

# LEGAL CERTIFICATION OF DIGITAL DATA: THE EARTH RESOURCES OBSERVATION AND SCIENCE DATA CENTER PROJECT

*Ronald J. Rychlak\**  
*Joanne Irene Gabrynowicz\*\**  
*Rick Crowsey\*\*\**

*“Most certification today is pure ‘credentialism.’ It must begin to reflect our demand for excellence, not our appreciation of parchment.”*

William J. Bennett, US Secretary of Education, Sept. 3, 1986<sup>1</sup>

## I. INTRODUCTION

Remote sensing is the process of gaining information about an object or phenomenon while at some distance and without any direct contact with it.<sup>2</sup> This information is typically transferred through electromagnetic energy or light. Imagery gathered in this manner can convey complex facts in clear and concise pictures.

Like photographs, films, and videotapes, remote sensing images can help judges and jurors understand aspects of a case

---

\* MDLA Professor of Law and Associate Dean for Academic Affairs at the University of Mississippi School of Law; Adjunct Professor in the Ole Miss Graduate Engineering Program.

\*\* Professor of Remote Sensing and Space Law at the University of Mississippi School of Law; Director of the National Center for Remote Sensing, Air, and Space Law Center; Editor-in-Chief of the JOURNAL OF SPACE LAW.

\*\*\* Spatial information expert (including litigation support, complex decision support and risk evaluation and assessment), systems/operations research consultant and president of Crowsey Incorporated.

The authors would like to thank Ms. Ashley Johnson, student research assistant, for her contribution to this article.

<sup>1</sup> JAMES B. SIMPSON, SIMPSON'S CONTEMPORARY QUOTATIONS (Houghton Mifflin Company, 1988), <http://www.bartleby.com/63/99/2499.html>.

<sup>2</sup> See ROBERT K. HOLZ, THE SURVEILLANT SCIENCE: REMOTE SENSING OF THE ENVIRONMENT 2 (1985); Sharon Hatch Hodge, *Satellite Data and Environmental Law: Technology Ripe for Litigation Application*, 14 PACE ENVTL. L. REV. 691 (1997).

that could not be brought into the courtroom. Once it is properly authenticated, this type of exhibit is usually admissible if it is helpful to the trier of fact's understanding of the issues. Imagery from satellites, for instance, can assist a judge and jury understand the issues in a case, and it can help maintain interest in otherwise tedious explanations of the complex information.<sup>3</sup>

The Department of Interior's United States Geological Survey at the Earth Resources Observation and Science Data Center (USGS/EROS) uses data collected from remote sensing satellites and other sources in order to provide customers with valuable information regarding Earth's changing land surfaces. USGS/EROS maintains, archives, and manages spatial images received from satellite signals sent directly to EROS or transmitted through ground collection locations. The archive includes aerial photographs taken as early as 1937 and continuing until the 1960s when satellites began producing images of every section of the Earth's surface.

By its charter and mission, USGS/EROS is responsible for providing an objective, accurate, and fair reproduction of the original source images and/or data to its customers. USGS EROS' charter reads in part:

EROS will expand and enhance the use of remote sensing as a tool for Earth and biological sciences, ensuring that monitoring efforts enable integrated science at regional and national scales. ... The EROS Data Center is a national data reception, processing, archiving, distribution, and research facility for remotely sensed data and other forms of geographic information.

It holds the world's largest collection of civilian remotely sensed data covering the Earth's land surface, archiving millions of satellite images and aerial photographs. This archive, co-located with its attendant engineering and scientific exper-

---

<sup>3</sup> See Marc Steinberg, *A Picture Can Be Worth a Lot More Than a Thousand Words*, 214 N.Y.L.J. 10 (1995), 6 (Special Pullout Section), at col. 1 [hereinafter Steinberg]. "The greatest challenge facing trial attorneys today is the task of explaining complex legal issues to the lay jury or non-expert judge." See generally, RONALD J. RYCHLAK, REAL AND DEMONSTRATIVE EVIDENCE: APPLICATIONS AND THEORY (LexisNexis 2<sup>nd</sup> ed., 2003).

tise, provides a unique capability for developing and promoting science applications of remotely sensed data to identify, monitor, and understand changes on the landscape and across the interface between nature and society. ... The Land Processes Distributed Active Archive Center (LP DAC), located at EROS, distributed 1.2 million products (94 terabytes of ASTER and MODIS data to all users in the first quarter of 2005. ... 2.7 million products and 232 terabytes of data during all of FY 2004, approximately 22 percent of the data went to NASA data processing users, 7 percent of the data went to NASA science users, and 1.5 percent went to USGS science users. The remainder of the data was distributed to a wide spectrum of users – for education, global climate change research, land management, disaster response, and many other purposes – across the country and the world.<sup>4</sup>

In the past, USGS/EROS certified photographic prints for litigation and other purposes. With advances in technology, there is an increasing demand for USGS/EROS to supply customers with certified digital data instead of prints. In order to make this shift, USGS/EROS and the National Center for Remote Sensing, Air, and Space Law at the University of Mississippi (NCRSASL) undertook a study to determine whether exhibits prepared from digital data, if proper procedures were followed, could be certified so that they would be admitted into evidence during legal proceedings.

Following the study, USGS/EROS and NCRSASL developed a new certification process that will provide the same assurances of reliability with digital data that the old certification process did for photographic prints. The new certification process will consist of transferring downloaded, digital images to the EROS archive, where they will be stored in computer databases. When a customer request for an image is received, USGS/EROS will assign a unique number to that order. This order number will be printed on any CD, DVD, or similar item provided to the customer. It will also be embedded in the digital data requested, and retained in USGS/EROS files. If the data is then used to produce exhibits, opposing counsel or the court will be

---

<sup>4</sup> USGS/EROS Charter, 2004 (on file with author).

able to use that order number to verify the validity of the exhibit. As such, properly prepared exhibits should be admissible in court for evidentiary purposes.

## II. EVIDENTIARY FOUNDATIONS

In order to have a real or demonstrative exhibit admitted into evidence, the proponent must lay a foundation for admission. In other words, before the court will receive an exhibit into evidence, it must be persuaded that the exhibit is fair and will help resolve a material issue in the case. The court must also conduct a balancing test, comparing the probative value of the exhibit to its potential to mislead or confuse the finder of fact.<sup>5</sup> Once an exhibit has been admitted into evidence, any other witness may use it without further testimony as to its foundation.

