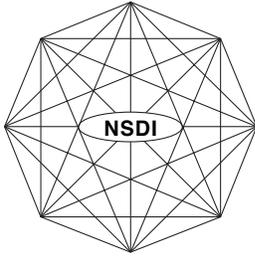


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National Spatial Data Infrastructure

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# FGDC Digital Cartographic Standard for Geologic Map Symbolization

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Geologic Data Subcommittee

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Federal Geographic Data Committee

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December 2005

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Prepared by the U.S. Geological Survey for the Federal Geographic Data Committee

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Recommended reference:

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Federal Geographic Data Committee

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46 Federal Geographic Data Committee

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48 Established by Office of Management and Budget Circular A-16, the Federal Geographic Data Committee  
49 (FGDC) promotes the coordinated development, use, sharing, and dissemination of geographic data.

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60 and the transfer of data; and organize the collection of geographic data to reduce duplication of effort. Working  
61 groups are established for issues that transcend data categories.

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## 307 **1. INTRODUCTORY MATERIAL**

### 308 **1.1 OBJECTIVE**

309 This document provides a single national standard for the digital cartographic representation of geologic map  
310 features. This standard is intended to support the Nation's producers and users of geologic map information by  
311 providing line symbols, point symbols, and colors and patterns that can be used to portray the various features  
312 on geologic maps. The objective of this standard is to aid in the production of geologic maps and related  
313 products, as well as to help provide geologic maps and products that are more consistent in both their  
314 appearance and their underlying database content.

315 A geologic map is a cartographic product that expresses information about the geology of a particular area. The  
316 map uses graphical elements such as line symbols, point symbols, and colored or patterned areas to portray  
317 complex geological information such as the composition, age, genesis, and extent of an area's geologic  
318 materials, as well as the geometry, orientation, and character of the geologic structures that have deformed  
319 them. Geologic maps generally are intended for use by both the geoscience professional and the general public;  
320 however, designing and preparing a geologic map that will inform such a diverse audience can be a daunting  
321 task because of the complexity of both the mapping concepts and the geologic information. This standard  
322 attempts to facilitate map comprehension by providing clear and familiar symbology, thereby ensuring that the  
323 lines, points, and areas on the map convey the same meaning to all information producers and users. This  
324 standard also endeavors to clarify some of the concepts of geologic mapping, as well as to standardize some of  
325 the terminology used to describe the various features on a geologic map.

326 The imperative for the clear communication of geologic map information to such a diverse audience was  
327 outlined early in the history of the U.S. Geological Survey (USGS) by then-Director John Wesley Powell, who  
328 stated that "the maps are designed not so much for the specialist as for the people, who justly look to the official  
329 geologist for a classification, nomenclature, and system of convention so simple and expressive as to render his  
330 work immediately available alike to the theoretic physicist or astronomer, the practical engineer or miner, and  
331 the skilled agriculturist or artisan" (Powell, 1888, p. 229). The consistent, unambiguous expression of geologic  
332 map information is even more critical now because such information increasingly is compiled, stored,  
333 manipulated, and exchanged in digital files and geospatial databases. In the digital files, the cartographic  
334 representation of each feature on a geologic map must have a unique and explicit meaning, and it also must be  
335 compatible with the feature's attributes in the geologic map database. To that end, the preparers of this standard  
336 reviewed existing formal and informal USGS geologic map symbolization standards and adapted them for  
337 implementation with modern digital mapmaking systems and geospatial databases.

338 Although this standard is herein formalized, it is not intended to be used inflexibly or in a manner that will  
339 unduly restrict a geologist's ability to communicate the observations and interpretations gained from geologic  
340 mapping. On the contrary, this standard recognizes that, in certain situations, an existing symbol or its usage

341 might need to be modified to fit a particular geologic situation or setting. Likewise, this standard recognizes that  
342 a new symbol or set of symbols may need to be created to more fully express local geologic conditions or to  
343 keep pace with evolving geologic mapping concepts and practices. Accordingly, such new or modified symbols,  
344 if found to be of wide applicability, will be incorporated into this standard through planned, periodic revisions.

## 345 **1.2 SCOPE**

346 This standard contains descriptions, examples, cartographic specifications, and notes on usage for a wide  
347 variety of symbols that may be used on typical, general-purpose geologic maps and related products such as  
348 cross sections. However, the standard also can be used for different kinds of special-purpose or derivative map  
349 products and databases that may be focused on a specific geoscience topic (for example, slope stability) or class  
350 of features (for example, a fault map). The standard is scale-independent, meaning that the symbols are  
351 appropriate for use with geologic mapping compiled or published at any scale. It is designed for use by anyone  
352 who either produces or uses geologic map information, whether in analog or digital form.

## 353 **1.3 APPLICABILITY**

354 This document establishes standards that are applicable to all geologic map information (in other words,  
355 geologic maps and databases) published by the Federal Government and its Federally funded contractors and  
356 collaborators. Non-Federal agencies and private firms that produce geologic map information also are urged to  
357 adopt the standard.

358 The standard applies to all forms of geologic map publications, whether they are released as (1) hard-copy  
359 products, in either offset-print or plot-on-demand format, or (2) digital products, either as files for spatial  
360 analysis in Geographic Information Systems (GIS), as Portable Document Format (PDF) files in online  
361 publications, or as browse-graphic files for display on the World Wide Web. In particular, the standard applies  
362 to all geologic map products archived within the National Geologic Map Database (NGMDB), which is  
363 administered by the USGS: geologic map products submitted to and incorporated within the NGMDB will  
364 conform to this standard.

## 365 **1.4 RELATED STANDARDS**

366 The USGS traditionally has established nationally applicable cartographic standards for the production of  
367 geologic map information, both explicitly, through various formal and informal standards documents (see  
368 Section 2.1 below, entitled "Relation to Previous U.S. Geological Survey Standards"), and implicitly, through  
369 the cartographic content of its publications. This standard supersedes any existing USGS formal or informal  
370 cartographic standards for geologic maps.

