those of the dogs; in some cases, we use the handler's tracks. The dogs range away from the handlers and cover more area than indicated by the handler's tracks.
- Our dogs are specifically trained to give an "alert" when they detect the scent of human remains. The alert is at the strongest source of the scent they have located.
- It is important to note that the dogs do not necessarily alert directly over a burial.

- **Alert Interpretation Key**
  Each alert is given an interpretation number, 1-3, and is described below. This is based on the handler's experience in observing trained dogs identify burials in a variety of known locations and the dog's behavior while working. It also takes into consideration the knowledge of the site, age of burial, burial customs, and past ground disturbances. **This information is offered as a guide to understanding what might be expected.**

  1. Possible Intact Burial: To our knowledge the ground has been undisturbed. The dog is strongly committed to a single location. Based on this, we believe the burial is most likely intact and may be historic or shallow.

  2. **Compromised Burial:** Some ground disturbance may have occurred to the area, either naturally or man-made. The dog is committed to the location, but it may not be as strong of an alert as an intact burial. Based on this and other research, we believe the remains may be an older burial, cremains, reinterned or partial burial, deep, and/or in dense soil.

  3. **Scattered or Dissipated Remains:** This category contains several possible conditions.
  • The ground has been greatly disturbed, either naturally or man-made. Most common reasons for disturbed burials are construction or farming, especially plowing. Older burials can become so degraded that the remaining bones are small fragments or only grave soil remains. When a body has decomposed in the ground the "grave soil" contains the scent that the dogs recognize as human remains.
  • Included in this category is the *conduit effect* where scent travels along underground conduits. Items like pipes, cables, tree roots, utility boxes and poles and/or rodent holes passing through remains can act as a channel for scent, bringing it to the surface. An alert on this sort of item does not necessarily mean there are human remains at that location.

• In some cases, the dog cannot access the exact location of the source. Or the level of scent available to the dog may be below their *target threshold* (scent strong enough to elicit an alert.) The handler observes the dog is clearly working an area of the target odor and is searching for stronger scent.
The dog indicates there is scent, but their reaction to this category varies from having a hard time pinpointing an exact location, to giving several alerts in close proximity, or not alerting. Based on this and other research, we believe the remains may be severely fragmented, grave soil, and/or located in different area than the accessible scent. This may mean that finding visible identifiable remains may not be possible.

For more detailed information please refer to *Appendix C: Using Historic Human Remains Dogs*.

Map and Flag Information
We use consumer level GPS devices with their inherent inaccuracies. Occasionally, an alert waypoint is adjusted to be more correct using the visual reference of satellite imagery. We also change the coordinate information, accordingly. Any waypoint that has been adjusted will be noted.

We use different colored flags for each dog and mark each flag with the team's identification, waypoint number and other important information. The color coding for pin flags, waypoints, and tracks for each handler/dog team in this report are identified in the table below. Note that our Intern and Novice Teams' tracks and waypoints are not reported.

ID	Handler Name	Dog Name	Flag Color	Waypoint Color	Track Color
J	Adela Morris	Jasper	Blue	Blue	Blue
PE	Lynne Engelbert	Piper	Florescent green	Florescent green	Florescent green