### A. *Photographic Evidence*

Generally, photographic evidence is admissible when it would have been appropriate for the trier of fact to view or examine the subject of the pictures at the time they were taken or when the photos would help the trier of fact better understand an issue in the case. When photographic evidence is relevant, but other considerations argue against its admission, the ruling rests initially with the judge.<sup>6</sup> These matters are normally left to

---

<sup>5</sup> Hearsay and best evidence concerns are not part of the traditional foundation; objections as to these matters go to the trustworthiness of the evidence. As such, they should be dealt with before substantive questions concerning the exhibit are asked. There are four general factors that must be met in order to have tangible exhibits admitted into evidence. They are:

- 1) The competency of the witness to present testimony as to the item;
- 2) The relevance of the item to a material issue in the case;
- 3) A showing of identification or authentication that the item really is what it purports to be; and
- 4) A showing that the exhibit has sufficient trustworthiness to be used by the finder of fact.

<sup>6</sup> *United States v. Englebrecht*, 917 F.2d 376 (8<sup>th</sup> Cir. 1990), *cert. denied*, 499 U.S. 912 (1991).

the trial court's sound discretion,<sup>7</sup> and the court's ruling will not be reversed absent an abuse of discretion.<sup>8</sup>

The Federal Rules of Evidence define relevant evidence as "evidence having any tendency to make the existence of any fact that is of consequence to the determination of the action more probable or less probable than it would be without the evidence."<sup>9</sup> In addition, some courts require a witness to "identify" the photograph by stating what the photograph shows.<sup>10</sup> The usual course is for a witness on the stand to identify the photograph as a correct representation of events which he saw or of a scene with which he is familiar. In fact he adopts the picture as his testimony, or, in common parlance, uses the picture to illustrate his testimony.<sup>11</sup> The most important thing, when laying the foundation for photographic evidence, is to establish that the photograph fairly and accurately represents its subject.<sup>12</sup>

### B. Scientific Evidence

Prior to 1993, evidence based upon novel scientific or technical processes was admissible only if it had been "sufficiently established to have gained general acceptance in the particular field in which it belongs."<sup>13</sup> This required the proponent to show

---

<sup>7</sup> *Id.* (photograph of defendant posing by marijuana plant); *United States v. Harris*, 534 F.2d 207 (10<sup>th</sup> Cir. 1975) (photographs seized in raid on house of prostitution), *cert. denied*, 429 U.S. 941 (1976).

<sup>8</sup> *Young v. Illinois Central Gulf Railroad Co.*, 618 F.2d 332, 338 (5<sup>th</sup> Cir. 1980) (photos illustrating the warning given by railroad crossings were improperly excluded from evidence); *United States v. Blackwell*, 694 F.2d 1325 (D.C. Cir. 1982) (photographs of defendant holding a gun properly admitted).

<sup>9</sup> FED. R. EVID. 401.

<sup>10</sup> *See Lucero v. Stewart*, 892 F.2d 52 (9<sup>th</sup> Cir. 1989); *Tokar v. Crestwood Imports, Inc.*, 532 N.E.2d 382 (Ill. App. 1988); *McKee v. State*, 253 Ala. 235, 44 So. 2d 781 (1949).

<sup>11</sup> FED. R. EVID. 1002 advisory committee's note.

<sup>12</sup> *See Skaggs v. Davis*, 424 N.E. 2d 137 (Ind. App. 1981) (photograph of car properly admitted based on testimony that it accurately represented the car on the day of the accident, despite earlier contrary testimony); *Dillon v. State*, 422 N.E.2d 1188 (1981) (photographs showing victim's facial bruises admitted based on husband's testimony that they accurately depicted her appearance after the attack). *Cf. People v. Donaldson*, 181 N.E.2d 131 (Ill. 1962) (inadequate foundation where witness could not testify as to the subject's appearance at the time photograph was taken); *Hayes v. State*, 634 S.W.2d 359 (Tex. Crim. App. 1982) (photograph inadmissible where witness could not state with certainty that it accurately depicted the intersection in question).

<sup>13</sup> *Frye v. United States*, 293 F. 1013 (D.C. Cir. 1923).

that the relevant theory, technique, or instrumentality was generally accepted within the relevant scientific communities. The three foundational requirements were 1) that it be accepted as dependable by members of the profession involved, 2) that the specific instrumentality being used was in good working condition, and 3) that the person who did the work was qualified to do so. This standard was generally referred to as the *Frye* standard, and is still used in some states.<sup>14</sup>

In 1993, the Supreme Court handed down the decision of *Daubert v. Merrell Dow Pharmaceuticals, Inc.*, in which the Court concluded that the *Frye* standard is “absent from and incompatible with the Federal Rules of Evidence....”<sup>15</sup> According to the Supreme Court, Rule 702 does not incorporate the “general acceptance” test of *Frye*.

Nothing in the text of this Rule [702] establishes “general acceptance” as an absolute prerequisite to admissibility. Nor does respondent present any clear indication that Rule 702 or the Rules as a whole were intended to incorporate a “general acceptance” standard. The drafting history makes no mention of *Frye*, and a rigid “general acceptance” requirement would be at odds with the “liberal thrust” of the Federal Rules and their “general approach of relaxing the traditional barriers to opinion testimony.”<sup>16</sup>

In summary, with respect to “scientific evidence,” the trial court must make a preliminary assessment of whether the reasoning or methodology underlying the testimony is scientifically reliable and whether that reasoning or methodology can properly be applied to the facts in issue.

Under the new standard, the trial court must undertake a twofold inquiry. The first prong requires that the evidence must assist the trier of fact. According to the court, this condition goes primarily to relevance. “Expert testimony which does not relate to any issue in the case is not relevant and, ergo, non-helpful.”<sup>17</sup>

---

<sup>14</sup> *Id.* at 1014.

<sup>15</sup> *Daubert v. Merrell Dow Pharmaceuticals, Inc.*, 507 U.S. 579, 589 (1993).

<sup>16</sup> *Id.* at 588.

<sup>17</sup> *Id.* at 590-592 (quoting 3 WEINSTEIN & BERGER ¶ 702[02], pp. 702-18).

Evidence must also be relevant and material, and it must not create a risk of confusion on the part of the finder of fact. *Daubert* requires the court to determine whether the evidence should be excluded for some evidentiary reason not related to the issue of new science.

The second prong requires the evidence to amount to “scientific knowledge.” In order to constitute “scientific knowledge,” the evidence must be derived by the scientific method, meaning the evidence must be supported by appropriate scientific validation.