371 During preparation of this standard, its relation to other standards or standards-development activities was  
372 assessed, and no significant conflicts were found. For example, the International Organization for  
373 Standardization (ISO) Standard 710, Parts 1–4, describes a general schema for graphical display of a selected

374 set of geologic map symbols. Although similar to some that are included in this standard, they were found to  
375 have limited applicability. In addition, similar standards have been developed in other agencies of the Federal  
376 Government, including the U.S. Forest Service (in the geology component of their Terra database), the U.S.  
377 Army Corps of Engineers (in the geology component of their Tri-Service CADD-GIS Spatial Data Standards),  
378 and the U.S. Bureau of Reclamation (in their Engineering Geology Office Manual). These were found to be  
379 somewhat specialized and limited in their coverage of geologic map features. Conversely, this standard provides  
380 comprehensive coverage of symbology for a broad range of geologic map features.

### 381 **1.5 STANDARDS DEVELOPMENT PROCEDURES**

382 This standards document represents only the latest milestone in a long history of geologic map standards  
383 development in the United States, which, within the USGS, began prior to 1881. As then-Director John Wesley  
384 Powell noted in 1888, in reference to geologic map standards under development at that time within the USGS,  
385 "While it is not professed that this [cartographic] system is final, or even unobjectionable, it represents the  
386 present state of knowledge and opinion" (Powell, 1888, p. 230). Although the present standards document  
387 draws heavily on previously established formal and informal cartographic standards of the USGS, it has  
388 undergone substantial revisions that reflect current geologic mapping practices and modern digital mapmaking  
389 methods. Accordingly, the standards-development procedures outlined in this section will address only the most  
390 recent development history of this standard (for a more complete historical background, see Section 2.1 below,  
391 entitled "Relation to Previous U.S. Geological Survey Standards").

392 This standards document was developed by members of the USGS Geologic Discipline's Western Publications  
393 Group and the National Geologic Map Database (NGMDB), with guidance and contributions from members of  
394 the Map Symbol Standards Committee (see below; see also, Section 2.3, entitled "Preparers of This Standard").  
395 In addition, this standards document has benefited from the broad, modern-day perspective gained from the  
396 many thoughtful responses from reviewers of the Federal Geographic Data Committee's (FGDC) Public Review  
397 Draft of the standard (Federal Geographic Data Committee, 2000; see also, U.S. Geological Survey, 2000). The  
398 preparers of this standard gratefully acknowledge all current and prior participants and appreciate their  
399 invaluable contributions to the development of both this standards document and all preceding works.

400 In 1995, a proposed cartographic standard for geologic map information was informally released by the USGS  
401 as the "Cartographic and Digital Standard for Geologic Map Information" (U.S. Geological Survey, 1995a,  
402 1995b). In 1996, this proposed standard was formally reviewed by geologists and cartographers from the USGS,  
403 as well as from the Association of American State Geologists (AASG), which represents the State geological  
404 surveys, and from the FGDC's Geologic Data Subcommittee, which is composed of representatives from  
405 Federal agencies that produce or use geologic map information. That review (Soller, 1996) indicated the need  
406 for some revision to the proposed standard prior to its consideration by the FGDC for formal adoption as a  
407 Federal standard.

408 In 1996, plans were outlined to create a revised and updated Federal standard, and an early standards-  
409 development group was formed (see Section 2.3 below, entitled "Preparers of This Standard"). A proposal to  
410 develop the revised standard was submitted by the FGDC's Geologic Data Subcommittee (see  
411 [http://ncgmp.usgs.gov/fgdc\\_gds/mapsymbprop.html](http://ncgmp.usgs.gov/fgdc_gds/mapsymbprop.html)), and the FGDC accepted that proposal in 1997. Later that  
412 year, the standards-development group produced a preliminary version of the draft standard, which was  
413 circulated among selected USGS and State geological survey personnel for review. Comments were  
414 incorporated and, in 1999, the revised draft standard was submitted (as the "Working Draft") to the FGDC's  
415 Geologic Data Subcommittee for consideration. Upon review and subsequent approval by the Subcommittee,  
416 the Working Draft was submitted to the FGDC Standards Working Group, which, in 2000, approved the  
417 document for public review as the "Public Review Draft" (see below), pending adoption of minor changes.

418 The Public Review Draft of this standard was finalized and then published in April 2000 (Federal Geographic  
419 Data Committee, 2000; see also, U.S. Geological Survey, 2000). In May 2000, the public was invited to review  
420 the draft standard and to provide comments and suggestions for revision (see  
421 [http://ncgmp.usgs.gov/fgdc\\_gds/mapsymb/mapsymbpubrev.html](http://ncgmp.usgs.gov/fgdc_gds/mapsymb/mapsymbpubrev.html)). At the end of the 120-day public review  
422 period (May 19 through September 15, 2000), all comments and suggestions to the Public Review Draft were  
423 compiled, and a plan was developed to address the comments and make the necessary changes. Under this plan,  
424 a standing Map Symbol Standards Committee was formed to assist in the resolution of the public's review  
425 comments and suggestions, as well as in the long-term maintenance of the standard. Committee members were  
426 drawn from the geologic mapping community in the State geological surveys, academia, and the USGS (see  
427 Section 2.3 below, entitled "Preparers of This Standard").

428 Revisions to the standards document began in 2001. The revised standard was approved by the Map Symbol  
429 Standards Committee, then by the FGDC Geologic Data Subcommittee, and then it was submitted to the FGDC  
430 Standards Working Group for formal approval in 2005.

431 This standard will be managed as a "living" standard—that is, it will be maintained and revised as needed to  
432 reflect new mapping concepts or evolving usage conventions. The initial release of this FGDC-approved  
433 standard is available as an offset-printed document, supplemented by electronic (CD-ROM) and online (PDF)  
434 versions. However, all future updates to this standard will be released online in PDF format only. To help  
435 maintain an up-to-date hard-copy version of the standards document, this initial offset-printed release has been  
436 designed in a "loose-leaf" format. Subsequent updates to this standards document may be downloaded as PDF  
437 files and then printed out and inserted where appropriate into a loose-leaf binder. These online updates will be  
438 the authoritative reference.

