Designation: D 5518 – 94ε1

Standard Guide for Acquisition of File Aerial Photography and Imagery for Establishing Historic Site-Use and Surficial Conditions[1]

This standard is issued under the fixed designation D 5518; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

ε[1] NOTE—Paragraph 1.6 was added editorially October 1998.

1. Scope

1.1 This guide is intended to assist potential users in the search for, evaluation of, and acquisition of remotely sensed aerial photography or imagery, or both, to be used for the purpose of establishing the historic site-use and other interpretable surface or near-surface conditions regionally, locally, or at a specified project location.

1.2 The instructions given in this guide identify sources of photography and imagery, and provide information pertaining to the specifications, characteristics, and availability of these data.

1.3 The major sources considered are restricted to federal and state organizations only. The sources described do not represent all possible sources of interest for environmental and engineering applications.

1.4 The values stated in both inch-pound and SI units are to be regarded separately as the standard. The values given in parentheses are for information only.

1.5 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

1.6 *This guide offers an organized collection of information or a series of options and does not recommend a specific course of action. This document cannot replace education or experience and should be used in conjunction with professional judgment. Not all aspects of this guide may be applicable in all circumstances. This ASTM standard is not intended to represent or replace the standard of care by which the adequacy of a given professional service must be judged, nor should this document be applied without consideration of a project's many unique aspects. The word "Standard" in the title of this document means only that the document has been approved through the ASTM consensus process.*

2. Terminology

2.1 *Definitions:*

2.1.1 *black-and-white infrared (IR) film*—film sensitive to blue-violet through reflective IR light wavelengths (0.4 to 0.9 µm), but is exposed to only green through reflective IR wavelengths (0.5 to 0.9 µm). Absence of exposure to the blue wavelengths allows for haze penetration or higher quality data collection, or both, through a greater thickness of the atmosphere or through a portion of atmosphere where light energy transmission is relatively poorer than clear, haze-free atmospheric conditions. This type of film is used for detection of different types of vegetation, diseased plants, soil/rock conditions or land/water boundaries within the constraints of the understanding of conditions of the data collection and interpretation.

2.1.2 *color film—or conventional color or natural color* film exposed to all visible wavelengths (0.4 to 0.7 µm). Uses include identifying soil types, rock outcrops, industrial stockpiles, and shorelines within the constraints of the understanding of the conditions of data collection and interpretation. These data are limited due to ″fogging", that is, poor haze penetration, associated with the exposure to blue wavelengths.

2.1.3 *color IR*—a form of false-color, reversal film that shows false colors for natural features and is exposed as is black-and-white IR film. Absence of exposure to the blue wavelengths allows for haze penetration or higher quality data collection, or both, through a greater thickness of the atmosphere or through a portion of atmosphere where light energy transmission is relatively poorer than clear, haze-free atmospheric conditions. Natural, healthy, deciduous foliage appears red where as painted, artificial foliage or coniferous vegetation appears purple. This film is also used for detection of diseased plants, insect infestation or other stressed vegetation, soil/rock conditions, including moisture content variations, or land/water boundaries within the constraints of the understanding of the conditions of data collection and interpretation.

[1] This guide is under the jurisdiction of ASTM Committee D-18 on Soil and Rock and is the direct responsibility of Subcommittee D18.01 on Surface and Subsurface Characterization.

Current edition approved March 15, 1994. Published May 1994.

2.1.4 *imagery*—usually reserved for reference to data collected by electro-mechanical methods. These methods include multi-spectral scanners (MSS), such as the instrument on U.S. LANDSAT satellites or the thematic mapper (TM) scanner, that collect reflected or emitted energy and record the magnitude of this energy.

2.1.5 *index or photo index*—usually a mosaic of photographs, uncorrected for geometric distortion, that has been collected from a flight or portion of a flight, photographically reproduced at a suitably reduced scale. A photo index will show area coverage along with adequate indexing information for ordering purposes.