The primary locus of this obligation is Rule 702, which clearly contemplates some degree of regulation of the subjects and theories about which an expert may testify. If scientific, technical, or other specialized knowledge will assist the trier of fact to understand the evidence, or to determine a fact in issue “an expert” may testify thereto. The subject of an expert’s testimony must be “scientific... knowledge.” The adjective “scientific” implies a grounding in the methods and procedures of science. Similarly, the word “knowledge” connotes more than subjective belief or unsupported speculation. The term “applies to any body of known facts or to any body of ideas inferred from such facts or accepted as truths on good grounds.”<sup>18</sup>

The main thrust is no longer to establish that the proposition is generally accepted in the expert’s field. Instead, “the focus... must be solely on principles and methodology, not on the conclusions that they generate.”<sup>19</sup>

Although the case law on digital photographic evidence is sparse, it does not appear that courts allowing these exhibits into evidence are subjecting them to either the *Daubert* or *Frye* test.<sup>20</sup> This is probably because digital data has been sufficiently accepted so as to obviate the need for testimony on these matters. If, however, a court were to subject digital images to either *Daubert* or *Frye*, litigants should be able to meet either

---

<sup>18</sup> *Id.* at 589, 590.

<sup>19</sup> *Id.* at 595.

<sup>20</sup> Brian Barakat & Bronwyn Miller, *Authentication of Digital Photographs under the “Pictorial Testimony” Theory*, FLA.L.B.J. 38 (July/Aug. 2004)

burden. Satellite imagery and digital data are both sufficiently well established to meet those tests.

### *C. Judicial Notice*

When a new scientific process is first used to prepare an exhibit in court, the proponent must satisfy the relevant standard to show that the science underlying the exhibit is valid. Thus, when photographs were first offered into evidence, the proponent had to explain the workings of a camera and prove that they rendered reliable images. After courts have seen these new exhibits and accepted them into evidence several times, the proponent will no longer be required to prove the science behind the process; the court will take judicial notice of it. Continuing our example, at some point in time, proponents no longer had to explain how the camera worked; that part of the process was accepted by the court.

Federal Rule of Evidence 102(b) allows a judge to take judicial notice of an adjudicative fact when it is “not subject to reasonable dispute in that it is either (1) generally known within the territorial jurisdiction of the trial court or (2) capable of accurate and ready determination by resort to sources whose accuracy cannot reasonably be questioned.”<sup>21</sup> Courts have taken judicial notice of the process used to capture and produce traditional photographs. It is safe to assume that digital photographs will eventually reach the same status as traditional photographs, if they have not already done so. As more digital photographs are admitted as exhibits into court proceedings, courts will begin to take judicial notice without inquiring into the process used to capture, store, and produce digital images.<sup>22</sup>

## III. SATELLITE-BASED EXHIBITS

Satellite data can often provide the only visual evidence that captures an event. Nevertheless, more than thirty years since the first release of satellite data for non-military uses has

---

<sup>21</sup> FED. R. EVID. 102(b).

<sup>22</sup> It should be noted that judicial notice does not preclude a court from determining whether an image is relevant and the proponent has laid the proper foundation.

passed, the technology remains greatly under-utilized by the legal community. The prospect for future use of this technology in the courtroom, however, seems to be increasingly promising.

The advent of Google Maps, including satellite imagery, and similar services making satellite imagery-based consumer products commonplace, is accelerating the attention paid by attorneys and the court, and they are beginning to use spatial information more and more often. Cases known by the authors to have used satellite imagery and related spatial information (aerial photographs, geographic information systems and global positioning system data) include: automobile accidents, automobile and train accidents, environmental disputes, toxic torts, environmental justice, petroleum refinery class actions, chemical plant class actions, Katrina-related damage claims, and many others.

One example of the power and importance of spatial information, and credibility and veracity of our nation's spatial information archive, is its use by parties on both sides of disputes arising out of the aftermath of Hurricane Katrina.

One Mississippi Gulf Coast resident appeared to be the only person in Mississippi who had secured payment from his insurer for wind damage from hurricane Katrina in the first few months following Hurricane Katrina.. His residence in Bay Saint Louis, Mississippi is a total loss, with only debris remaining on the property.

When homeowner "Jones" (a pseudonym) met his insurer's damage assessment team, he was told that he would probably receive a payout on his Federal Flood Insurance policy and his Mississippi Wind Pool insurance policies, but because the damage was caused primarily by surge and flooding, he would not be receive any payment from his homeowner's policy. Mr. Jones produced and shared with the adjustment team aerial and satellite imagery along with National Weather Service exhibits. It was clear from these exhibits that his home experienced several hours of winds in excess of 100 mph, which caused significant, if not total loss damage well before the floodwaters and storm surge came ashore at his location. Upon close examination of Mr. Jones' spatial information, the assessment team decided to pay the full value of his policy. Other home owners are using

similar spatial information to understand what caused the destruction of their homes and as evidence for legal decision-makers who are charged with deciding many of these cases.

Similar to Mr. Jones' case, an internationally recognized plaintiff's lawyer recently has repeatedly used spatial information at trial and in settlement negotiations to successfully gain fair treatment for thousands of homeowners along the Gulf Coast (e.g., *Leonard v. Nationwide Civil Action*, No.1:05CV475 LTS-RHW (Miss. 2006)).

Another example of the value Earth imaging provides to legal decision-makers involved a dump truck driver who was struck by a freight train while proceeding across an un-gated railroad crossing. One of the key pieces of evidence in the trial was a series of aerial photographs and satellite images, some obtained from USGS/EROS Data Center. The time series analysis covered the period from 1938 through 2005, and was used to objectively understand and communicate how the railroad company maintained their right of way. This was important because the plaintiff alleged he didn't see the train due to heavy vegetation on railroad right of way. Analysis of the imagery revealed that the railroad company appeared to consistently keep its right of way trimmed and that there was some vegetation on private property that could have obscured the driver's line of sight. Based in part on the spatial evidence, the jury found for the defendant. After the case was decided by the jury, discussions with attorneys and jurors revealed that the aerial photographs and satellite imagery offered into evidence was very helpful in their understanding of the issues from an objective perspective. It seems that in some cases, not only is a picture worth a thousand words, but it may be the most revealing and understandable evidence offered in a complex case.