439 Because this standard is intended for use with digital applications, a PostScript implementation of the Public  
440 Review Draft was informally released as a USGS Open-File Report (U.S. Geological Survey, 2000). This early  
441 PostScript implementation enabled reviewers to directly apply the standard to geologic maps and illustrations  
442 prepared in desktop illustration and (or) publishing software. The PostScript implementation has been updated

443 to reflect changes found in the now-approved standard and has been released as a USGS Techniques and  
444 Methods report (U.S. Geological Survey, 2005). Additionally, preliminary work on an ArcGIS implementation  
445 may be completed in the future and released as a USGS report. Information regarding these implementation  
446 efforts will be posted on FGDC's Geologic Data Subcommittee website ([http://ncgmp.usgs.gov/fgdc\\_gds/](http://ncgmp.usgs.gov/fgdc_gds/)).

447 Questions and comments about, or suggested additions to, this standard may be submitted by e-mail to  
448 [mapsymbol@flagmail.wr.usgs.gov](mailto:mapsymbol@flagmail.wr.usgs.gov) or mailed to Geologic Map Symbol Standard, c/o David R. Soller, National  
449 Geologic Map Database, U.S. Geological Survey, 926A National Center, Reston, Virginia, 20192.

## 450 **1.6 MAINTENANCE AUTHORITY**

451 On behalf of the FGDC, the USGS will maintain this Federal standard. The responsibility for coordinating  
452 Federal geologic mapping information is stipulated by Office of Management and Budget Circular A-16 (see  
453 <http://www.whitehouse.gov/omb/circulars/a016/a016.html>). The Geologic Mapping Act of 1992 (see  
454 <http://ncgmp.usgs.gov/info/ngmact.html> and subsequent reauthorizations) stipulates a requirement for standards  
455 development under the auspices of the National Geologic Map Database (NGMDB). Under this authority, the  
456 NGMDB will function on behalf of the USGS as coordinator of this maintenance activity (see  
457 <http://ngmdb.usgs.gov/info/standards/general.html>). Maintenance will be conducted in cooperation primarily  
458 with the AASG, which is the USGS's partner in the Geologic Mapping Act. The NGMDB will continue to rely  
459 on the Map Symbol Standards Committee to assist in its maintenance efforts. The Committee membership  
460 comes from the NGMDB, the USGS scientific staff and Publications Groups, the AASG, and the academic  
461 community (see Section 2.3 below, entitled "Preparers of This Standard"). The Committee will, as needed,  
462 review comments and suggestions for revisions, additions, and deletions to the standard.

## 463 **2. BACKGROUND**

### 464 **2.1 RELATION TO PREVIOUS U.S. GEOLOGICAL SURVEY STANDARDS**

465 Soon after the USGS was established in 1879, USGS geologists began to map and assess the Nation's lands,  
466 including many areas previously unexplored by Europeans. A new publication series, the Geologic Atlas (or  
467 "Folio") series, was created to publish many of these maps. Beginning prior to 1881, the USGS, then under the  
468 direction of John Wesley Powell, began to identify geologic and cartographic standards and conventions  
469 necessary to uniformly portray the geology in this series: "In providing for the publication of this large body of  
470 material, it seemed wise to adopt a common system of general nomenclature, a uniform color scheme for  
471 geographic geology, a system of conventional characters for diagrams, and a form for geologic and topographic  
472 charts and atlases" (Powell, 1882a, p. XL; see also, Powell, 1882b, for an elaboration on the proposed  
473 standards). Following a 1889 Conference on Map Publication, these standards were articulated in more detail  
474 and then were published (Powell, 1890).

475 The standards that were adopted by the USGS in the 1880s served as a strong foundation for the Nation's

476 geological science. Paramount to systematized geologic mapping was the adoption of a standard rock  
477 stratigraphic nomenclature, a naming convention for geologic formations, and the subdivisions of geologic time.  
478 Another significant contribution was the adoption of a standardized color scheme for displaying geologic map  
479 units. This scheme used pure, single-ink colors, usually a different one for each geologic time period; to achieve  
480 this, a practical and informative system of overprint patterns also was developed, which served to differentiate  
481 the various mapped units within a single time period. Although this single-ink color scheme did not persist  
482 intact in the twentieth century because of the emergence of more modern printing technologies (for example,  
483 the combining of CMYK—cyan, magenta, yellow, and black—inks to produce a greater variety of colors),  
484 many of the overprint patterns that were developed then are still in use today.

485 In the following decades, as the geological sciences advanced, the concepts of geologic processes and historical  
486 geology became more complex, and new insights and refinements required more map symbols and precise  
487 scientific cartographic methods to convey details of geology. In 1920, the USGS published a manual on the  
488 preparation of illustrations (Ridgway, 1920). By that time, the need for standardization had become urgent:  
489 "More than 200 symbols have been used on maps to express 25 different kinds of data, a fact indicating at once  
490 a notable lack of uniformity and a need of standardization" (Ridgway, 1920, p. 20). The manual addressed  
491 various issues associated with geologic cartography, including standard symbology for geologic maps and cross  
492 sections (for example, geologic line and point symbols, water wells, oil and gas wells, coal seams, mine  
493 workings, and topographic and other base-category information) and stratigraphic columns (for example,  
494 lithologic patterns).

495 After 1920, and throughout much of the twentieth century, the maintenance of USGS standards for geologic  
496 map symbolization and cartography was an internal and somewhat informal process enacted through official  
497 USGS policy. For example, USGS Chief Geologist W.H. Bradley (written commun., 1956) adopted  
498 recommendations and a list of symbols from the Map Symbol Committee (E.N. Goddard, Chairman), and  
499 USGS Chief Geologist D.L. Peck (written commun., 1978) adopted recommendations from the committee for  
500 Standards for General Purpose Geologic Maps (J.C. Reed, Chairman).