2.1.6 *multi-spectral scanners*—electro-mechanical systems that simultaneously collect and record reflected or emitted energy in various wavelength ranges, spectral bands, from the same parcel of terrain. This parcel of terrain is referred to as a picture element (pixel), the size of which is a function of the optics and design of the sensor and the distance the sensor is carried above terrain.

2.1.7 *panchromatic photography*—black and white photography, the film is sensitive to all visible wavelengths (0.4 to 0.7 µm); but is often exposed only to visible red and green wavelengths (0.5 to 0.7 µm). Absence of exposure to the blue wavelengths allows for haze penetration or higher quality data collection, or both, through a greater thickness of the atmosphere or through a portion of atmosphere where light energy transmission is relatively poorer than clear, haze-free atmospheric conditions. Uses include those of color film but with much better detail available. Man-made features are easily interpreted. Such interpretations are made within the constraints of the understanding of the conditions of data collection and interpretation.

2.1.8 *photography*—reserved for reference to the type of data recorded on a film plate in proportion to the photochemical reaction to light striking the emulsion on the film plate. This term is also used in reference to the products made from processing of the exposed film plate, for example, paper prints, transparencies.

2.1.9 *resolution—for photography* the term applied to describe the smallest target which might be reliably recorded and distinguished from closely spaced objects as shown on the film plate. This is a function of a variety of factors; most importantly the chemical makeup of the film plate emulsion including grain size, the film processing, the contrast between the target and its background on the terrain and the nature of the reflectivity of the target. For scanning systems this quality is frequently called detectability and is a function of the same terrain and data collection factors in addition to the optical design, electronics/mechanics of the scanner and its data recording systems and the distance it is carried above terrain.

2.1.10 *spectral band*—used to describe the range of wavelengths over which a single datum value is collected and recorded for each picture element by a multispectral scanner. The range of wavelength for a spectral band is a function of the electronics/mechanics of the scanning system. Many bands of data may be recorded simultaneously for each pixel. Table 1 identifies typical spectral bands for scanners used on U.S. LANDSAT satellites. The information from this table may be

TABLE 1 Spectral Bands and Characteristics of the Data as Collected by LANDSAT Multispectral Scanner and Thematic Mapper Scanner[A]

LANDSAT multispectral scanner data characteristic; pixel size of 57 by 79 m, approximately 1.1 AC			
Spectral Range			
Band	Wavelength Range, µm	Color	General Applications
4	0.5 to 0.6	green	Greatest potential for water penetration; shows some contrast between vegetation and soil.
5	0.6 to 0.7	lower red	Best for showing topographic and overall land-use recognition, especially cultural features, such as roads and cities, bare soil, and disturbed land.
6	0.7 to 0.8	upper red to lower infrared	Tonal contrasts reflect various land-use practices; also gives good and/water contrast.
7	0.8 to 1.1	near infrared	Best for land/water discrimination, vegetation growth vigor analysis.
Thematic mapper scanner data characteristics; pixel size of 30 by 30 m (average).			
1	0.45 to 0.52	blue	Designated for water body penetration, making it useful for coastal water mapping. Also useful for differentiation of soil from vegetation, and deciduous from coniferous flora.
2	0.51 to 0.60	green	Designed to measure the visible green reflectance peak of vegetation for vigor assessment.
3	0.63 to 0.69	red	A chlorophyll absorption band important for vegetation discrimination.
4	0.76 to 0.90	reflected infrared (IR)	Useful for determining biomass content and for delineation of water bodies.
5	1.55 to 1.75	reflected IR	Indicative of vegetation moisture content and soil moisture. Also useful for differentiation of snow from clouds
6	10.4 to 12.5	thermal (emitted) IR	A thermal infrared band of use in vegetation stress analysis, soil moisture discrimination, and thermal mapping.
7	2.08 to 2.35	reflected IR	A band selected for its potential for discriminating rock types and for hydrothermal mapping.

[A]See Footnote 13.