#### *A. Security Concerns*

The admissibility of domestic satellite evidence that might otherwise be considered confidential was addressed in the landmark case of *Dow Chemical Company v. United States*.<sup>23</sup> In

---

<sup>23</sup> *Dow Chemical Company v. United States*, 476 U.S. 227 (1986).

that case, Dow objected on privacy grounds to the use of aerial photography that provided excellent, detailed images of a large industrial complex. The trial court found remote sensing more invasive than the human eye and concluded that information that could be derived from the data violated Dow's expectation of privacy.<sup>24</sup> The Supreme Court, however, held that "the mere fact that human vision is enhanced somewhat... does not give rise to constitutional problems."<sup>25</sup> The aerial search of a large industrial complex for investigatory purposes did not violate Dow's protection against warrantless searches or expectation of privacy.<sup>26</sup>

At the international level, satellite imagery has been used by the International Court of Justice in boundary dispute cases and arbitrations. "[T]he use of satellite data as evidence before national and international courts has been characterized as a "matter of concern in the legal world, particularly in certain instances in court proceedings...the use of satellite data in international litigation will become a matter of routine in a not dis-

---

<sup>24</sup> *Id.* at 227. The attorney for the defendant, Jane M. Gootee, presented her perspective and provided suggestions when using remote sensing in environmental enforcement, defense, and litigation. See Jane M. Gootee, *Aerial Searches: A Defendant's Perspective -Dow Chemical v. United States*, in *Earth Observation Systems: Legal Considerations for the '90s*, 42 (American Society for Photogrammetry and Remote Sensing and American Bar Association, 1990).

<sup>25</sup> *Dow Chemical*, 476 U.S. at 238. The court noted, however, that privacy expectations for the private residence are higher because the private residence is the place of "intimate activities associated with family privacy," and the expectation of such privacy is not reasonably or legitimately extended to an industrial complex. See *id.* at 228.

<sup>26</sup> In *State of Washington v. Jackson*, 46 P.3d 257 (Wash. Ct. App. 2002), the defendant was convicted of first-degree murder, and he appealed. The Court of Appeals held, in part, that:

in a matter of first impression, police installation of Global Positioning System (GPS) tracking device on defendant's vehicles did not offend either Fourth Amendment or state constitutional provision protecting a person's home and private affairs from warrantless searches; (4) seeking grant of judicial permission in form of search warrant to install GPS tracking devices on defendant's vehicles was appropriate."

Defendant's privacy interests were insufficient to require warrants, given that monitoring of his public travels in his truck by use of GPS device was merely sense augmenting, revealing open view information of what might easily have been seen from lawful vantage point without such aids.

tant future [therefore] some kind of basic rules ought to be developed to smoothen the transition to the new technology."<sup>27</sup>

### B. Foundations and Objections

In general, the reliability of evidence derived from a scientific theory or principle depends on three factors: 1) the validity of the underlying theory, 2) the validity of the technique applying that theory, and 3) the proper application of the technique on a particular occasion.<sup>28</sup> This includes insuring the proper working order of instrumentation, following proper procedures, and employing properly qualified persons using the technique and interpreting the results.

Courts are already familiar with aerial photographs. Like other photographs, they are admitted if they are relevant, accurate, and a proper foundation is laid.<sup>29</sup> Satellite images are similar. They can assist a jury in understanding the issues, and can help maintain interest in explanations of complex information.<sup>30</sup> In addition, these pictures are often the only evidence that fully captures an event.<sup>31</sup> In order to use satellite data, the proponent must qualify his expert witnesses,<sup>32</sup> authenticate and prove the

---

<sup>27</sup> Maureen Williams, *Space Law and Remote Sensing Activities Discussion Paper*, U.N./Brazil Workshop Disseminating and Developing International and National Space Law: the Latin American & Caribbean Perspective at 295 (2004), available at [http://www.unoosa.org/pdf/publications/st\\_space\\_28E.pdf](http://www.unoosa.org/pdf/publications/st_space_28E.pdf).

<sup>28</sup> PAUL C. GIANNELLI & EDWARD J. IMWINKELRIED, 1 SCIENTIFIC EVIDENCE 1-2 (1993).

<sup>29</sup> *Hubert v. City of Marietta*, 224 Ga. 706, 164 S.E.2d 832, 834 (1968) (foundation laid when knowledgeable witness testified that aerial photograph was accurate).

<sup>30</sup> See Steinberg, *supra* note 3, at 10 ("The greatest challenge facing trial attorneys today is the task of explaining complex legal issues to the lay jury or non-expert judge.").

<sup>31</sup> See, e.g., *NutraSweet Co. v. X-L Engineering Co.*, 227 F.3d 776 (7<sup>th</sup> Cir. 2000) (plaintiffs used aerial photographs to establish the dumping sequence in which Volatile Organic Compounds were dumped on X-L's land and then migrated through the groundwater onto NutraSweet's land); *St. Martin v. Mobil Exploration & Producing U.S. Inc.*, 224 F.3d 402 (5<sup>th</sup> Cir. 2000) (plaintiffs introduced aerial photographs to show open ponds produced by the oil companies that were eroding their marsh, presenting a series of photographs that showed the progression of the deterioration of the marsh); *In re Vernon Sand & Gravel, Inc.*, 93 B.R. 580 (Bkrcty. N.D. Ohio 1988) (aerial photographs were found to be determinative on the question of a discrepancy as to the acreage of land involved).

<sup>32</sup> The proponent will need to consider witnesses who can (a) testify about the accuracy and reliability of the technology, the equipment, the processing techniques; (b) certify the data supplier's possession and transfer of custody of the images prior to trial;

contents of the data, and establish that proper and accepted digital imagery processing techniques were used. The need for the latter two steps arises particularly because digital satellite imagery can easily be manipulated. In fact, satellite data are almost always manipulated.<sup>33</sup> Therefore, it is essential to establish the authenticity of the data and trace its chain of custody so as to demonstrate to the court that it has not been inappropriately manipulated or altered.