501 In the mid-1970s, the USGS outlined the technical specifications for geologic symbology in its informal  
502 "Technical Cartographic Standards" volume (U.S. Geological Survey, ca. 1975). This informal standard, which  
503 was maintained until the mid-1980s, was available to USGS cartographers and editors as a set of green,  
504 loose-leaf notebooks that allowed pages to be replaced as the standard evolved. The technical specifications at  
505 that time were devised to serve the needs of cartographers who prepared maps for offset-print publication using  
506 hand-placed type, hand-scribed linework, and peelcoat color-separation techniques. This informal standard  
507 served the USGS well, but it was not available to other producers or users of geologic maps, nor was it formally  
508 recognized as a standard by the Nation's geoscience community. However, the cartographic details of this  
509 standard were clearly displayed on USGS geologic maps. And so, drawing from the cartographic content of  
510 USGS maps, others have published manuals on geologic map standards that have (unofficially) incorporated

511 parts of this informal standard: for example, the American Geological Institute's "AGI Data Sheets for Geology  
512 in the Field, Laboratory, and Office" (Dietrich and others, 1982 [2nd ed.]; Dutro and others, 1989 [3rd ed.])  
513 includes many symbols commonly shown on USGS geologic maps (see also, "Suggestions to Authors of the  
514 Reports of the United States Geological Survey" [7th ed.]; Hansen, 1991).

515 Beginning about the mid-1980s, digital-cartographic and GIS (Geographic Information System) technologies  
516 rapidly evolved and became more widely available. The gradual adoption of digitally based mapmaking  
517 methods made clear the need to develop new cartographic standards that would satisfy the requirements of the  
518 latest technologies for the preparation of digital files, whether they are to be used for geospatial databases, for  
519 plot-on-demand or online map publications, or for the production of negatives for offset printing of maps.

520 In response to this steady increase in digital mapmaking and the accompanying concern about preparing  
521 consistent, high-quality, digitally produced geologic maps and geologic map databases, the USGS informally  
522 released in 1995 a proposed standard entitled "Cartographic and Digital Standard for Geologic Map  
523 Information" (U.S. Geological Survey, 1995a). As noted above, subsequent review of that document by the  
524 USGS, the AASG, and the FGDC's Geologic Data Subcommittee (Soller, 1996) indicated the need for some  
525 revision prior to its consideration by the FGDC for formal adoption as a Federal standard, which led to the  
526 development of this standard (see discussion in Section 1.5 above, entitled "Standards Development  
527 Procedures").

## 528 **2.2 CHANGES FROM PREVIOUS STANDARDS**

529 In this new standard (contained in [normative] appendix A), descriptions, examples, cartographic specifications,  
530 and notes on usage are provided for a wide variety of symbols that may be used on typical digital geologic maps  
531 or related products such as cross sections. In the preparation of this standard, every effort was made to retain the  
532 original symbols and their specifications from the 1995 USGS proposed standard (U.S. Geological Survey,  
533 1995a); however, many updates have been incorporated into this new version. The number of symbols has  
534 increased significantly, from about 800 to over 2300. Symbols are more logically grouped; some sections have  
535 been combined with others, and a few new sections have been added.

536 Many symbols, particularly lines, have been redesigned slightly so that they would more successfully translate  
537 to digital applications. For instance, in the old "Technical Cartographic Standards" volume (U.S. Geological  
538 Survey, ca. 1975), as well as in the 1995 USGS proposed standard (U.S. Geological Survey, 1995a), the  
539 lineweight for contacts was specified as .005 inches (.125 millimeters). However, experience has shown that  
540 .005–inch lines do not always plot well when digitally output by high-resolution imagesetters. Therefore, the  
541 minimum lineweight for contacts, as well as for most other stroked-line symbol elements, has been increased to  
542 .006 inches (.15 millimeters) in this new standard. In addition, the dash and gap lengths for many line symbols  
543 have been adjusted so that their dash-gap templates can be more easily defined electronically.

544 A chart showing a wide range of CMYK colors ("CMYK Color Chart") has been included; an offset-print

545 version of this chart has been in use at the USGS for many years, and the variety of colors has proved to be  
546 sufficient for portraying complex geology shown on most maps, regardless of the output medium. In addition, a  
547 chart that shows commonly used geologic patterns ("Pattern Chart") has been added; the patterns themselves are  
548 similar to what was in the old "Technical Cartographic Standards" volume (U.S. Geological Survey, ca. 1975),  
549 as well as in the 1995 USGS proposed standard (U.S. Geological Survey, 1995a), but most have undergone  
550 lineweight changes to facilitate digital output at high resolutions. The old pattern numbers have been revised  
551 and the patterns are now organized into seven geologically relevant series. A few new patterns have been added,  
552 and some have been eliminated. In addition, each pattern in the Pattern Chart, as well as each color in the  
553 CMYK Color Chart, has associated with it a generic lookup-table number that, if desired, may be used to access  
554 the pattern (or color) from within digital applications.

555 Also included in this new standard is a diagram showing suggested ranges of map-unit colors for stratigraphic  
556 ages of sedimentary and metamorphic rocks, as well as for volcanic and plutonic rocks. In addition, a new  
557 geologic age symbol font ("FGDC-GeoAge") has been added. Three new sections that address map marginalia  
558 have been included: (1) quadrangle location maps for each of the 50 states (and District of Columbia, Guam,  
559 Puerto Rico, and U.S. Virgin Islands), as well as a map of the 48 conterminous states (so that quadrangle  
560 locations covering more than one state can be shown); (2) a variety of bar scales, as well as calculation tables  
561 that show how to convert between inches, miles, and kilometers; and (3) a series of mean declination arrows,  
562 showing magnetic north both east and west of true north.