Project Information

Date of Survey: November 20, 2022

Project Name: Jackson Ranch Church and Cemetery

Client: University of Texas Rio Grande Valley

Client Contact(s):
Roseann Bacha-Garza
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Other Interested Parties:
Russell Skowronek
956-665-8085
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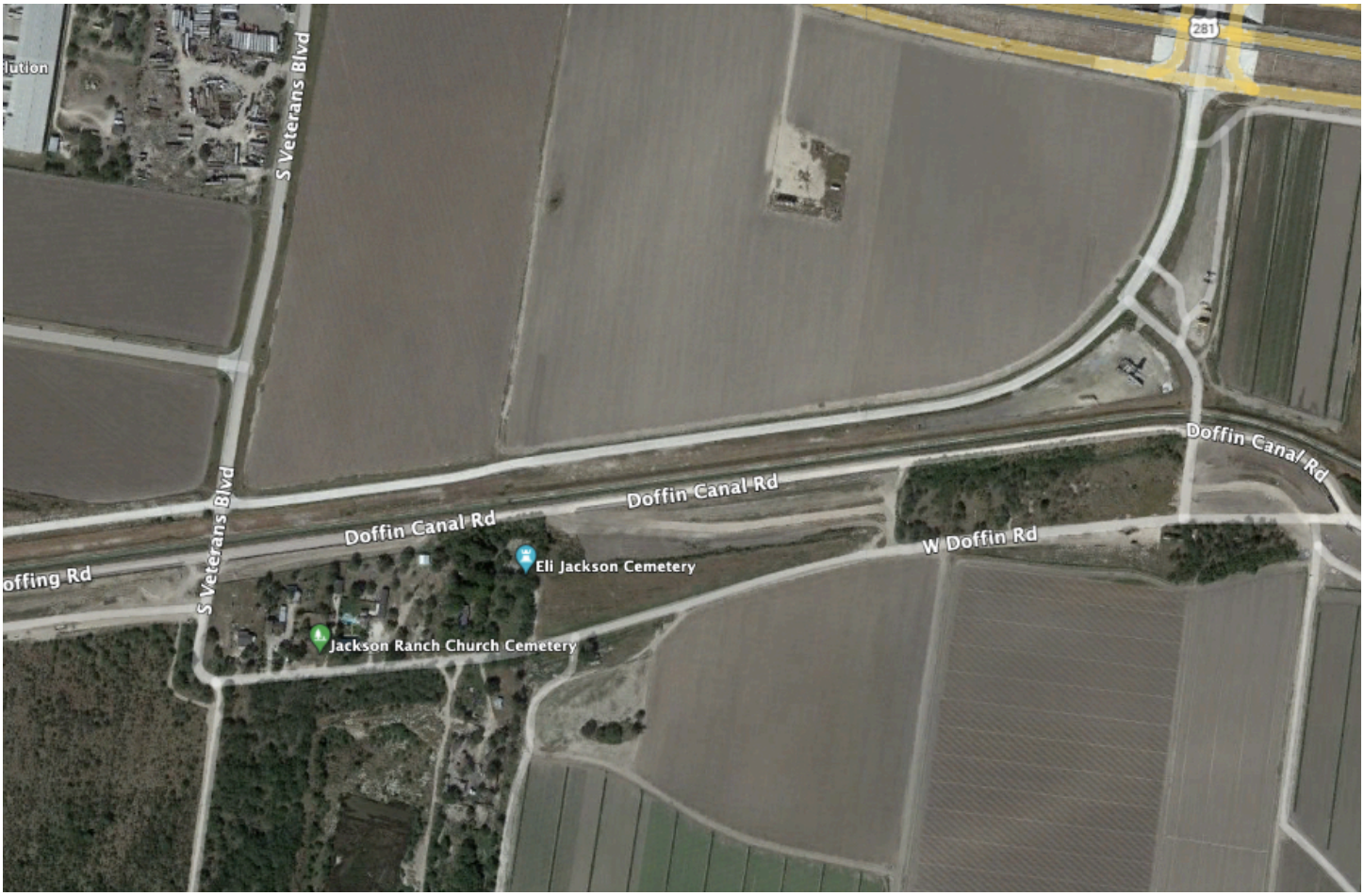
ICF Personnel Responding:

Name	Assignment
Adela Morris	Dog handler, Project Manager
Lynne Engelbert	Dog handler

Prepared By: Lynne Engelbert

Project Location



Pertinent History
This area is part of the Jackson Ranch – settled in 1857. The family patriarch, Nathaniel Jackson died in 1865. There are likely 3 unmarked graves at the Jackson Ranch Church and Cemetery. They have conducted GIS mapping survey and Ground Penetrating Radar of sections of these properties. They also have historical research regarding lists of those buried at both cemeteries.

Project goals
Conduct a survey to locate unmarked burials at the Jackson Ranch Church and Cemetery.

Methods
The two dogs worked the cemetery, assuring that there was double coverage of the area. The teams worked using a free, and medium grid searches.

The client can request an electronic GPS file of the tracks and waypoints of alerts.

Survey Details

Search Area: Jackson Ranch Church and Cemetery

Area Description
Small cemetery with church in the center, burials w/markers on the left and mostly open, grassy area on the back. There were a few burials with markers in the back. The search area included around the foundation of the church but not inside.

We estimate this search area was between 90% and 95% accessible to the dogs.

Alert Details

Handler / dog: Lynne & Piper			
Search Strategy: Free search and medium grid			
Date and Time Searched: Nov. 20, 2022: 10:40 – 11:30 a.m.			
General Comments: We were asked to focus on the back of the churchyard, approx. 47°, 15 mph wind from the NW, Dew Point 42%, Ground Temp. 47°			
GPS Used: Garmin Alpha 200i			
Waypoint #	**GPS Coordinates, UTM**	**Alert Key**	**Handler Comments**
PE1	14 R 581532 2885474	2	Piper alerted just west of the A. Rutledge marker
PE2	14 R 581540 2885473	2	Alert at bare patch of ground
PE3	14 R 581540 2885474	3	Alert near small concrete pad
PE4	14 R 581543 2885467	3	Alert at large prairie dog burrow
PE5	14 R 581542 2885435	2	At NE corner of cross (possible cremains?)
PE6	14 R 581542 2885433	3	At SE corner of cross (possible cremains?)
Handler / dog: Adela & Jasper			
Search Strategy: Free search			
Date and Time Searched: 11/20/22 10:40am - 11:37am			
General Comments: Focus on the area behind the church, used Piper's waypoints			
GPS Used (waypoints): Garmin Alpha 200i Handheld			
GPS Used (dog tracks): Garmin Alpha TT 15x Dog Collar			
Waypoint #	**GPS Coordinates, UTM**	**Alert Key**	**Handler Comments**
J1	14 R 581532 2885474	2	Close to Piper's alert, corroborated PE1
J2	14 R 581540 2885473	2	Bare patch of dirt, corroborated PE2
J5	14 R 581542 2885435	3	Alerted in 3 locations around the large cross, see PE5 alert

