MICHIGAN DEPARTMENT OF NATURAL RESOURCES CADASTRAL SURVEY:

END-RESULT SPECIFICATIONS

3000 SCOPE OF CONTRACT

The intent of this contract is to procure Land Surveying services for the State of Michigan. The terms of this Contract include the Scope of Work, Specifications, Exhibits, and Standard Contract terms, all of which were included with Solicitation, Request for Proposal, and/or Request for Quotation.

3100 PROJECT DESCRIPTION AND LOCATION

All work performed under this contract shall be under the direct supervision of a Professional Surveyor licensed in Michigan. All surveys shall comply with applicable state laws and regulations, as well as applicable portions of the appropriate GLO/BLM Manual of Surveying Instructions.

The work to be performed under this contract typically involves retracement surveys of the Public Land Survey System (PLSS). The surveys will be performed between accepted controlling corner positions to reestablish lost or obliterated General Land Office (GLO) corners and/or to establish section subdivisional corners designated by the COR. Government property boundaries will be designated for posting to applicable standards. A Certificate of Survey may be required to be prepared for recordation. Topographic surveys may be requested independent of or in conjunction with boundary surveys.

The Michigan DNR project zones are located and specified in the Schedule of Items and on the project vicinity map (Exhibit 2). Actual work locations and services to be performed have not been determined at this time. These will be specified by delivery/task order(s), issued when the Government determines its specific surveying needs.

Award of this contract will not restrict the State of Michigan from having land surveying services performed by State Government employees or others during the contract period.

The following specifications are specific requirements of the work performed under this contract in addition to (or as a clarification of) the professional services listed above.

3122 SURVEY METHODS AND PROCEDURES

The Contractor shall select the methods and instruments to be used for field data collection and boundary location. Methods such as photogrammetry, traverse, triangulation, and Global Navigation Satellite Systems (GNSS) may be used. The system selected shall meet the accuracy standards prescribed by the State of Michigan. Where state standards are less restrictive than the specifications contained herein, the specifications contained herein shall apply.

All work shall be performed in a safe manner and in accordance with OSHA regulation. Refer to Exhibit 3, the Land Surveying Job Hazard Analysis (JHA), for examples of work hazards and abatement actions that may be taken to prevent accidents. Note that federal law requires at least a Class 2 high visibility safety vest be worn by workers within the right-of-way of federally funded highways. For the scope of this contract safety vests are required to be worn for any work performed along county maintained roadways. The Contracting Officer may, in writing, require the Contractor to remove from the work any employee found to be working in an unsafe manner.

3122.1 Survey Standards

The position of each corner and/or piece of evidence (BT stumps, topo calls, etc.) reestablished, established or found must be determined as part of a closed traverse loop, an acceptable radial tie, or a point positioning procedure designed to meet the standards prescribed by the State of Michigan and/or the specifications contained herein. Proposed procedure for performing radial ties shall be included in the Contractor’s Quality Control Plan and submitted to the COR at the post award conference. The precision of each traverse loop shall be demonstrated in the field notes and closure report required in Section 3160. An appropriate adjustment is required to be performed on all traverse loops with errors > 0.20’, but may be performed on all loops. The standard for locating the boundary line between corners is specified in Section 3146.

3122.2 Determination of Bearing

The method used to determine a bearing base for each project must be capable of establishing astronomic, geodetic, or state plane grid azimuth to within 1 minute of arc. Assumed bearings will not be accepted.

3122.3 Use of Global Navigation Satellite Systems (GNSS)

Geodetic/survey grade GNSS equipment and methods may be utilized for measurements and staking by contractors having that capability when it saves cost and/or time compared to conventional methods, but only in situations where appropriate relative accuracy standards can be achieved at the 2σ (95%) confidence interval. It is the contractor’s responsibility to be aware of the limitations of any measurement/staking tool used and be able to demonstrate that relative accuracy standards have been achieved. The use of GNSS to measure a line does not relieve the Contractor from the responsibility to search and evaluate all evidence of GLO and/or subsequent surveys and to tie evidence of encroachment and occupation onto Government land.

If field procedures include the use of GNSS equipment, clearing the site location is limited to shrubs and trees under 6 inches in diameter. The COR must approve all other clearing on Michigan DNR lands by the Contractor. All clearing on privately owned lands must be approved in writing by the property owner.

All GNSS work shall conform to the Forest Service “Standards For the Positional Accuracy of Cadastral Surveys When using Global Navigation Satellite Systems (GNSS)” (Exhibit 12). Note that these standards refer to 3-dimensional position solutions at the 2σ (95%) confidence level. If Real Time Kinematic (RTK) techniques are used, ensure that repeat measurement tolerances are set in both field and office software at or below required positional accuracy at the 95% confidence level. A minimum of 3 independent measurements of at least 30 epochs of data shall be collected for each RTK point. Any station with uncertainties greater than those outlined in these standards will either need to be re-occupied or made part of a conventional traverse to confirm the coordinate values. Distances between intervisible pairs of project GNSS control points shall be checked by EDM measurement to verify relative positional accuracy prior to utilizing control to perform additional conventional traverse or radial ties.