Federal Rule of Evidence 901(B)(9) allows “evidence describing a process or system used to produce a result and showing that the process or system produces an accurate result.” This may be established by testimony that the satellite data collection company and the transporter properly handled the data and that the expert who processed and interpreted the data used an approved scientific method. The authenticating witness must be familiar with the field and office procedures that produced the exhibit and be able to explain why errors and mis-

---

and (c) reference similar more conventional data (aerial photographs, maps) and any other factors that would dispel the fear of possible manipulation of the images. Furthermore, the best expert witnesses would be able not only to authenticate the data but also to explain it in a manner that the average juror can understand. *See* RYCHLAK, supra note 3, at 477 (“Hiring an Expert”). *See also* St. Martin v. Mobil Exploration & Producing U.S. Inc., 224 F.3d 402 (5<sup>th</sup> Cir. 2000) (aerial photos, combined with testimony from an expert witness and testimony from others familiar with the land, led the court to conclude that defendants caused the degradation to the land.); United States v. Lopez-Lopez, 282 F.3d 1 (1<sup>st</sup> Cir. 2002) (customs Service agent could testify as expert in drug case to explain how drug importation schemes use Global Positioning System to facilitate air drops and boat-to-boat transfers); Johnson v. Hamrick, 155 F. Supp.2d 1355 (N.D. Ga. 2001) (black citizens brought action challenging city’s at-large system for electing city council; plaintiffs tendered an expert in GIS who used GIS software to create a proposed districting system). *But see* Velsicol Chemical Corp. v. State, Dept. of Environmental Protection, 442 A.2d 1051 (N.J. Super. Ct. App. Div. 1982) (court found that “maps and overlays which showed the incidence of mean high tide flow, based upon infrared aerial photographs, and which were based upon a report of natural color photography and of field observation was insufficient to sustain State’s burden of proof where no witnesses responsible for preparation of report testified to application therein of biological methodology, its gathering, collating and analysis of scientific data.”).

<sup>33</sup> In *State v. Wright*, 752 A.2d 1147 (Conn. App. 2000), the defendant was convicted of drug offenses and he appealed. The Appellate Court held that a computer-generated engineering map showing that defendant’s residence was 1125 feet from an elementary school was admissible. A GIS technician testified that he went to the actual locations depicted on the map to determine their locations, and that the coordination system that formed the basis of the map generation was checked by the state and by private engineering companies and that the map was a fair and accurate representation of the distance.

takes are unlikely to have crept into the system.<sup>34</sup> The data suppliers should be able to certify that proper, accepted digital imagery processing techniques were employed and that the satellite images were produced by the data processor in a routine way.<sup>35</sup> Other bases for admissibility of satellite data include the hearsay exceptions in Rules 803(6) and 803(8) for business or public records,<sup>36</sup> or the silent witness exception, which relates to devices that accurately record events when they occur.<sup>37</sup>

Satellite images can be presented in the form of charts, summaries, or calculations and allowed as evidence under Federal Rules of Evidence 1006.<sup>38</sup> The data may also be presented as an illustration of a witness's testimony.<sup>39</sup> If an enhanced im-

---

<sup>34</sup> See *Velsicol Chemical Corp. v. State, Dept. of Environmental Protection*, 442 A.2d 1051 (N.J. Super. Ct. App. Div. 1982) (court found that "maps and overlays which showed the incidence of mean high tide flow, based upon infra-red aerial photographs, and which were based upon a report of natural color photography and of field observation was insufficient to sustain State's burden of proof where no witnesses responsible for preparation of report to testified to application therein of biological methodology, its gathering, collating and analysis of scientific data.").

<sup>35</sup> FED. R. EVID. 406; See also Carole E. Powell, *Computer Generated Visual Evidence: Does Daubert Make a Difference?*, 12 GA. ST. U. L. REV. 577, 585 (1996).

<sup>36</sup> Gregory P. Joseph, *Computer Evidence*, 22 LITIG. 4 (Fall 1995); Andrew C. Wilson et al., *Tracking Spills and Releases: High-tech in the Courtroom*, 10 TUL. ENVTL. L.J. 371 (1997). The vast majority of computer-generated documents reaching the courtroom today do so under the business records exception. However, in regard to GIS data, other potential routes for admissibility are through an exception for public records maintained by a public agency, through other statutory exceptions, as demonstrative evidence to aid the trier of fact (i.e. jury) in understanding testimony, or for the limited purposes of showing the basis of an expert's opinion. Harlan J. Onsrud, *Evidence Generated from GIS*, available at [http://www.spatial.maine.edu/~onsrud/pubs/GIS\\_Evidence.html](http://www.spatial.maine.edu/~onsrud/pubs/GIS_Evidence.html). See also *United States v. Asarco Inc.*, 214 F.3d 1104 (9<sup>th</sup> Cir. 2000) (court found that a GIS database was part of the EPA's administrative record).

<sup>37</sup> See Mario Borelli, *The Computer as Advocate: An Approach to Computer Generated Displays in the Courtroom*, 71 IND. L.J. 439, 446 (1996); Andrew C. Wilson et al., *Tracking Spills and Releases: High-tech in the Courtroom*, 10 TUL. ENVTL. L.J. 371 (1997).

<sup>38</sup> FED. R. EVID. 1006 provides that "[t]he contents or voluminous writings, recordings, or photographs which cannot conveniently be examined in court may be presented in the form of a chart, summary, or calculation." See generally Hodge, *supra* note 2, at 718; Howard A. Latin et al., *Remote Sensing Evidence and Environmental Law*, 64 (6) CAL. L. REV., 1300, 1443 (Dec. 1976).

<sup>39</sup> See Latin, *supra* note 38, at 1441. The introduction of satellite imagery in conjunction with an expert's testimony may also counter an opponent's objection that any such evidence should be excluded as hearsay. Under Fed. R. Evid. 703, expert testimony may include hearsay if the basis of the testimony is reasonably relied upon by members of the expert's field. *United States v. Elkins*, 885 F.2d 775 (11<sup>th</sup> Cir. 1989), *cert. denied*,

age is submitted as independent evidence, the data must be authenticated according to Federal Rule of Evidence 901(b)(9).<sup>40</sup>

Under FRE 901(a), the chain of custody must be shown when the condition of the evidence is at issue, which can happen when the evidence is satellite data.<sup>41</sup> To establish the chain, the proponent must show: 1) the accuracy and reliability of the data, including all formulas, calculations, and assumptions used in defining and analyzing it, 2) the accuracy of the data as it was entered into the computer, 3) the reliability and capability of the computer hardware and software, 4) the process of software used for the computer graphics, and 5) the reliability of the final presentation. The data supplier can usually support links in the chain of custody with certification of the data,<sup>42</sup> and demonstrate that data security within the workplace was maintained at all times.

In addition, FRE 406, which relates to the routine practice of the person or organization, can be used to support the chain of custody.<sup>43</sup> Also, a chain of custody document can be developed which allows a supervisor to confirm the chain. The expert who processed the data may be in the best position to testify about the chain of custody of satellite data.<sup>44</sup>

If the exhibit is inadmissible due to failure to meet a hearsay exception or failure to meet authentication requirements, it

---

494 U.S. 1005 (1989). *Accord* Grimes v. Employers Mut. Liability Ins. Co., 73 F.R.D. 607, 611 (D.C. Alaska 1977).

<sup>40</sup> See FRE 901 (b)(9) requires that the party present proof that the process or system used produces an accurate result. The best evidence rule requires that an original writing, recording or photograph be used before a secondary source can be admitted, but this would not normally present a serious problem. See FED. R. EVID. 1002.