Photographs

Piper's PE1 alert just west of Rutledge marker.	

PE2 Alert at bare patch of land	

Map of Alerts

Map of Tracks

Appendix A: Project Weather Conditions

Weather conditions during this project were less than optimal with overcast skies, Approximately 47°, 15 mph winds from the NW, Dew Point 42% and a ground temperature of 47°.

Appendix B: Handler Biographies

Adela Morris	**Historic Human Remains Detection Specialist** **Member of the ICF Board of Directors** **Evaluator and Instructor: Human Remains Detection** Adela has been involved in human remains detection with her dogs since 1986 and has deployed her dogs on hundreds of searches specializing on cold cases, crime scenes and historic burials. She has certified seven dogs for human remains detection. Since 2017, she has also worked with the Alta Heritage Foundation's Cremated Remains Recovery Team, helping locate previously cremated remains for victims of wildfires whose homes have been destroyed. She is the founder of the Institute for Canine Forensics, a nonprofit organization for the advancement of research and education for the use of canines. Adela is also the founder of the Canine Specialized Search Team, a volunteer resource for Santa Clara County Sheriff's Office. Adela is an evaluator and instructor for Human Remains Detection with ICF and for the state of CA. She has served as an expert witness. **Historic Human Remains Detection Publications** • "Locating the Grave of John Snyder", Overland Journal, Vol. 30, No. 3, Fall 2012. • "Assessing Canine Forensic Results with Archaeological Excavations at Protohistoric Síi Túupentak (CA-ALA-565/H) in the San Francisco Bay Area", Society for California Archaeology Annual Meeting, March 2019. • "Applying Canine Detection in Support of Collaborative Archaeology", 2021, Advances in Archaeological Practice, 9(3), 226-237, doi:10.1017/aap.2021.12 **Canine:** Jasper **Historic Human Remains Detection, Certified** **DOB:** January 1, 2011 **Breed:** Border Collie, Tri-Blue Merle **Certification:** Historic Human Remains Detection; re-certified every year since initial certification in 2012 **Canine**: Zia **Historic Human Remains Detection, Novice** **DOB:** April 26, 2021 **Breed:** Border Collie, Red & White

Lynne Engelbert	**Historic Human Remains Detection Specialist** **Evaluator and Instructor: Human Remains Detection, Disaster Search** Lynne has 30+ years of detection dog training and handling experience and is an associate with the Institute for Canine Forensics. Lynne and Piper, her border collie, are certified in Historic Human Remains Detection, and FEMA Human Remains Detection (disaster). They were formerly certified to California Office of Emergency Services (CalOES) Human Remains Detection (Type 1). Since 2017, Lynne and Piper have worked with the Alta Heritage Foundation's Cremated Remains Recovery Team, helping locate previously cremated remains for victims of wildfires whose homes have been destroyed. Lynne serves as an evaluator for Human Remains, Historic Human Remains Detection and FEMA disaster search dogs (live-find and HRD). Lynne and her former search partner Lucy (1991-2006) were a FEMA-certified live-find Canine Search Specialist team and became a CalOES certified Cadaver team in January 1999 with several major finds in their career. They deployed to the Oklahoma City Bombing (Lucy with a former handler) and the World Trade Center after 9/11. She was also a certified Canine Search Specialist with the FEMA and CalOES with her live-find disaster search dog, Sweep (2003-2017). Lynne is an instructor for Human Remains Detection, disaster search and canine decontamination. She has also worked with local and federal law enforcement agencies in doing maintenance training for narcotics, explosives and arson detection dogs. **Canine:** Piper **Historic Human Remains Detection, Certified** **DOB:** April 15, 2010 **Breed:** Border Collie, Black & White **Certifications:** Historic Human Remains Detection; certified 2012-2019 and recertified 2020-present FEMA Human Remains Detection, FEMA Urban Search and Rescue standard; initial certification, 2015, re-certified in 2018 (current) **Canine:** Jazz **Historic Human Remains Detection, Novice** **DOB:** April 11, 2019 **Breed:** Border Collie, Black & White

Appendix C: Using Historic Human Remains Detection Dogs

General Information

The Organization

The Institute for Canine Forensics (ICF) is a 501(c)(3) non-profit corporation established in 1997. ICF is singularly dedicated to training, certifying, and providing Historic Human Remains Detection (HHRD) dog teams. HHRD dogs have unique and specialized training in locating historic and prehistoric human remains. We work closely with archaeologists and anthropologists to ensure our training and methods are consistent with current standards of practice. Over the last 10 years ICF has worked 20 - 40 projects a year with about 70% of that being Native burials.