* 1. Records Research

It is the Contractor's responsibility to research the records of public agencies, and private records to the extent possible, to obtain the survey history of the subject property and relevant adjoining properties. The Contractor shall provide the results of any records research to the COR prior to the start of field work. Copies of any subsequent research shall also be provided to the COR as they are acquired.

The Government will provide the Contractor information in their possession: Government title records, any corner recovery information and previous survey records at the time of Request for Services. It is the Contractor’s responsibility to evaluate corner and survey records for accuracy and completeness.

* 1. Adjoiner notification (if explicitly required in the Scope of Work)

Prior to the start of field work, the Contractor shall develop a list of adjoining property owners and notify the effected adjoiners of the pending survey in writing (see Exhibit 8 for example). In addition to notification, the letter will address the necessity for access, marking of accessories and minor clearing of line on private land if necessary. A list of adjoiners, including property descriptions, shall be provided to the COR prior to the start of field work.

* 1. Conflicts and Encroachments

The Contractor is not required to resolve title or possession conflicts, but shall accurately report the facts and any professional opinions that are relevant to the conflict prior to posting boundary lines. The Contractor shall identify, by survey, any encroachments or lines of occupation along the boundaries of Michigan Department of Natural Resources (MDNR) lands. The nature and extent of the encroachment or lines of occupation shall be documented in a narrative as part of the Report of Survey as well as graphically on the Control Diagram and Certificate of Survey drawings. When encountering fences, please be specific as to the condition of the fence and whether it is being maintained.

* 1. Field Notes and Point Numbering

During the field work, the contractor will keep a record of the survey in a field book with sufficient detail to provide verification of the final survey record. Field notes should be well organized, accurate, neat, legible, detailed and complete (see Exhibit 11 for example). On multi-section projects, field notes shall be organized, labelled and separated by section. This can most easily be achieved by utilizing loose leaf field books. Field notes should contain sketches roughly to scale that accurately depict and clarify the ground survey and contain neatly printed annotation and a north arrow. Avoid crowding too much information onto a page.

Field data should be recorded in such a manner as to allow another technically qualified person to readily retrace the survey without consultation with the Contractor. Field notes shall include information on all monuments recovered and set, including: monument size and type, height above or below ground, reference to occupation lines and roads, and accessories listed in clockwise order from North. Bearings and distances to accessories and any conflicting monumentation should be measured with a compass and tape. Monument size shall also be measured with a tape and not estimated.

If the Contractor uses an electronic data collector, the raw data file shall contain all measurements and error checks and be submitted as part of the Report of Survey. Hardcopy field notes are also required as summary documentation of field measurements and monument information as required above.

All descriptive codes for surveyed points should be concise, consistent, and easy to interpret. Descriptions of corner locations should be distinctive, identifying the corner in the section, and the section in multi-section surveys; county codes may be utilized.

* 1. Clearing for Control Survey

Clearing shall be kept to the minimum necessary for the survey. Survey operation should be kept on Government land whenever possible. No timber or brush of scenic or commercial value shall be cut along control traverse lines. In an effort to preserve homes for various wildlife, please refrain from cutting standing dead trees unless they pose a safety hazard. The contractor is responsible for obtaining permission from landowners prior to clearing line on private land.

3125 CONTROL DIAGRAM

The Contractor shall electronically provide a control diagram in an AutoCAD compatible .dwg file showing reduced data of the control survey and any survey computations made to determine property boundaries. If the project is within a township that the Contractor has previously performed work for the Government, then the AutoCAD file shall contain both the previous work as well as the current project work.

A preliminary control diagram and Land Corner Recordation Certificates (LCRC’s) for all GLO corners requiring monumentation shall be provided to the COR prior to the posting or monumentation on any project. A narrative report shall be included with the control diagram and shall describe the basis for the survey decisions made and a discussion of the evidence, methods, and procedures used in determining the location of all controlling corners within the survey.

The COR will be allowed 5 working days to review the submitted documentation. A comma delimited text file of coordinates with descriptors for each point shall be provided with all diagrams. If the control diagram contains previous work within a township, then point numbers shall not be reused within the current project work. A final control diagram showing all survey control shall be included in the Report of Survey as specified in Section 3160.