<sup>41</sup> The federal courts are split regarding chain of custody requirements under the FRE. See GIANNELLI, *supra* note 28, at 208.

<sup>42</sup> Hodge, *supra* note 2.

<sup>43</sup> FED. R. EVID. 406 (Routine Practice of Person or Organization). See GIANNELLI, *supra* 28, at 212.

<sup>44</sup> In *Velsicol Chemical Corp. v. State, Dept. of Environmental Protection*, 442 A.2d 1051 (N.J. Super. Ct. App. Div. 1982), the court found that maps and overlays showing the incidence of mean high tide flow, based upon infra-red aerial photographs and based upon a report of natural color photography and of field observation, were insufficient to sustain State's burden of proof where no witness responsible for preparation of report testified to application therein of biological methodology, its gathering, collating and analysis of scientific data.

may be possible to use it simply to illustrate the testimony of a witness.

### *C. Similar forms of Remote Sensing Evidence*

In general, the rules that apply to satellite digital data also apply to other evidence that is not visible to the naked eye, such as X-ray evidence. Unlike regular photographs, exhibits prepared with remote sensing data, whether satellite data or X-rays, show scenes that are not visible to the naked eye. This makes a big difference in what must be done to establish the foundation, because no witness is able to testify that the exhibit is a fair and accurate representation of a scene with which he or she is familiar.

In cases in which it is not possible to have a person testify that the exhibit accurately and fairly depicts a scene with which he or she is familiar, the foundation may be established with testimony regarding the process used to create the exhibit and internal identification procedures. This may include a sort of "chain" testimony, or a court's willingness to accept testimony related to the exhibit, despite relatively weak foundational support.<sup>45</sup>

Some courts have held that the silent witness theory, which treats remotely-sensed exhibits as self-authenticating, applies to common exhibits, like X-ray evidence. These courts essentially presume the reliability of the X-ray and identification procedures used by a hospital.

Modern day practice is such that the radiologist very likely does not see the patient, the treating doctor is not present when the X-rays are exposed or read, and he may well rely heavily upon the radiologist's report in diagnosing and treating his patient's condition. X-rays are made with proper identifying marks and the trained radiologist can determine from the film itself as to whether the exposure is proper and the film diagnostic. When

---

<sup>45</sup> See *People v. Beasley*, 109 Ill. App. 3d 446, 440 N.E.2d 961 (1982) (photographic enlargements of fingerprints admitted without testimony establishing an accurate representation when a latent-print examiner testified that he had prepared the enlargements and identified them as defendant's prints).

these safeguards are accepted in the hospital, we see no reason why they should not be similarly accepted in court.<sup>46</sup>

Other courts have allowed testimony by physicians to establish authenticity, even though they were not present at the taking of the X-rays.<sup>47</sup>

The second part of the foundation for remotely-sensed exhibits is proving that the exhibit accurately reflects the scene it purports to depict. When it comes to X-rays, this can be accomplished by having the expert testify as to what he or she saw through a microscope or fluoroscope, or by proving skill in technique, that the equipment was in good working order and was used properly, the manner in which the X-ray was taken, and by offering the expert's opinion of the validity of the X-ray based on his or her experience.<sup>48</sup>

---

<sup>46</sup> *Banks v. Bowman Dairy Co.*, 65 Ill. App. 2d 113, 116-17, 212 N.E.2d 4, 6 (1965). *See also Hoffman v. City of New York*, 535 N.Y.S.2d 342 (N.Y. Sup. 1988) (admissible as "business records"); *King v. Williams*, 279 S.E.2d 618 (S.C. 1981) (hospital chain of possession); *Texaco, Inc. v. Pursley*, 527 S.W.2d 236 (Tex. App. 1975) (hospital records of X-rays supported their admission).

<sup>47</sup> *See Texaco, Inc. v. Pursley*, 527 S.W.2d 236 (Tex. App. 1975); *Oxford v. Villines*, 232 Ark. 103, 334 S.W.2d 660 (1960); *Chailland v. Smiley*, 363 S.W.2d 619 (Mo. 1963) (en banc). *But see Woodruff v. Naik*, 351 S.E.2d 233 (Ga. App. 1986) (improper qualification of foundation witness). If the court requires strict authentication, the foundation can be difficult to establish. First, the proponent will have to establish that the X-ray is of the person, or the anatomical part, or the object lodged in the anatomy that it purports to be.

*See United States v. La Favor*, 72 F.2d 827 (9<sup>th</sup> Cir. 1934) (identification held insufficient); *T.C. Young Constr. Co. v. Brown*, 372 S.W.2d 670, 673 (Ky. 1963) (identification sufficient). This can usually be done with the testimony of a qualified expert such as a physician or X-ray technician. *See Chailland v. Smiley*, 363 S.W.2d 619 (Mo. 1963) (en banc). Another way of identifying the X-ray is with the procedure that the hospital uses to identify the X-ray, which is usually done by marking the X-ray with the person's name and the date when the X-ray is taken. In *United States v. Goslee*, 389 F. Supp. 490 (W.D. Pa. 1975), the court held that X-rays are to be routinely admitted into evidence, even though no one can actually verify that a specific X-ray is accurate, because the X-ray process as a whole is considered to be reliable and accurate. Labels on an X-ray, which identify it as the X-ray of a certain person could constitute hearsay if offered to prove whose X-ray it is, but they would likely come under the business records exception. Fed. R. Evid. 803(6). CAT scans, magnetic resonance images, and sonograms that are labeled by typing the identification into the computer that is used to process the images would be treated similarly. In such a case, an X-ray technician or attending physician can corroborate identification. *See Harth v. Nicholas Liakis & Son, Inc.*, 103 Misc. 2d 217, 425 N.Y.S.2d 523 (1980); *see* 5 A.L.R. 3d 327.