The Dogs

The use of Historic Human Remains Detection dogs is one of several techniques that may be used to locate historic and prehistoric burials. They are the *only* remote sensing tool that can detect and recognize the scent of human remains. This makes them uniquely qualified to aid archaeologists. HHRD dogs may also be used in combination with other more traditional techniques. For example: GPR can detect anomalies in the ground. HHRD dogs can identify the scent of human remains. Overlapping this information can indicate unmarked burials. Using scientific methodologies, archaeologists can build predictive models to help determine the possibilities for unknown burials in a given location.

Each handler is an independent contractor, owns their own dog and is responsible for their dog's training, health and wellbeing. Along with scent training, the dogs are taught obedience, agility and socialized to other animals and humans. Most of our dogs have flown in-cabin with us all over the country and, in some cases, internationally. We use a variety of dog breeds, mostly from working lines.

Developing a Customized Search Plan

Important Information for Setting up the Project for Success

An initial customized search strategy is based on information given to us by the client during the information gathering phase. The more detailed and complete this information is, the more suitable our initial plan can be. The search plan is re-evaluated on-site and may be modified as needed.

Project Goals and Priorities

Each project is unique, as is each search area. ICF has several techniques that can be deployed to accommodate different needs. For example:

- *Time constraints* - For some projects, the need to complete the field survey quickly is paramount. In this case, we might apply more teams for a faster survey.
- *Boundaries* - Other projects only require identifying the boundaries of a cemetery so the area can be avoided. We might do a free search outside the assumed boundaries, to help identify any unknown burials.

- *Specific Locations* - Other clients may be seeking the location of each burial for removal / preservation. We might work a tighter grid search, overlapping with multiple teams to make sure as many burials as possible are found.
- *Research* – Clients conducting a study may need to exclude bias. In this case, teams can work double blind.

History of the Site

Understanding the history of the site can help us understand what might be found and in what condition remains may currently be in. This information goes toward developing our search plan. For example, it is helpful to know any:

- Prehistoric history including Native culture and their burial practices
- Land grading, especially if any fill soil was added
- Known land use including buildings, agriculture / tilling, etc.
- Any known burials in the area
- Oral history of burials
- Cultural features that have been identified
- Registered archeological site(s) within the search area, if so please provide number(s)

Search Boundaries, Maps, Photos, Terrain, Vegetation and Hazards

It is important that we have explicit search boundaries to ensure we cover all the requested areas. Boundaries can be provided by:

- GPS coordinates / tracks
- Aerial photo with drawn boundaries (e.g., Google Maps / Earth)
- Physical features (e.g., roads, fences, streams)

Knowledge of the terrain, vegetation and any known hazards are very important to the development of a customized plan. For example:

- Height of ground cover, including impenetrable brush
- Fences, especially electric or barbed
- Animals (livestock, rattlesnakes, etc.)
- See more details below in the *Dog Working Conditions* and *Accessible Terrain* sections

Current photos of the area are important to see the present-day state of the site, including things that might not have been obvious to the client. (We use Google Maps / Earth so we can visually review the area, but the current conditions are often different.)

How We Work

The search location is broken down into multiple, manageable areas. Our standard practice is for two dog teams to search each area. At times more coverage will be added, for example: difficult terrain, areas with many potential burials or areas where burials will need to be excavated for preservation. Normally we search a short distance outside of the defined boundary, as the scent

from a burial can sometime only be detected a short distance from it. Occasionally this results in the dogs alerting on areas outside the scope of the project.

The dogs work at different times during the day with different weather conditions and for varying lengths of time. The best search strategy is determined based on the need of the client, weather conditions, terrain and the dog searching. Typical search patterns include searching boundaries followed by gridding in two directions. Grid spacing depends on the client's needs, what we are looking for, terrain, soil conditions, etc. Using multiple dogs to cover an area increases the Probability of Detection (PoD.) Typical grid spacings include:

- **Free:** This style of search lets the dog choose the area it wants to search and is not as controlled as a grid search. It can be useful when speed is needed but it can be more difficult to keep track of the areas the dog has searched. The benefit of this search mode is if the dog has scent they will gravitate to that location and work it first.
- **Wide Grid:** The size of the grid spacing ranges from 10 to 30 meters, depending on terrain. This style of search covers areas faster and is used when we have limited time or large areas to search. This usually means less coverage of a search area. To increase the probability of detection, the area is often searched with a cross-grid.
- **Medium Grid:** A medium grid search is commonly used when we are looking for, or believe we have located, a cemetery. It typically uses grid spacing from 3 to 5 meters and often is searched with a cross-grid to get better coverage and Probability of Detection. Having more than one dog search the area also increases the Probability of Detection.
- **Fine Grid:** A fine grid search is used to search for single bones and teeth. It typically uses a grid of about 1 to 2 meters and often is searched with a cross-grid to get better coverage and Probability of Detection. We do not use it very often in the field because we are usually not asked to search for individual bones and teeth. A Fine Grid Search covers about ¼ acre per hour. It is tiring on the dog and they usually need a rest break after covering their ¼ acre.