563 A few new informational sections have been added to the introductory material in this standard. The section  
564 entitled "Guidelines for Map Color and Pattern Selection" provides useful information on color selection and  
565 the use of patterns. The section entitled "Guidelines for Map Labeling" provides recommendations on  
566 placement of text on a map.

567 The most significant update to this standard is the addition of two important sections to the introductory  
568 material. The section entitled "Geologic Mapping Concepts and Definitions" provides basic information about  
569 some of the fundamental concepts of geologic mapping, as well as defines and categorizes the various types of  
570 geologic map features. The section entitled "Scientific Confidence and Locational Accuracy of Geologic  
571 Features" clarifies the concepts of, and establishes new terminology for, the levels of scientific confidence and  
572 locational accuracy of geologic map features.

573 In response to reviewer's comments (Soller, 1996), much of the first part of the 1995 USGS proposed standard  
574 has been abandoned because it was either not pertinent to this standard (for example, the sections on geologic  
575 map content, metadata, and geocoding) or not widely applicable to the full range of mapping situations (for  
576 example, the specification of a "1.0 mm accuracy standard"). In addition, no attempt has been made in this new  
577 standard to provide detailed definitions for the geologic features represented by the various symbols. For such  
578 information, please refer to one of a number of reference books available; an excellent source is the American  
579 Geological Institute's Glossary of Geology (Bates and Jackson, 1987 [3rd ed.]; Jackson, 1997 [4th ed.]).

580 **2.3 PREPARERS OF THIS STANDARD**

581 Principal contributors<sup>1</sup> to the preparation of this FGDC Digital Cartographic Standard for Geologic Map  
582 Symbolization include the following individuals:

583 David R. Soller (USGS; Chief, National Geologic Map Database)—Coordinator, author, and editor, FGDC  
584 Digital Cartographic Standard for Geologic Map Symbolization; coordinator, Map Symbol Standards  
585 Committee.

586 Taryn A. Lindquist (USGS; Digital Map Specialist and Geologic Map Editor, Western Publications  
587 Group)—Editor, author, and compiler, FGDC Digital Cartographic Standard for Geologic Map  
588 Symbolization; designer, line symbols and point symbols, FGDC Digital Cartographic Standard for  
589 Geologic Map Symbolization.

590 Map Symbol Standards Committee: Thomas Berg (State Geologist, Ohio); Jay Parrish (State Geologist,  
591 Pennsylvania); Mark Jirsa (Minnesota Geological Survey); Robert Hatcher (University of Tennessee,  
592 Knoxville); Steven Reynolds (Arizona State University); and Byron Stone, Jack Reed, Jonathan Matti,  
593 Taryn Lindquist, and David Soller (all USGS)—Referees and reviewers of public comments and  
594 subsequent revisions, Public Review Draft (Jonathan Matti is especially noted for his guidance on issues of  
595 scientific confidence and locational accuracy).

596 Sara Boore (USGS; Publication Graphics Specialist, Western Publications Group)—Book designer, FGDC  
597 Digital Cartographic Standard for Geologic Map Symbolization; designer, point symbols, line symbols,  
598 color charts, and patterns, FGDC Digital Cartographic Standard for Geologic Map Symbolization.

599 F. Craig Brunstein (USGS; Geologic Map Editor, Central Publications Group)—Technical reviewer,  
600 Working Draft.

601 Alessandro J. Donatich (USGS; Geologic Map Editor, Central Publications Group)—Technical reviewer,  
602 Working Draft.

603 Carolyn Donlin (USGS; Online Publications Specialist and Geologic Map Editor, Western Publications  
604 Group)—Preparer, online publication of Public Review Draft (PostScript implementation).

605 Michael F. Diggles (USGS; CD-ROM Publications Specialist and Online Publications Specialist, Western  
606 Publications Group)—Preparer, CD-ROM publications of PostScript implementations; preparer, online  
607 publication of FGDC-approved standard (PostScript implementation).

608 Kevin Ghequiere (USGS; Cartographer, Western Publications Group)—Designer, patterns, FGDC Digital

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<sup>1</sup> Unless otherwise noted, persons listed as contributors to the "FGDC Digital Cartographic Standard for Geologic Map Symbolization" participated in the preparation of the following versions of the standard: the Working Draft; the Public Review Draft (Federal Geographic Data Committee, 2000) and its PostScript implementation (U.S. Geological Survey, 2000); and the now FGDC-approved standard (this document) and its PostScript implementation (U.S. Geological Survey, 2005).

- 609 Cartographic Standard for Geologic Map Symbolization.
- 610 Richard D. Koch (USGS; Digital Map Specialist, Western Publications Group)—Designer, geologic age  
611 symbol font, FGDC Digital Cartographic Standard for Geologic Map Symbolization.
- 612 Diane E. Lane (USGS; Geologic Map Editor, Central Publications Group)—Technical reviewer, Working  
613 Draft.
- 614 Susan E. Mayfield (USGS; Publication Graphics Specialist, Western Publications Group)—Designer, color  
615 charts and patterns, FGDC Digital Cartographic Standard for Geologic Map Symbolization.
- 616 Kathryn Nimz (USGS; Digital Map Specialist, Western Publications Group)—Designer, patterns, FGDC  
617 Digital Cartographic Standard for Geologic Map Symbolization.
- 618 Glenn Schumacher (USGS; Publication Graphics Specialist, Western Publications Group)—Designer, bar  
619 scales, mean declination arrows, and quadrangle location maps, FGDC Digital Cartographic Standard for  
620 Geologic Map Symbolization.
- 621 Stephen L. Scott (USGS; Publication Graphics Specialist, Western Publications Group)—Designer, point  
622 symbols and line symbols, FGDC Digital Cartographic Standard for Geologic Map Symbolization.
- 623 Will Stettner (USGS; Cartographer, Eastern Publications Group)—Technical reviewer, Working Draft.
- 624 José F. Vigil (USGS; Motion Graphics Specialist, Western Publications Group)—Designer, geologic age  
625 symbol font, FGDC Digital Cartographic Standard for Geologic Map Symbolization.
- 626 Jan L. Zigler (USGS; Geologic Map Editor, Western Publications Group)—Technical reviewer, Working  
627 Draft.