3130 CORNER MAINTENANCE AND ACCESSORIES

Maintenance of existing corners must be approved by the COR and shall only be performed when requested through a delivery/task order. When maintenance is performed, the Contractor shall ensure that existing monuments are firmly and securely set in accordance with Section 54.207 of Act 74, Michigan PA of 1970. The Contractor shall also ensure that existing signs on posts and trees are securely attached and legible. Signs (if explicitly required in the Scope of Work) that are damaged or deteriorated shall be replaced. The Contractor shall establish new bearing trees or objects to replace dead, damaged, dying, or missing bearing trees or objects in accordance with Section 3137. Signs (if explicitly required in the Scope of Work) to be used are shown in Exhibit 4. Sign (if explicitly required in the Scope of Work) placement shall be in accordance with Exhibit 5.

3130.1

Brush and debris within a 3-foot radius of the corner shall be cleared away.

3130.2

The Contractor shall notify the COR of any damaged or missing monuments.

3135 CORNER MONUMENTATION AND ACCESSORIES

3136 Monumentation

All original GLO corners requiring monumentation under this contract shall be perpetuated or reestablished using a monument provided by the Government. Section subdivisional and other corners will be marked with a monument that meets State of Michigan requirements [5/8 inch (#5) by 30” length rebar with a 2 inch (minimum) aluminum cap monument] and will be supplied by the Contractor and monument type will be included in all drawing legends. If a conflicting monument is found at a C ¼ corner, then the C ¼ corner will be established using a monument provided by the government. An appropriate tool that can achieve relative accuracy standards shall be used to establish the position where each monument will be set.

Corner positions that fall in non-hard surface roadways shall be set 10-12” below the surface of the road. Corner positions that fall in hard surface roadways shall be contained within a visible protected enclosure and shall comply with any requirements of the agency having jurisdiction over the roadway, unless otherwise discussed with and approved by the COR. Per Act 132 of 1970 and Act 283 of 1909, the intersections of boundary lines with year round county maintained roads shall be monumented. If a road generally follows a section or ¼ line, then that shall be held for the centerline. The COR shall be contacted prior to monumenting a right-of-way other than 2 rods from a section or ¼ line. All corner positions reestablished/established shall meet the specifications in Section 3122.1.

3136.1 Monument Stamping

All original GLO and C ¼ corners monumented under this contract using a monument provided by the Government shall be stamped in accordance with the 2009 BLM Manual of Surveying Instructions (pages 109-120, limited examples shown in Exhibit 5). All section subdivisional corners monumented under this contract using a monument provided by the contractor shall be stamped in accordance with the 2009 BLM Manual of Instructions (pages 113-116). The Contractor should make examples of proper stamping readily available to field staff to avoid incorrect stamping. Monuments that are incorrectly stamped by the Contractor will be replaced with a properly stamped monument at the Contractor’s expense. In addition to the corner designation and year the monument was set, the surveyor’s license number shall be stamped near the lower perimeter of the cap. A 1/8” stamp set shall be used for all monument and sign (if explicitly required in the Scope of Work) stamping.

3136.2 Monument Reference Signing (if explicitly required in the Scope of Work)

Signs to be used are shown in Exhibit 4. Sign placement and attachment shall be in accordance with Exhibit 5. All signs will be provided by the Government. Each bearing tree requires a sign. All other accessories such as posts or poles require a sign. Posts or poles should only be used as accessories as a last resort.

Each corner monument set and/or accepted under this contract shall have a metal post with sign attached or fiberglass post with decal affixed, placed 1 to 3 feet from the monument *and* along the property line where the corner does not fall in a roadway, if one does not already exist. For corners that fall in a roadway and a line originating from the corner is being posted, then a post with the appropriate “Boundary” and “Land Survey Monument” sign/decal will be set along the line at the approximate road right-of-way limit, if one does not already exist. For corners that fall in a roadway and a line originating from the corner is *not*being posted, then a post with the appropriate “Land Survey Monument” sign/decal will be set at the approximate road right-of-way limit and facing the corner, if one does not already exist. For forest roads of unknown right-of-way width, posts shall be placed at an appropriate distance from the corner as to not sustain damage from road use and/or maintenance activities.

1. Bearing Trees and Accessories

All corners established, reestablished and/or maintained in this contract shall have a minimum of four accessories (not including the sign post) marked in accordance with Exhibit 5, unless otherwise directed by the COR. Bearing trees should *typically* be greater than 5 feet from the corner, outside of road right-of-ways, greater than 30° apart, and be selected based on their durability and general condition (refer to Exhibit 7 for excerpts from BLM training publication “Durability of Bearing Trees”). If historical bearing trees are found to not meet the above criteria, or are in poor condition, they should still be remeasured and included as an additional accessory to the corner. See Exhibit 4 for the blazing and painting of each bearing tree, and section 3147.3 for paint specifications.