Dog Working Conditions

Our dogs are living creatures and subject to weather conditions, especially heat. Cool, moist conditions are best. The best conditions are not always possible due to the season or location of the project. We have adopted some standard working practices to help ensure the dogs are safe and we get the best possible results. Our dogs are athletes, and our training program builds their endurance to extend the duration of time they can work.

Below is a list of our basic guidelines:

- The dogs' workday varies from 4 to 6 hours per day, depending on weather and other conditions. A workday is not the same as "nose time". Nose time is the amount of time the dog is actively working.
- The dogs can cover anywhere from 2 to 10 acres per workday depending on what they are looking for, the weather, the terrain and the search strategy used.

- For multiple-day projects our dogs typically work 3 days on and 1 day off.
- Weather, especially ground temperatures and humidity, play a critical role in the dogs' ability to locate scent. We monitor ground temperatures as this directly affects the availability of scent. Hot weather conditions, especially ground temperatures 85°F and higher appear to decrease the scent available to the dog. The ground temperature can be significantly higher than the air temperature.
- In general, ground temperatures below 85°F work best for locating burials. The higher the ground temperature, the lower the Probability of Detection. Ideal ground temperatures are between 40°F and 85°F.
- We stop working dogs when the ground temperature approaches 100°F, or the dogs internal body temperature reaches 104°F.
- We do not work in rain heavier that a slight drizzle, or on ground with standing water, due to degradation of scent conditions. Very high humidity *at ground level* may also severely impact the dogs' PoD.
- Project working time may be changed / delayed to increase the dogs' PoD.
- The safety of our dogs always comes first. For example, we do not work deserts at night in the summer due to the presence of rattlesnakes. We prefer that any electric fences in the area be turned off. Livestock and other animals, like loose dogs, can cause undue safety issues. At some locations we work the dogs on a long line for their safety.
- Each handler has their own personal protective equipment (PPE) including a hard hat, high visibility vest for themselves and a high visibility vest for their dog.

In addition to the ideal cool, moist conditions, our dogs have successfully worked projects in the following conditions:

- Hot, dry desert conditions (Southern California deserts)
- Cold, wet conditions (Alaska)
- Hot, humid tropical conditions (South Pacific, Republic of Kiribati)

Our dogs are trained to perform an alert when they detect the scent of human remains. The alert is either a sit or down at the strongest source of the scent they have located. At times it is not physically possible to alert near the source due to vegetation or other obstacles, or the scent can be channeled through disturbances in the ground (insect or rodent activity) and the scent can be more available a short distance away from the grave. (See *How Scent Travels* below.)

Accessible Terrain

The terrain impacts the PoD. The percent of accessible terrain is estimated by how much of the search area the dogs' noses have access to the surface of the ground. Brush, thick grasses, downed trees, etc. can make it very difficult for the dogs to cover some areas. Dry grasses like foxtails, needle grass, rip gut, and wild rye can be very dangerous to the dogs as they propagate by seed pods that have one-way barbs. These seeds can attach to the animals' fur and can lodge in the

dog's nose, eyes, ears or skin, sometimes requiring surgical removal. In areas where these grasses grow, the work needs to be done in times of the year before the grasses dry or they have been removed.

Dense grass above four inches in height can degrade the PoD. for the dogs. Grass above one foot in height has a significant degradation in PoD. Tall grasses and other groundcover trap scent in a localized area and the dog must pass directly above that area, with their nose at ground level to catch the scent. It is recommended that tall grass be cut a week before a search. If that isn't possible, a shorter time interval than a week is preferable over searching in tall grass. Ideally it is recommended that the cut grass be removed if it leaves large, thick clumps, which can result in trapping the scent between the clumps and the ground and not allowing it to rise.

Paved areas create scent barriers. Asphalt can be worked if it is old, cracked, and/or has holes, although it has a very low PoD. An alert on pavement may occur where there is a crack or hole and not necessary on top of the burial.

How Scent Travels

Human remains scent (vapor) travels away from the decomposing body or skeleton by way of diffusion, or vapor transport. Scent will follow the path of least resistance and can flow by means of water movement, animal or insect activity, and plant or root activity. Burrowing animals, such as rodents, as well as some insects like ants, create channels in the soil that can allow the release of scent to the surface.