### 628 **3. GEOLOGIC MAPPING CONCEPTS AND DEFINITIONS**

#### 629 **3.1 GEOLOGIC MAPS**

630 A *geologic map* is a cartographic product that portrays information about the geologic character of a specific  
631 geographic area. It is a two-dimensional representation of real-world, three-dimensional geologic features. To  
632 achieve this, a geologic map uses graphical elements to express detailed information about the different kinds of  
633 earth materials, the boundaries that separate them, and the geologic structures that have subsequently deformed  
634 them. For example, a typical general-purpose geologic map may consist of *lines* that trace contacts, faults, and  
635 folds; *points* that locate bedding attitudes, minor fold orientations, and sample localities; *areas* that represent  
636 geologic units, landslides, and areas of alteration; and *labels* that identify geologic map units, sample-locality  
637 numbers, and fault names. Thus, an appropriately symbolized and labeled geologic map can portray  
638 comprehensive information about the composition, age, and genesis of the geologic materials and the nature of  
639 their boundaries, as well as the character and three-dimensional geometry of the geologic structures that have  
640 deformed them. In addition, such geologic map information usually is drawn onto a base map that also uses

641 graphical elements to represent the topography, drainage, and cultural features of an area, and so a geologic map  
642 also can depict the spatial relation of the various geologic features to the physical landscape. Other things that  
643 may be shown on a geologic map include information about the geomorphology, pedology, paleontology, rock  
644 alteration and mineralization, geophysics, geochemistry, or geochronology of an area.

### 645 **3.2 GEOLOGIC MAP DATABASES**

646 A *geologic map database* is a digitally compiled collection of spatial (geographically referenced) and  
647 descriptive geologic information about a specific geographic area. The information in the geologic map  
648 database consists of (1) the geographic location and the orientation, length, shape, and (or) area (in other words,  
649 the geometry) of each geologic feature or object (for example, an outcrop or a fault), and (2) many different  
650 types of descriptive geologic information about each feature or object.

651 A geologic map database also may contain extensive amounts of additional qualitative and quantitative geologic  
652 information. For example, a geologic map database may include geochemical analyses, radiometric ages, soil-  
653 horizon information, and geophysical contours, as well as information on the weathering of surface exposures  
654 of geologic features, the subsurface geometry of geologic map units, and the glacial landforms or other types of  
655 geomorphic features.

656 Fundamental data elements of a geologic map database are *lines* (for example, contacts and faults), *points* (for  
657 example, bedding attitudes and fossil localities), and *areas* or *polygons* (for example, map-unit areas and zones  
658 of alteration). In addition, each feature or object in the geologic map database has several associated *feature*  
659 *attributes*. The most basic feature attributes may simply identify the feature (for example, "thrust fault" or  
660 "overturned anticline") and express its scientific confidence and locational accuracy (for example, "identity  
661 certain" or "location inferred"). Other feature attributes may consist of detailed descriptions of each feature (for  
662 example, the lithologic characteristics of a map unit, the dip of a mapped fault, or the identification and age  
663 determination of a fossil specimen).

664 When a geologic map is generated as a cartographic product from a geologic map database, each geologic  
665 feature is represented by a specific *geologic map symbol*. The attributes in the database provide the information  
666 needed to symbolize each feature. In addition, *annotation* is added to the geologic map wherever necessary to  
667 identify the various features (for example, map-unit labels and fault names) and to provide essential quantitative  
668 information (for example, dip values and fossil-locality numbers).

### 669 **3.3 GEOLOGIC MAP UNITS**

670 A *geologic map unit* is a cartographic representation of a volume of geologic materials that share enough  
671 characteristics (for example, the composition, areal extent, age, and (or) genesis) to be considered a single entity  
672 (a single geologic unit). On a typical geologic map, most geologic units are represented by polygons that are  
673 filled with colors and (or) patterns. Geologic units can also be represented by lines (for example, dikes) or  
674 points (for example, blueschist blocks).

675 The *formation*, whether formal or informal, is the lithostratigraphic unit most commonly depicted on a geologic  
676 map. A formation can be subdivided into lower rank stratigraphic units (for example, members, tongues, lentils,  
677 or beds) or assembled with other formations to make up more generalized, higher rank stratigraphic units (for  
678 example, groups or supergroups), depending on the scale of the map or the focus of the geologist (see guidelines  
679 for the recognition and naming of geologic units by the North American Commission on Stratigraphic  
680 Nomenclature, 1983).

### 681 **3.3.1 Geologic Time, the Ages of Rock Units, and Geologic Age Symbols**

682 The USGS has published a scheme for the major divisions of *geologic time*, the age estimates of the boundaries,  
683 and the specialized *geologic age symbols* to be used on geologic maps (Hansen, 1991). This particular scheme  
684 was formally adopted after a 1980 meeting of the Geologic Names Committee of the USGS (Hansen, 1991). In  
685 addition, several other schemes of geologic time boundaries have been published (see, for example, Berggren  
686 and others, 1995; Gradstein and Ogg, 1996; Haq and van Eysinga, 1998; Harland and others, 1982, 1989;  
687 International Union of Geological Sciences, 1998; Palmer, 1983; Palmer and Geissman, 1999; Snelling, 1985),  
688 each of which is based on different assumptions, techniques, and (or) data. Any formally published age scheme  
689 may be used for a particular map, as long as which scheme was used is specified on the map and in the geologic  
690 map database.