Bearing to the center of the base of accessories shall be referenced to true North and have a tolerance of ≤4°. Note that metal objects, such as watches, pencil clips, spikes, hammers, etc. should not be in or near hands when obtaining bearings using a magnetic compass. To ensure an accurate compass reading the compass must be held level so the needle swings freely and independent readings should be taken at least twice. Accessories shall always be listed in clockwise order from North. Note that posts identifying the corner are not considered accessories for the purpose of reestablishing the corner position and should be listed last. Location of reference nails in accessories shall be reported as well as horizontal distances to the nearest 0.01 feet. Note that it typically requires two people to effectively tape an accurate *horizontal* distance, slope distance is not acceptable. Also, distances obtained by inversing between GNSS measurements generally will not meet relative accuracy standards.

Bearing tree tags (if explicitly required in the Scope of Work) should be stamped or engraved with the distance, and direction **from the reference to the corner**, township, range, section, corner ID, surveyor license number and date. (See Exhibit 3)

1. Recordation of Corner Certificates

For each GLO and section subdivisional corner position monumented or maintained under this contract, a corner certificate meeting the requirements of Act 74 shall be prepared. The certificates will document the entire survey history of the corner position, including method of any previous restoration and measurements made to adjacent controlling corners. The current condition of all previous accessories for the corner shall also be noted and all accessories in good condition shall be included in Part C. The NAD83 State Plane Coordinates (International Feet) for corners generated from OPUS fixed GPS base stations should be shown on the LCRC For clarity and consistency, the format for submitted LCRC’s shall be similar to that shown in Exhibit 10.

If conflicting monumentation is recovered at a corner position, this shall be documented on the LCRC. Rationale for accepting and rejecting positions when conflicting monumentation exists shall be presented in a *concise* but detailed and defendable manner. A detailed list of all collateral evidence supporting the decision for acceptance or rejection shall be included in Part B (see Exhibit 10 for example). In order to maintain clarity for the reader, it is imperative that the narrative be as concise as possible and focus on the evidence recovered, not necessarily on *how* it was recovered, although the extent of search area should be included.

Preliminary LCRC’s for all GLO corners requiring monumentation along with a preliminary control diagram shall be provided to the COR prior to the posting or monumentation of any designated project. The COR will be allowed 5 working days to review the submitted documentation. A maximum of 1 GLO or 2 section subdivisional corners shall be documented per form. Prior to recordation, the final certificate(s) will be submitted to the COR for review. Final LCRC’s and plats, stamped with the Register of Deeds recording information must be received by the COR before a final invoice is submitted. The cost of recording the LCRC’s should be included in the Certification work item if a plat is prepared, or in the monumentation item if a plat is not required.

3140 PROPERTY LINE MAINTENANCE AND REPOSTING (if explicitly required in the Scope of Work)

Maintenance and/or reposting of previously surveyed and marked property line may be requested to be performed through a delivery/task order.

3141 Property Line Maintenance (if explicitly required in the Scope of Work)

Maintenance shall consist of repainting existing line and corner posts, line and off line trees, and corner accessories. If functional posts are found along the property lines, then orange flagging shall be tied along the tops. If *corner* posts are found to be missing or in poor condition, they shall be replaced. Old blazes on trees should **not** be reopened, but only re-painted. Trees along the government side of the line that have reached a merchantable diameter since the survey was done should be blazed according to 3147.3 and exhibits.

A report shall be submitted noting the density of vegetation along the lines, the general condition of the line posts, and condition of each corner accessory, including current diameter and if tags are missing. If line posts are found to be missing or moved, specific information shall be provided regarding the location and number of posts. The report shall also include information regarding any encroachments or other unauthorized uses occurring along the lines being maintained. The report can consist of notations on survey documents of record or a more formal report format. If the prior survey documents of record include identified encroachments, the report shall include the status of those encroachments (ex. resolved, still exist, expanded).

3142 Property Line Reposting (if explicitly required in the Scope of Work)

If the condition of a previously marked line(s) is reported to be extremely over grown and/or no longer adequately posted, then reposting of the line may be requested through a delivery/task order. Reposting shall consist of clearing the property line, painting and reflagging of existing posts, placing additional posts and signs, and blazing and painting trees in accordance with Sections 3146 thru 3147.4.

3145 PROPERTY LINE LOCATION AND POSTING (if explicitly required in the Scope of Work)

The Contractor shall locate and post the property lines in accordance with the following specifications.

3146 Locating the Property Line (if explicitly required in the Scope of Work)

The position of property corners controlling the location of the property line shall be based on the deeded ownership of the State of Michigan and located by survey methods that ensure that they meet or exceed the accuracy requirements set forth in Section 3122. If a conflict is discovered between deeded ownership of the State of Michigan and 1 or more adjoiners, this shall be brought to the attention of the COR prior to any marking or posting. Documentation of conflicting title lines shall be included as part of the Report of Survey as specified in Section 3160.