Dogs can only detect what is available in the air. Water molecules compete with vapor molecules for binding sites. Water physically displaces odor molecules thus causing human remains scent to appear to be stronger, or pool, at vegetation or moist soil. Humidity is higher in and around photosynthesizing vegetation because it is transpiring. As vegetation transpires, it releases water into the atmosphere and bumps the odor molecules off of whatever they are bound to, making odor in the air more available to a dog's nose. Scent can also travel and then be trapped in depressions or obstacles in its path creating a scent pool.

Underground Utilities
It is common to see alerts on or near underground utility access points. Features such as pipes, cables, utility boxes, power and light poles can act as a channel for scent, bringing it to the surface. Scent can move both horizontally and vertically along utility equipment. We believe alerts in these areas are due to scent traveling along utilities that pass close to burials or fragments of human remains. An alert on utilities does not necessarily mean there are human remains in that location.

It is important to note that the dogs do not necessarily alert directly over a burial. Land disturbance, be it man-made, rodent and/or insect activity or the natural movement of the earth, including floods or landslides, can spread the scent over the area. The soil in which the body has decomposed retains the human scent signature that the dogs are trained to recognize and alert on. Disturbed burials will often create larger scent pools, making pinpointing by the dogs more difficult. However, even after years of disturbance and movement, the dogs can still detect, and alert, in reasonably close proximity to a burial.

Bones that have been on the surface for extended periods of time will deteriorate, losing most of their scent, especially in areas with direct sunlight and hot conditions. Environmental conditions that break down scent include sunlight, heat, and wind. Intact, undisturbed graves have more scent available than do disturbed graves or bones.

Qualifications

Training and Certification

Our training regimen and time training exceeds the best practices for the industry standard. We train in all types of weather conditions and terrains, including buildings, urban and wilderness. We log our training sessions including nose time, location of trainings and whether problems were worked blind or known.

Our certification process consists of pre-certification signoffs that include obedience, compatibility with humans, different environments and scent work. The team is required to pass our skills test observed by an outside evaluator and then the team is required to complete field experience before they are considered certified. Once a team is certified, they must complete an ongoing annual certification that ensures skills and evaluations are done throughout the year and maintain a 75% or higher efficacy.

Additionally, our dogs are:

- not cross-trained for other scent disciplines
- socialized to many different situations, people and places
- trained to alert as close as possible to the strongest scent available
- taught to preserve scent sources and are not allowed to dig or mouth potential remains
- routinely trained with flags present so they learn that flags in their search area are insignificant and do not necessarily relate to an alert by another dog

Working with Native Monitors

We have a good working relationship with many tribes, as well as archaeologists. Because of that we have learned to work areas that Native monitors deem significant due to their knowledge of topography, presence of artifacts or features that were used in historic or prehistoric burial

practices. These areas can be more closely searched for potential burials. The handler/dogs are given a narrowed down area to search but are not told exactly where these features are. This eliminates the potential to cue or guide the dogs to a specific object or location.

Selecting a HHRD Dog Search Team

ICF recommends the following guidelines when considering using a dog team to locate historic or ancient burials. Since there are no national standards, the following criteria should be considered to make sure the team fits well with your needs.

- **How long has the organization existed?**
  - ICF was established in 1998. We have over two decades of specialized experience training, certifying, and providing Historic Human Remains Detection (HHRD) dog teams**.**
- **Request a list of clients and projects that the team has worked.**
  - ICF has a wide range of clients including:
    - Multiple Native Tribes
    - Government agencies at the federal, state and local level
    - International organizations
    - Cultural Resource Management (CRM) agencies
    - Churches / cemetery preservation organizations and universities

    Please refer to our web page at www.ICFK9.org for more information, including published papers, past projects, clients, and testimonials.
- **How many historic human remains projects do they work per year?**
  - ICF works 20-40 projects annually
- **Request a sample report.**
  - ICF customizes each report. The template we use as starting point was developed over decades of collaboration with archeologists, Native Tribes / CRMs, and land developers. Please request a sample report from ICF.
- **Do they have any published papers or articles relating to their work?**
  - ICF has participated in several published studies and projects. Please refer to our web page at www.ICFK9.org for more information, including published papers, past projects, clients, and testimonials.
- **Are they covered by both general and professional liability insurance?**
  - ICF has both general and professional liability insurance.
- **Will they travel to your location? Do they have the experience and knowledge to successfully work projects in unfamiliar environments?**
  - ICF has a proven track record of working successfully throughout the United States and internationally. Our dogs are trained to travel and work in a variety of environments. We have proven expertise in travel logistics for handlers and dogs.
- **How many certified teams do they have available to work projects?**