### 691 **3.3.2 Map-Unit Labels**

692 A *map-unit label* is an alphanumeric symbol that identifies the geologic map unit on the map. The map-unit  
693 symbol is an abbreviated acronym that usually is made up of, in the following order, (1) either capital letters or  
694 geologic age symbols indicating the age of the geologic unit (see Appendix A, Section 32), and (2) lower case  
695 letters denoting the name or the lithologic characteristics of the geologic unit. In some cases, numerical  
696 subscripts are added to designate different subunits (for example, members or individual lava flows) within a  
697 geologic unit.

698 Map-unit labels are added to the geologic map wherever necessary to clearly identify the various geologic map  
699 units. In addition, map-unit labels are included among the feature attributes in the geologic map database,  
700 thereby designating each mapped area as belonging to a particular geologic map unit.

## 701 **3.4 PLANAR GEOLOGIC FEATURES**

702 A *planar geologic feature* is a two-dimensional geologic surface, which may be either a real-world, physical  
703 surface (for example, a contact between two geologic units) or a hypothetical surface (for example, an axial  
704 surface of a fold). The geometry of the geologic surface may be flat, curved, or crenulated, and its orientation  
705 may be horizontal, inclined, vertical, or overturned.

706 The intersection of a planar geologic feature with the ground surface forms a real or perceived (projected) linear  
707 trace. When these linear traces are mapped in the field and then plotted as lines on a base map, they become the

708 most basic and fundamental elements of a typical geologic map: they may delineate simple map-unit areas, or  
709 they may define complex patterns of structural deformation. The various types of linear traces are portrayed on  
710 a geologic map by unique line symbols (Appendix A), each of which has a different width, pattern,  
711 ornamentation, or color; thus, a particular line symbol conveys specific information about the character and (or)  
712 geometry of each planar geologic feature.

### 713 **3.4.1 Contacts**

714 A *contact* is a planar surface that bounds a geologic unit (except where that bounding surface is a fault; see  
715 discussion below in Section 3.4.3, entitled "Faults"). A contact is intrinsic to the genesis of each geologic unit;  
716 that is, the contact delineates the stratigraphic position where, owing to changing environmental conditions or  
717 other genetic factors at the time of origin, the properties and characteristics of one geologic unit change, either  
718 abruptly or gradually, to those of another geologic unit.

719 Discussion of contacts in this standard primarily pertains to those that have been mapped in the field (for  
720 example, contacts that bound formations, members, beds, lava flows, or intrusions). Contacts can also exist  
721 between higher rank units, although these contacts typically are not mapped in the field; instead, they are  
722 concepts that may arise later when lower rank stratigraphic units are combined into higher rank stratigraphic  
723 units (see discussion of lithostratigraphic boundaries by the North American Commission on Stratigraphic  
724 Nomenclature, 1983, p. 856–58).

725 Contacts can be classified as one of a number of types, depending on the nature or origin of the contact and the  
726 geologic units that it separates. Examples of such contact types include the following: sedimentary  
727 (conformable; unconformable, etc.); alluvial; landslide; residual; igneous (intrusive, extrusive, pyroclastic);  
728 metamorphic; and high-strain (cataclastic, mylonitic, tectonic). If available, supplemental information about a  
729 contact's type is added as a feature attribute to the geologic map database; however, specialized line symbols  
730 usually are not used to represent these various contact types. In general, unless otherwise stated on the geologic  
731 map or in the geologic map database, contacts should be considered generic; that is, they have no particular type  
732 or identity.

733 The geologic age of a contact also may be specified as a feature attribute in the geologic map database, but  
734 rarely is this characteristic symbolized on the geologic map; if desired, such information can be communicated  
735 by the addition of geologic point data or annotation placed along the trace of the contact. In addition, specific  
736 information collected about a contact's local surface exposure, orientation or character can be added as geologic  
737 point data and annotation placed along the trace of the contact where the observation was made.

#### 738 **3.4.1.1 Discrete versus Gradational Contacts**

739 In the field, a contact between two geologic units is a transition zone whose width can range from very narrow  
740 to very broad. Examples of transition zones include the following:

- 741 • a single surface, as sharply delineated as a knife-edge, between two lithologically distinct geologic units;
- 742 • a single surface that zigzags between two intertonguing geologic units;
- 743 • a narrow zone, a few centimeters to a few decimeters wide, in which the lithologic character changes from  
744 one geologic unit to another;
- 745 • a diffuse zone, a few meters to many meters wide, in which the lithologic character of one geologic unit gives  
746 way gradually to that of another geologic unit.

747 Despite the differences inherent in each of these examples, contacts generally can be classified as either one of  
748 two types of transition zones: *discrete* or *gradational*. A precise definition of the width of a discrete versus a  
749 gradational contact, however, is difficult because of (1) different scales of mapping (for example, a contact that  
750 is gradational at a scale of 1:24,000 would probably be considered discrete at a scale of 1:100,000); (2) differing  
751 interpretations that can arise between geologists whose mapping primarily focuses on either sedimentary,  
752 igneous, or metamorphic rocks (for example, contact relations that are considered gradational by a geologist  
753 who maps sedimentary rocks may be viewed as discrete by a geologist who maps plutonic rocks); and (3)  
754 differences in individual biases that may arise from different geologic-mapping traditions in geologically  
755 dissimilar parts of the Nation. Because of these and other factors, this standard makes no attempt to delimit the  
756 precise width of a discrete or a gradational contact. Nevertheless, this standard provides the following general  
757 definitions:

758 A *discrete* contact is a map-unit boundary that is individually distinct; that is, the transition between geologic  
759 units is abrupt enough to be recognized and delineated easily on the map. A discrete contact may be a sharp,  
760 knife-edged surface, or it may be transitional across a zone as wide as a meter or more, depending on the scale  
761 of the map.

762 A *gradational* contact is a map-unit boundary that is diffuse; that is, the transition between geologic units is  
763 gradual enough that it cannot be recognized or delineated easily on the map. A gradational contact is so diffuse  
764 across the transition zone (the width of which will vary at different map scales) that delineation of its exact  
765 position can be difficult.