3147 Posting the Property Line (if explicitly required in the Scope of Work)

Posting is the act of placing posts and signs along the property line so that it is readily identifiable. The posts and signs defining the property line shall have a positional error tolerance of ±0.5 feet in relation to the boundary line being posted. Some of the signs that are available are shown on Exhibit 4. All signs will be provided by the government. The **contractor shall provide** **a minimum** 6 foot long orange Carsonite post or 6 to 7 foot long 13 gauge (0.1046 inch) metal U-channel post (unless otherwise reviewed and approved by the COR) with 9 inch on center holes drilled to accept the “Property Boundary” and “Land Monument” signs which shall be attached through the holes with minimum 3/16 inch aluminum or stainless steel rivets, correctly sized nuts and bolts, or self-tapping screws. The posts shall be driven a minimum of 2 feet into the ground, and extend a minimum of 4 feet above ground. Temporary lath may be left in place between posts, however, all other temporary lath should be removed and reused as a cost control measure.

3147.1 Clearing Property Line (if explicitly required in the Scope of Work)

The property line will be cleared of small trees, brush, and debris to allow easy foot travel, unless the line is defined by a feature such as a hedge. In an effort to preserve necessary homes for various wildlife, please refrain from cutting standing dead trees when clearing Forest property lines unless they pose a safety hazard. Trees over 6 inches in diameter shall not be cut along property lines, unless otherwise discussed with and approved by the COR. All cutting debris shall be placed on the government side of the line. Trees should not be left leaning above ground onto other trees.

If a chainsaw is used for line clearing, the following personal protective equipment (PPE) is required for the operator: Approved hardhat (ANSI Z89.1-1997, Type1, Class E), eye protection, hearing protection (85 dB and above), appropriate gloves (cut-resistant for chain filing), long sleeved shirt, chainsaw chaps that meet the requirements of OSHA, heavy duty, cut resistant or leather 8” high laced boots with nonskid soles. A worker should not operate a chainsaw when working alone.

3147.2 Boundary Sign Placement (if explicitly required in the Scope of Work)

Posting the property line shall include placing metal or fiberglass line posts along the true property line located to the standard specified in Section 3147. A properly designed driver shall be used to install posts to a minimum depth of 24”. Orange flagging shall be tied to the top of each post to increase their visibility along the line.

Line posts shall be placed at ridge, stream, road, and trail crossings (see Exhibit 6). Where trails and roads are intersected, posts shall be placed 5-10 feet either side of the traveled roadway. Where county or state roads are intersected, posts shall be placed on each side at approximate right-of-way limits. Please be specific in describing the type of road or trail that crosses a property line. Examples are; year-round county maintained, county seasonal, numbered roads (#1234), access drive to private, user created road or ATV trail accessing NFS.

Posts shall be placed 75-125 feet from each corner controlling the location of the property line where the corner does not fall in a roadway. Where corners fall in a roadway, the first post shall be placed as directed above in section 3136.2, then the second post shall be placed 75-125 feet from the first. Additional posts shall be placed at not more than 250 foot intervals elsewhere along the line. Exact interval between posts will be dependent upon terrain. Posts shall be placed so as to be intervisible, if the trees and brush were removed.

3147.3 Blazing and Painting Property Line (if explicitly required in the Scope of Work)

Posting the property line shall include blazing all trees (over 4 in. dia.) on applicable lands within arm’s reach (±3’) of the property line with two blazes at chest height and 120˚ apart. Trees that fall on the line (line trees) shall be blazed on both sides of the tree with hack marks placed 2 inches above and below the blaze. (See Exhibit 6 for illustrations). If a situation is encountered where many closely spaced trees falls within arm’s reach of the property line, then trees may be blazed at ±30 foot intervals. The only acceptable tool for blazing is a sharp long handled axe. New blazes should be a minimum 2 inches wide by 6 inches long and through the wood cambium. Old blazes along the property line shall not be reopened, just repainted. Trees located on private lands will not be marked but may be repainted if previously blazed. See Exhibit 6 for blazing specifications.

Durable, long lasting, oil-based enamel paint, bright BLUE or RED in color (depending on project classification), but not florescent, specifically designed for forested boundary marking, shall be applied to all blazes, new and old, on trees used to mark the property line and bearing tree blazes and bands. Oil-based paint is to be applied in sufficient quantity to completely cover the entire surface of the blaze and ½” to 1 inch of the bark.All use of oil-based paint shall be in accordance with the manufacturer’s material safety data sheet.