  - ICF has 7 certified teams, 1 intern team (that have passed all their testing and are currently completing their field experience requirements) and 6 novice teams in training.
- **Request resumes of available resources. What experience and relevant education / training do they have?**
  - ICF has almost *200 years of accumulated detection dog experience* and have *participated in thousands of projects / searches*. We have wide ranging skills set / training on the team including almost 50 years of professional project management. Please request a copy of our teams' bios.
- **How are the dogs certified? Request information on testing and skills required.**
  - ICF was the 1st organization to write a certification process for HHRD dogs and remains the world leader in these practices. Please request a copy of our certification process.
- **Are their dogs *specialized in old burials* or are they trained for multiple scents (e.g., live human, explosives, drugs)?**
  - ICF dogs *specialize* in historic human remains detection; they are *not* cross trained to detect any other scents.

Report

We produce a final report on each project for the client. ICF's report is only given to the paying or requesting client unless a written request is given by the client to include additional people/ agencies. All alerts will be included in the report (even alerts encountered outside of requested search areas) unless otherwise requested.

The report generally contains the following information:

- Summary of our findings
- Coordinates of all dog alerts
- A map of the search area(s), dog tracks, and any recorded alerts
- Description of the terrain
- Alert interpretation, comments and observations
- Sample pictures of terrain and dog alerts, as available
- Weather
- Handlers' biographies

Alert Interpretation Key:

Each alert is given an interpretation number, 1-3, and is described below. This is based on the handler's experience in observing trained dogs identify burials in a variety of known locations and the dog's behavior while working. It also takes into consideration the knowledge of the site, age of burial, burial customs, and past ground disturbances. This information is offered as a guide to understanding what might be expected.

1. **Possible Intact burial:** The location where the body was originally interred. To our knowledge the ground has been undisturbed and the burial, is possibly intact. Most likely a historic, or shallow burial. The dog is strongly committed to a single location.
2. **Compromised Burial:** The handler has knowledge of the site, which may include any of the following: older burial, some disturbance has occurred to the location (either natural or man-made), deep burial or dense soil, burial customs include cremation, only bones buried or not all the remains are present at the burial. The dog is committed to the location, but it may not be as strong of an alert as an intact burial.
3. **Scattered or Dissipated Remains:** The site is a known disturbed area, either natural or man-made. The most common reasons for disturbed burials are construction or farming, especially plowing. Older burials can become so degraded that the remaining bones are small fragments or only grave soil remains. When a body has decomposed in the ground the "grave soil" contains the scent that the dogs recognize as human remains. This may also mean that finding visual, identifiable remains may not be possible as only scent is left.

   Included in this category is the *conduit effect* where scent travels along in underground utilities. Things such as: pipes, cables, tree roots, utility boxes and poles and/or rodent holes can act as a channel for scent, bringing it to the surface. An alert on utilities does not necessarily mean there are human remains at that location.

   The dog's reaction to this category varies from having a hard time pinpointing an exact location to giving several alerts in close proximity or not alerting. The handler observes the dog is clearly working the target odor (sometimes called a scent pool) and is searching for stronger scent, or they cannot access the exact location of the source. Also, the level of scent available to the dog may be below their *target threshold* (scent strong enough to elicit an alert).

All reported alerts are valued. Single-flagged alerts may have the same creditability as multiple-flagged alerts. Alerts may not be reproducible by other dogs, depending on condition (e.g., ground temperature and wind.)

Multiple flags in close proximity do not necessarily mean more than one grave but most likely are because each dog chooses a different location to alert on at a single grave. Each burial may be anywhere between 3ft to over 5ft in length. Multiple flags in close proximity can also mean the burial has been scattered by ground dwelling rodents, roots, or earth moving equipment.

When a body has decomposed in the ground the "grave soil" contains the scent that the dogs recognize as human remains. Alerts on disturbed, "scattered" burials can be grave soil, or actual remains (bones/teeth).

Team Status

All dog teams on a project and their status are listed in the report. A dog teams' status determined if their tracks / waypoints are included. Dog Teams status can be:

- **Novice** – has not passed a Basic Skills Test. Tracks and waypoints are not included in the report.
- **Intern** - has passed a Basic Skills Test, their Annual Skills Checklists are up of date, but handler and / or dog have not completed Field Experience. Tracks and waypoints are included in the report.
- **Certified** – has passed a Basic Skills Test, their Annual Skills Checklists are up of date and both handler and dog have completed Field Experience. Tracks and waypoints are included in the report.