<sup>48</sup> In *Bayou Des Families Development Corporation v. U.S. Corps of Engineers*, 541 F. Supp. 1025 (E.D. La. 1982), the District Court held that Army Corps of Engineers did not abuse its discretion in denying developer's after-the-fact application for a permit to

In order to show that the equipment was dependable and in good working order, the proponent will have to prove that the particular machine in question works well, not just the X-ray process in general. This burden can usually be met by showing that the machine used was of standard quality.<sup>49</sup>

In addition, it may be necessary to prove that the operator was sufficiently qualified to operate the machine.<sup>50</sup> When it comes to X-rays, the operator may be a physician, but a medical degree is not necessary. X-rays are usually taken by or under the supervision of a radiologist, and he or she should be able to testify that the X-rays are accurate representations and should be admitted into evidence.<sup>51</sup>

There is also sort of a "changed circumstances" issue that must be resolved with remotely-sensed evidence. The proponent of the evidence must establish the similarity of the scene depicted in the exhibit and the scene at the time relevant to the trial. The fact that the image was captured weeks or months after the event in question does not necessarily affect its evidentiary value, as long as there is proof that the condition portrayed in the exhibit remained essentially unchanged from the time of the event to the time that the image was captured.<sup>52</sup>

#### IV. USGS

USGS/EROS maintains a comprehensive archive of the planet's land surface. It provides scientists, the U.S. government, and many other organizations invaluable information re-

---

construct a levee and pumping station to facilitate development. An expert used remote sensing to show indications of wetland hydrology. The court stated, "Dr. Huffman is trained in remote sensing techniques. His examination of aerial infra-red photographs of the area taken in 1978, 1974, and 1973, together with his on-site investigation, led him to the opinion that the entire area in question... is and has been continuously since at least 1970 a wetland."

<sup>49</sup> See *Lackenmeyer v. Glotfelty*, 284 Ill. App. 397, 2 N.E.2d 180, 185 (1936); *Eaker v. International Shoe Co.*, 154 S.E. 667 (N.C. 1930).

<sup>50</sup> See *Woodruff v. Naik*, 351 S.E.2d 233 (Ga. App. 1986) (lack of witness qualifications held harmless error); *Howell v. George*, 30 So. 2d 603 (Miss. 1947) (sufficient to show X-ray was made by regular operator at hospital).

<sup>51</sup> *Williams v. Atruda*, 58 A.2d 562 (R.I. 1948).

<sup>52</sup> See *Cooney v. Hughes*, 310 Ill. App. 371, 34 N.E.2d 566 (1941) (no error in admitting X-ray taken 17 months after injury).

lating to changes in the Earth's surface. This information can aid in understanding previous environments, reviewing existing conditions, preparing for potential disasters, and predicting potential outcomes. As such, it can be invaluable for litigation purposes.

#### *A. Digital Photographic Evidence*

The most fundamental difference between traditional and digital photographs is how they are captured and stored. Digital image data are stored in electronic pixels, which are digital values conveying position and specific value (usually color). Analog images are captured and stored in film negatives, which are analog values captured in physically tangible media.

As with traditional photographs, digital images are admissible in court if they are relevant to an issue, accurately portray the scene, and are established by a proper foundation.<sup>53</sup> It would normally be sufficient, as it is with traditional photographs, to present a witness's testimony that the photograph is a fair and accurate portrayal of the scene, regardless of how the image was captured.<sup>54</sup> As the Supreme Court of Georgia stated in *Almond v. State*: "we are aware of no authority, and appellant cites none, for the proposition that the procedure for admitting pictures should be any different when they were taken by a digital camera."<sup>55</sup> However, since a witness is almost never able to testify as to whether the digital data received by USGS/EROS is a fair and accurate portrayal of the scene, the foundation must be established using other methods. A proper foundation may include proving the authenticity of the image and its contents, showing that accepted processing techniques were used, or detailing a chain of custody.

#### *B. Previous and Current Procedures*

Beginning in the 1970s, USGS/EROS collected image data from satellites, stored the data collected in a secure location,

---

<sup>53</sup> RYCHLAK, *supra* note 3, at 505.

<sup>54</sup> *State v. Wilson*, 135 N.J. 4, 15, 637 A.2d 1237 (1994).

<sup>55</sup> *Almond v. State*, 274 Ga. 348, 553 S.E. 2d 803 (2001).

and provided customers with physical, photographic, print-out copies of the images. Upon request, USGS/EROS would provide a certified copy of an image. This was particularly helpful to litigants who wanted to use such images in court.

The certification process for photographic images involved: 1) providing a statement describing the copy or reproduction requested; 2) affixing the USGS seal to the reproduced data; and 3) supplying a signature that provided the source or authenticity of the data.<sup>56</sup> These steps assured the customer that he or she had received a true copy of the information contained in the USGS/EROS files. Certified copies of the images were routinely accepted into evidence during courtroom proceedings based on the process used by USGS/EROS to collect, store, and reproduce the data, even though there was almost never a witness available to testify that the exhibit was a “fair and accurate” depiction of the scene.

In recent years, customer demands for physical printouts have decreased, while production costs of generating physical printouts have increased. At the same time, several suppliers have discontinued providing the raw materials needed to produce the printouts and have converted to digital products. Due to these changes, USGS/EROS has made the decision to provide customers with digital data compiled on DVDs, CDs, or in other formats.

With digital data, it is no longer possible to certify that a photograph delivered to a customer is a true copy of an image stored in USGS/EROS archives. As such, USGS/EROS contacted the NCRSASL to develop a procedure that would permit data to be certified in a way that would satisfy the evidentiary of litigation. The new certification process, set forth below, does that. It provides the same level of assurance to the customer and to the court that the old process did. As a result, exhibits

---

<sup>56</sup> USGS/EROS certification is done in accordance with The Department of Interior Manual. See Department of Interior Departmental Manual, *Certification of Documents*, Part 310, Ch. 10 (2003), available at [http://elips.doi.gov/elips/DM\\_word/3562.doc](http://elips.doi.gov/elips/DM_word/3562.doc).

prepared from digital data provided by USGS/EROS should be fully admissible in court.<sup>57</sup>

Under the new process, USGS/EROS will download images in digital format from remote sensing satellites, and then transfer the data to the EROS archive in Sioux Falls, South Dakota where they will be stored in computer databases. When USGS/EROS receives a request for data, it will assign a unique product number to each order and provide the requested data to the customer in digital format. The product order number will be printed on the CD or DVD, imbedded in the digital data, and retained in USGS/EROS files.

This digital certification will verify that the data provided to the customer is the same data that is contained in the USGS/EROS archives. Once the digital data have left that USGS/EROS facility, they are subject to manipulation. In fact, there will almost always be a certain amount of manipulation, just so that the data can be converted into a usable format, such as a printout. It is also reasonable to assume that litigants will use magnification, colorization, and other process to make the exhibit clear to the finder of fact.