3147.4 Visually Sensitive Areas

Visually sensitive areas near houses and public use areas should be posted in a less visible manner. The COR shall be contacted if the visually sensitive nature of an area is in question. Areas typically determined to be visually sensitive shall only be posted. Tree blazes and paint will typically be limited to areas outside of the visually sensitive areas.

3150 CERTIFICATE OF SURVEY

The Contractor shall prepare a Certificate of Survey of suitable Sheet Size and Scale to depict the finding of the Survey UNLESS the Survey is being prepared for the conveyance of property, in which case the Contractor shall prepare a recordable Act 132, Michigan PA of 1970 Certificate of Survey drawing similar to that shown in Exhibit 9 when included as part of the scope of work. The control diagram should not be included as part of the certificate. The certificate(s) shall show the relationship of recovered, reestablished and established corner positions used for the survey. This may also include corner positions measured under previous delivery/task orders. A description of all monuments recovered, reestablished and established along with their accessories shall be included on the certificate(s). Any monuments found near a corner position and rejected shall also be described and shown. Distance from monument to any line(s) of occupation shall be included in the description.

The applicable property boundary posted shall be shown with a heavier solid line. All overlaps, hiatus, lines of occupation and/or encroachments will be clearly shown on the drawing, whether created by deed calls, man-made features or monumentation.

All certificates of survey will display measured distance, as well as previous record data, in feet. Distance measurements shall be shown in reverse chronological order, with current measurement first and original measurement last. Projects performed using a state plane grid system shall display distances as grid in international feet. The certificate shall include a statement describing the distance units, mean project combined grid factor, and a conversion formula from grid to ground distance. All certificates shall also contain statements regarding the method of section subdivision and a concise narrative of any existing conflicting monumentation found and why it was not accepted. The certificate shall also include a data table listing the geodetic and grid coordinates (international feet), to at least 3 decimal places, for all GLO and section subdivisional corner positions recovered, reestablished and established.

The survey drawing shall be prepared using a CAD system and shall be of high quality and to professional standards. Drawings should be sharp, clean, distinct, and legible. Submission of the certificate is required in both hard copy and an AutoCAD compatible .dwg file. The AutoCAD file shall include all point data, including descriptors for each point, but need not include the Contractor’s drawing border.

All Contractor produced AutoCAD drawings shall become the property of the Government and the Government shall have the right to reuse these items in future projects as it sees fit without further compensation to the Contractor.

3151 Conflicts and Encroachments

Information regarding visible signs of encroachment, trespass, or lines of occupation shall be shown on the certificate of survey. The extent of all encroachments shall be detailed on the certificate. If a project does not require a certificate of survey, the extent of all encroachments shall be detailed on the control diagram. When reporting fences, please be specific as to the condition of the fence and whether it is being maintained.

3152 Filing or Recording of Certificates and LCRC Forms

The Contractor shall file or record the certificate of survey (if applicable) and the applicable LCRC forms in the appropriate jurisdiction in accordance with local and state statutes.

Prior to filing or recording, one hard copy, or electronic copy of the certificate and any land corner recordation forms shall be submitted to the COR for final review and acceptance. After acceptance and recordation, both a hard copy and electronic copy of the recorded document with county filing information shall be furnished to the Government.

3155 TOPOGRAPHIC MAP

When topographic surveying is requested, the size and scale of the drawing will be specified in the scope of work. The survey drawing shall be prepared using a CAD system and shall be of high quality and to professional standards. Drawings should be sharp, clean, distinct, and legible. Submission of the topographic map is required in both hard copy and an AutoCAD compatible .dwg file. The AutoCAD file shall include all point data, including descriptors for each point, but need not include the Contractor’s drawing border.

3160 SUMMARY OF SURVEY SUBMITTALS

The following is a summary of the items to be furnished to the Government during the course of executing a project. Items 3160.5 thru 3160.12 shall be submitted in a report format with cover page and table of contents:

3160.1 Records research acquired during course of project.

* 1. List of adjoining landowners with legal descriptions (if applicable and included in the scope of work).
  2. Electronic preliminary control diagram with points and narrative report describing basis for and survey decisions made.
  3. Preliminary LCRC’s for all GLO corners requiring monumentation (see Exhibit 10 for required format).
  4. Report of Survey narrative to include conflicts and encroachments, contact with adjacent landowners regarding conflicts, and quality control checks performed by the Contractor, and any other notes pertaining to meetings, field visits, and/or information pertinent to the performance of the work under the contract.
  5. Final Control Diagram and/or Topographic map with all points in both hard copy and AutoCAD compatible .dwg file.
  6. Certificate of Survey drawing (if required) in both hard copy and AutoCAD compatible .dwg file (see Exhibit 9 for example format, also include statements required under 3150).
  7. Final Land Corner Recordation Certificates (both hard and electronic copies) for all monumented and maintained corners (containing county filing information).
  8. Report of closure for all traverse loops and/or report of relative accuracies obtained by methods other than a closed loop.
  9. Copy of field notes and raw data files that include all error checks.
  10. Project coordinate listing including descriptors for each point in hard copy and a comma delimited text file.
  11. GNSS measurement report to include how state plane coordinates were established for the project and OPUS solution reports. Survey measurements performed using RTK GNSS techniques shall include a summary report showing all independent measurements observed for each point. The difference between multiple independent measurements shall be within acceptable tolerance according to state statutes and Michigan DNR standards.