GPS

Accuracy

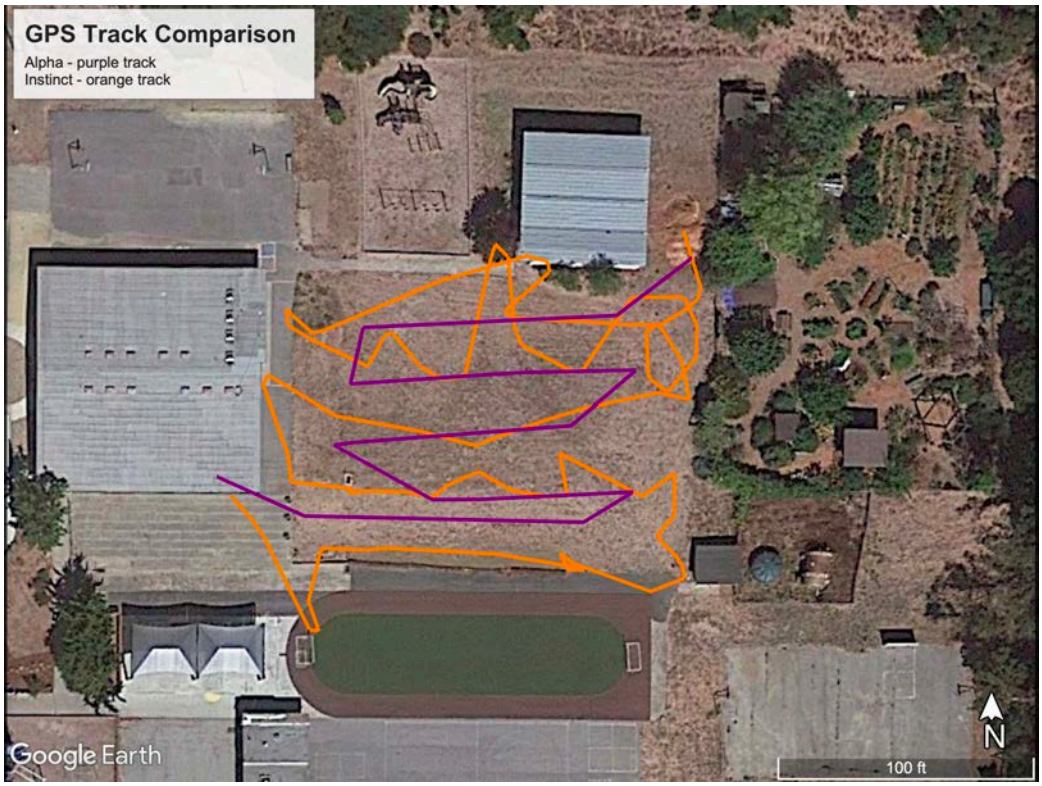
ICF uses consumer grade GPS devices to record dog tracks, as well as waypoint / alerts. In the table below, you will find some of the GPSs ICF uses and examples of their respective accuracy measured in specific conditions. The Precision Open Field is measured to 95% certainty over a 24-hour period with sky unobstructed / no overhead vegetation. Precision will be worse with overhead vegetation. This data is provided for illustrative purposes and will vary depending on field conditions.

Clients that need higher accuracy for waypoints should measure the location of dog alerts (pin flags) themselves. Please contact us if higher accuracy dog tracks are required.

GPS	Sample Waypoint Precision, Open Field	Sample Dog Track Precision, Open Field
UBlox ZED-F9P (RTK Surveyor)	0.9m	
Garmin Instinct Solar Watch	1.5m	1.5m
Garmin Alpha 200i (handheld)	3.5m	
Garmin Alpha & TT 15 collar		6.1m

Quantization Error

Some GPS's only allow / record certain positions, and so those tracks only *approximate* where a dog has been (i.e. snap-to-grid.) In the case of the Garmin 200i + TT I5, this introduces a 2.4-meter quantization error in the two-dimensional position. The figure below compares the tracks of the same dog wearing both an Instinct Solar's (orange track) and the Alpha 200i + TT 15 collar (purple track).



Assessing Canine Detection Effectiveness and Limitations

The ICF canine accuracy at finding graves has been measured in only a few unmarked historic cemeteries. In these measurements, the position of the canine alerts is compared to the position of the center of the grave. Results show that the standard deviation of the canine alert position is generally less than 4 meters as compared to geophysical positions taken at the grave. No excavation was done at any of these graves, but location was determined by geophysical means such as GPR. These same tests also showed that the dogs cannot accurately discriminate between burials immediately adjacent to each other. Lack of alert indicates that the scent is below the dog's threshold of detection; it does not, however, mean that an ancient burial is not present, only that it cannot be detected. In all remote sensing techniques, the data is subject to interpretation and there is a potential for false positives or negatives. As such, all remote sensing techniques require ground truthing and controlled studies to be carried out that assess what variables effect efficacy. Most of our work involves Native burials that are usually avoided or reburied. (see *References* for more details)

References

For more information on the Institute for Canine Forensics, including published papers, past projects, clients, and testimonials go to our web page at www.ICFK9.org