If a party has made a legitimate modification for clarity or visibility, that party should be able to provide the USGS/EROS product order number and other relevant information (such as changes made for purposes of clarity)<sup>58</sup> to the court or opposing party so that a fair evaluation can be made. With this new digital certification process, it should be easy to determine whether the image has been altered in an illegitimate way, rendering it inadmissible.

---

<sup>57</sup> It is important to realize the limited nature of the certification. The old process only certified that the photo given to the customer was a true copy of the photo (or film negative) held in the USGS/EROS archives. A photo conceivably might have been tainted before it was received by USGS/EROS, or it might have been modified after leaving USGS/EROS. The certification made such modification more difficult, but it did not completely eliminate the possibility. The digital certification process does the same, and in fact, provides more security for litigation processes.

<sup>58</sup> The data suppliers should be able to certify that proper, accepted digital imagery processing techniques were employed and that the satellite images were produced by the data processor in a routine way. FED. R. EVID. 406; *See also* Powell, *supra* note 35, at 585.

### *C. Evaluation*

Some specific evidentiary rules could have an impact on the admissibility of digital data that has been provided by – and even certified by – USGS/EROS, but none of them pose significant problems to the use of such data in court. Nor do they suggest that there are problems with the new certification process.

#### 1. Best Evidence Rule

The Federal Rules of Evidence 1002, generally referred to as the “best evidence rule,” requires the proponent, in order to prove the content of a writing, photograph, etc., to provide the original writing, photograph, etc.<sup>59</sup> It can be argued that a digital photograph will qualify as an original under Rule 1002 since an original includes the negative and any printout made from it,<sup>60</sup> and a print made from a digital photograph is essentially the same as one developed from a film camera. However, considering the possibility that a digital printout would not constitute an original under the Federal Rules of Evidence, Rule 1003 allows the admission of a duplicate unless “1) a genuine question is raised as to the authenticity of the original, or 2) in the circumstances it would be unfair to admit the duplicate in lieu of the original.”<sup>61</sup>

#### 2. Silent Witness Theory

A digital photograph can also be offered into evidence as substantive evidence under the “silent witness theory.” If this approach is used, the proponent will most likely be required to offer evidence of the process used to capture, store, and produce the image, and that the process produced an accurate result.<sup>62</sup> In

---

<sup>59</sup> FED. R. EVID. 1002.

<sup>60</sup> FED. R. EVID. 1001(3).

<sup>61</sup> FED. R. EVID. 1003. Another possibility of meeting the requirements of Rule 1002 would be to consider digital photographs as data, which, according to Rule 1001(3), would allow “any printout or other output readable by sight, shown to reflect the data accurately” to qualify as an original. FED. R. EVID. 1001(3). Therefore, litigants using USGS/EROS data should not encounter any problems in meeting the “best evidence rule” requirements when submitting their exhibits into evidence.

<sup>62</sup> FED. R. EVID. 901(b)(9).

addition, it may be necessary to establish a detailed chain of custody, which would include

- 1) proving the accuracy and reliability of the data
- 2) proving the accuracy of the data as it was entered into the computer
- 3) showing the reliability and capability of the computer hardware/software
- 4) illustrating the process used for the computer graphics
- 5) and proving the reliability of the final product

The USGS/EROS certification of digital data will make it much easier for proponents of exhibits prepared from digital data to meet these requirements.

### 3. Hearsay Exception

When demonstrative evidence is offered for the truth of the matter asserted, as opposed to illustrate or clarify other evidence, there is the possibility of a hearsay objection. The proponent of an exhibit prepared from USGS/EROS data should be able to overcome this objection by showing that the digital data are business records, and therefore not excluded by the hearsay rule. Federal Rule of Evidence 803(6) allows records of regularly conducted activity to be admitted into evidence regardless of the hearsay rule if the

- 1) record was made in the regular course of business
  - 2) record was made at or near the time of the act, condition, or event
  - 3) custodian of the record or other qualified witness testifies to the record's identity and mode of preparation, and
-

- 4) sources of information and method and time of preparation were such as to indicate the record's trustworthiness.<sup>63</sup>

Records kept in the ordinary course of business include any "memorandum, report, record, or data compilation."<sup>64</sup> These records are not kept for purposes of litigation, but are relied upon by government, business, and science professionals. As such, the data from USGS/EROS should easily survive a hearsay objection.

## V. CONCLUSION

Digital data can be captured and stored in such a way that they may be used to produce exhibits that are admissible into evidence at judicial proceedings. The new certification process at USGS/EROS will permit such use of digital data because the data, when they leave the USGS/EROS facility, have been adequately preserved when considering traditional, common law authentication factors. Moreover, because of the product number assigned to each order, it will be easy to uncover any illegitimate or unfair alteration. If digital data has been altered for a legitimate reason, such as visibility, the proponent should be able to explain the procedures and permit the opposing party to re-create the exhibit, relying upon the USGS/EROS order number and other legitimate post-production modifications. In such cases, the digital certification process will greatly facilitate admissibility.

In order to confirm that this new certification process will satisfy the needs of litigants, the authors of this paper contacted four judges: one state Supreme Court justice, one state Appellate Court judge, one federal Circuit Court judge, and one Federal District Court judge. All four of the judges had experience

---

<sup>63</sup> FED. R. EVID. 803(6).

<sup>64</sup> FED. R. EVID. 803(6). The court in *United States v. Sanders*, while ruling on a hearsay objection, concluded that "computer business records are admissible if 1) kept pursuant to a routine procedure designed to assure their accuracy, 2) created for motives that tend to assure accuracy, and 3) not themselves mere accumulation of hearsay." *United States v. Sanders*, 749 F.2d 195, 198 (1984).

at both the trial and appellate court levels. While judges do not usually give advisory opinions,<sup>65</sup> these four all agreed that, if the process were properly implemented, it should be possible to make admissible exhibits from the certified data provided by USGS/EROS.

The new certification process will require some minor changes in procedures at USGS/EROS, but the changes are not burdensome, and will almost certainly take less time to comply with than did the old photo certification process. Most importantly, exhibits prepared from USGS/EROS digital data, when properly handled by litigants and their attorneys, should be admissible in court for evidentiary purposes. This new certification process should be emulated by other agencies and organizations that handle digital data.

---

<sup>65</sup> The letter soliciting judicial input explained: "Essentially, we are asking you to look at this plan and determine whether you agree that, if proper procedures are followed, it will result in admissible exhibits. This is strictly an internal USGS matter, and your thoughts will not be disseminated to the public, used in court, or otherwise considered as a judicial ruling."