PERFORMANCE OF SERVICES

(A) Quality Control:

The Contractor shall provide adequate internal controls and review procedures to eliminate conflicts, errors and omissions, and to insure the technical accuracy of all services and products. The Contractor should review their Quality Control Plan prior to commencing work on each project. All submittals shall be reviewed for contract compliance prior to delivery.

(B) Site Visits, Inspections, and Investigations:

The Contractor shall notify the Government of all project site visits, inspections, meetings, or conferences. The Contractor shall visit and inspect/investigate the identified project site(s) as necessary and as required during the preparation and accomplishment of the work.

(C) Meetings and Conferences:

Periodic meetings shall be held, whenever requested by the Government or the Contractor, to resolve questions and problems relating to the work required under each delivery/task order.

The Contractor shall be required to attend and participate in all conferences. These conferences may be located at the project site, Contractor’s Office, a Michigan DNR Office, or other locations.

(D) Coordination and Execution of the Work:

The Contractor shall furnish sufficient technical, supervisory, and administrative personnel to insure execution of the work in accordance with the schedule in the delivery/task order.

During the execution of the work, the Contractor shall keep in close liaison with the Government Project leader.

Work beyond the original scope of work shall be accomplished only at the direction of the Contracting Officer or designated representative.

1. Submission of Project Data:

The Contractor shall submit all documentation as required under Section 3160 for review by the Contracting Officer or designated representative by the negotiated delivery date as specified in the delivery/task order.

SELF INSPECTION AND QUALITY CONTROL PLAN

The Contractor shall prepare a proposed inspection and quality control plan and submit to the COR for review and discussion at the post award conference. The plan should include the steps the Contractor will take to ensure that all work performed meets the requirements of the contract. At a minimum, the plan shall address the following items:

1. The Contractor shall be responsible for performing self-inspection for quality control on all measurement, corner monumentation and line posting of Forest boundaries. This shall include:
   1. Utilizing proper tools and field techniques to achieve required positional accuracy of measurements and staking.
   2. Checking all bearings and distances to evidence and accessories.
   3. Proper stamping and setting of monuments.
   4. Proper marking and posting of lines and accessories.
2. The Contractor shall be responsible for performing quality control checks to ensure acceptable error of closure is met for all survey work performed. The results of these quality control checks shall be included in the Report of Survey narrative as required in Sections 3122.1 and 3160.
3. The Contractor shall be responsible for performing quality control checks on all survey documents prior to their submittal to the COR for review and acceptance. The Contractor’s Quality Control Plan shall include a project submission checklist.

DEFINITIONS:

The Definition of Work Items shown below establishes and defines the work that may be performed under this contract. Project locations and specific work items have not been determined at this time. Delivery/task orders, issued in accordance with the contract specifications, will be used to specify project locations and work items to be performed.

Payment for services performed under this contract will be based upon the Definition of Work Items and the unit prices.

Definition of Work Items:

1. Corner Search – To include all records search and field work (except line measurement) associated with corner evidence evaluation necessary to perpetuate or reestablish a historical corner position. The rate for this item will be directly related to the complexity of the corner history and/or recoverability of record evidence. Evaluation of this item can range from; an original GLO survey corner in an easily accessible area which has not been surveyed but may have been searched by other surveyors since the original survey, was referenced with nondurable species and has no associated calls, presenting a relatively simple scenario; to a situation where an original GLO survey corner in a remote area, does not appear to have been previously searched, was referenced with durable species, and has reliable calls in various directions, presenting a relatively complex scenario. Corner Search involving the identification of stump remains may only be performed during snow free periods when the ground is thawed. Corner Search may be referred to as ‘Corner Inspection” (Section 3148) when conducted at a corner location where there is no expectation of finding evidence of the original corner references such as when the government has search the corner on previous occasions. The evaluation of search criteria should be based on such elements as; accessibility, durability of species of original bearing trees, and the distance of the corner position from identifiable and stable calls; the results of this evaluation should be elaborated upon in the Technical Proposal. The field notes should include the original references and pertinent calls established by the original survey, findings of the corner search/inspection, and any other information deemed important by the contractor. Search for original evidence should begin in the subject sections, and move to the next closest search area to afford identification of the nearest evidence to the subject sections. (Note: Corners marked in GLO dependent resurveys marked with durable monuments are not included in this definition.) This item does not pertain to obtaining ties to monumentation established during post ±1970 surveys. Ties to these monuments are considered an incidental part of the survey and are required to be shown on the control diagram and certificate of survey. The search area should also be swept with a metal detector and checked for any subsequent survey evidence. This item may only be performed during snow free periods.
2. Corner Maintenance – To ensure that existing monuments are firmly and securely set in accordance with Section 54.207 of Act 74, Michigan PA of 1970 and that existing signs on posts and trees are securely attached and legible. Signs that are damaged or deteriorated shall be replaced. Also to replace dead, damaged, or destroyed bearing trees or objects with new references marked to BLM Manual and MDNR/ Forest Service standards so that the corner has 4 good accessories. Includes the documentation and filing of a Michigan Land Corner Recordation Certificate.
3. Corner Monumentation – To place a monument and establish accessories at each position recovered from evidence, reestablished and established when a substantial monument does not already exist. All corners monumented include the documentation and filing of a Michigan Land Corner Recordation Certificate (LCRC), except items in 3C below. Item 3A pertains to original GLO corner positions and C ¼ corners where a conflicting monument exists. Item 3B pertains to section subdivisional Center ¼ corner and 1/16 corners unless a conflicting monument of record exists at a C ¼ corner. If a conflict exists at a C ¼ corner, it may be monumented in accordance with item 3A. Item 3C pertains to section subdivisional corners less than 1/16 corners or other property corners. Specifications in section 3136 determine the type and source of monuments to be used. Access issues associated with this item should be mitigated in the evaluation of the Control Corner Measurement and Property Line Measurement items.
4. Property Line Measurement – The measuring of Government property lines on exterior or interior of sections. Payment will be based on the inverse distance between monumented and/or accepted corner positions along the applicable boundary to the nearest 1/100 of a mile. Measurement of the line can be performed by conventional traverse, GNSS, or a combination of the two methods. This pay item is to include locating of traverse routes, all line clearing, measurements, data collection, reduction, and reporting. Typically, this item will have the same length as the Property Line Posted item.
5. Control Corner Measurement – The number of corners which must be coordinated or “controlled” to perform the specific task order. Payment will be based upon each corner needed to control the project. This work item can vary in difficulty from; monuments set in a recent contract survey or County Remon project with easy access and/or open tree canopy, representing a relatively simple scenario; to GLO Resurvey monuments and/or monuments that haven’t been visited in many years, in heavily inaccessible areas, with thick tree canopy, representing a relatively difficult scenario. Measurement of the line can be performed by conventional traverse, GNSS, or a combination of the two methods. This pay item is to include locating of traverse routes, all line clearing, measurements, data collection, reduction, and reporting.
6. Property Line Posted – The length of the straight horizontal line between controlling and/or monumented corner positions posted as property line with posts and signs according to the specifications in Section 3147. Estimates will be based upon the property line distance derived from inverse, to the nearest 1/100 mile, between monumented and/or accepted corner positions. Typically, this item will have the same length as the Property Line Measurement item.
7. Property Line Maintenance - The length of the straight horizontal line between controlling corner positions previously surveyed and posted requested to be maintained in accordance with the specifications in Section 3141. Estimates will be based upon the property line distance derived from inverse, to the nearest 1/100 mile, between corner positions and shall include reporting. The line does not need to be re-surveyed if its location can be determined from remaining evidence, and posts can be placed with confidence inside the 0.5 foot tolerance called for in section 3147.
8. Property Line Reposted - The length of the straight horizontal line between controlling corner positions previously surveyed and posted requested to be reposted in accordance with the specifications in Section 3142. Estimates will be based upon the property line distance derived from inverse, to the nearest 1/100 mile, between corner positions and shall include reporting.
9. Certificate of Survey – A multi-page drawing, meeting the specifications as defined in Section 3150. Item 9A, pertains to a drawing showing the retracement and subdivision of a single section within a township. This shall include ties to all controlling corners used to reestablish GLO corner positions. Item 9B pertains to each drawing showing the retracement and subdivision of each additional section of a multi-section project within a township. This item shall not be payable until the COR has approved the Certificate of Survey.
10. Topographic Survey – A survey that determines ground relief and location of natural and man-made objects and delineates those features on a drawing. Payment will be based on the number of hours required to complete the combination of field and drafting work.
11. Monument Box Installation – Provide a monument box with lid that has approximate opening size of 6 ½” and height of 10”. Provide labor and other tools and materials necessary to install the monument box in accordance with county road agency standards.