766 The discrete versus gradational character of a contact is specified as a feature attribute in the geologic map  
767 database. In addition, if the map scale allows, gradational contacts can be represented on the geologic map by a  
768 specialized line symbol (see Appendix A, Section 1). Unless otherwise stated on the map or in the geologic map  
769 database, however, a generic contact (that is, one not represented by a specialized line symbol) should be  
770 considered discrete at the scale of the map.

### 771 **3.4.2 Key Beds**

772 A *key bed* is an easily identifiable stratigraphic marker bed within a geologic unit. Although a key bed is a  
773 three-dimensional volume rather than a two-dimensional surface, commonly it is too thin to depict as a map-

774 unit area at most map scales, and so it usually is classified as a planar geologic feature.

775 Key beds are identified on the basis of their lithologic character and, in most cases, their relation to the  
776 surrounding rock materials. Examples of various types of key beds include the following:

- 777 • a coal bed;
- 778 • a fossiliferous horizon;
- 779 • a cross-cutting dike;
- 780 • a clay bed in a dominantly coarse-grained sedimentary sequence;
- 781 • a gravel bed in a dominantly fine-grained sedimentary sequence;
- 782 • a marine sedimentary bed in a dominantly nonmarine sedimentary sequence;
- 783 • a nonmarine sedimentary bed in a dominantly marine sedimentary sequence;
- 784 • a sandstone bed in a dominantly carbonate sedimentary sequence;
- 785 • a limestone bed in a dominantly dolomitic sedimentary sequence;
- 786 • a volcanic-ash bed or flow in a dominantly nonvolcanic sequence.

787 The type of key bed can be specified as a feature attribute in the geologic map database. In addition, some types  
788 of key beds are portrayed on the geologic map by specialized line symbols (see Appendix A, Section 1). In  
789 some cases, if the map scale allows, key beds are represented by colored or patterned areas. Map-unit labels are  
790 added to the geologic map to identify the various types of key beds shown on the map. In addition, map-unit  
791 labels are included among the feature attributes in the geologic map database to identify each key bed.

### 792 **3.4.3 Faults**

793 A *fault* is a planar surface of rupture along which geologic units have been fractured and then displaced. Faults  
794 can be geometrically complex structures that juxtapose map units over great distances, or they can be simple  
795 fracture planes along which the amount of offset is very small.

796 Discussion of faults in this standard primarily pertains to those that have been mapped in the field. Faults also  
797 can be required conceptually when lower rank stratigraphic units are grouped into higher rank units or  
798 tectonostratigraphic terranes, although these faults may not have been observed in the field.

799 Faults can be classified as one of a number of types, depending on the nature of their geometry and (or) sense of  
800 offset. Examples of fault types include the following: normal (low-angle, listric); reverse; thrust; overturned  
801 thrust; vertical; strike-slip (right-lateral, left-lateral); oblique-slip; detachment; or some combination of the  
802 above. Information about a fault's type is specified as a feature attribute in the geologic map database. When the  
803 map scale allows, such information also is represented on the geologic map by a specialized line symbol and  
804 (or) line-symbol decoration. A particularly robust set of specialized line symbols and line-symbol decorations

805 has evolved to represent the various fault types (see Appendix A, Section 2). In general, unless otherwise stated  
806 on the map or in the geologic map database, faults that lack such specialized symbology should be considered  
807 generic; that is, their geometry or sense of offset either is not known or has not been specified.

808 The age of a fault also can be specified as a feature attribute in the geologic map database, but rarely is this  
809 characteristic symbolized on the geologic map; if desired, such information can be communicated through the  
810 addition of geologic point data or annotation placed along the trace of the fault. In addition, specific information  
811 collected about a fault's local orientation can be added as geologic point data and annotation placed along the  
812 trace of the fault where the observation was made.

813 Some faults are relatively minor structures whose traces are mapped within single geologic units until the faults  
814 can no longer be observed or they no longer exist. More commonly, faults are mapped as larger, thoroughgoing  
815 structures that can produce a significant amount of offset between one or more geologic units, so that the  
816 rupture surfaces form new map-unit boundaries. In addition, faulting sometimes can take place at the  
817 stratigraphic position where a contact would normally exist between two stratigraphically coherent geologic  
818 units. But because faulting is not a process intrinsic to a geologic units' genesis (in these cases, faulting has  
819 occurred through already-formed geologic units), these bounding surfaces do not meet the criteria to be called  
820 contacts (see discussion above in Section 3.4.1, entitled "Contacts"). Therefore, although they may form  
821 boundaries between geologic units, such structures are classified as "faults," not "fault contacts" or "faulted  
822 contacts."

#### 823 ***3.4.3.1 Discrete Faults versus Fault Zones***

824 In the field, a fault forms a zone of offset whose width can range from very narrow to very broad. Examples of  
825 such zones of offset include the following:

- 826 • a single offset-fracture surface, as sharply delineated as a knife-edge;
- 827 • a narrow zone of offset, a few centimeters to a few decimeters wide;
- 828 • a diffuse zone, a few meters to many meters or as much as a kilometer or more wide, within which offset has  
829 been distributed among a few or many shear planes.

830 Despite the differences inherent in each of these examples, faults generally can be described in either one of two  
831 ways: as a *discrete fault* or as a *fault zone*. A precise definition of the width of a discrete fault versus a fault  
832 zone, however, is difficult for a number of reasons (see related discussion above in Section 3.4.1.1, entitled  
833 "Discrete versus Gradational Contacts"), and this standard makes no attempt to do so. Nevertheless, this  
834 standard provides the following general definitions:

835 A *discrete fault* is a zone of offset that is individually distinct; that is, the zone is narrow enough to be  
836 recognized and delineated easily on the map. A discrete fault may be a sharp, knife-edged surface of offset, or it  
837 may be a zone of offset as wide as a meter or more, depending on the scale of the map.

838 A *fault zone* (also called a *shear zone*) is a diffuse zone within which offset has been distributed among a few or  
839 many shear planes, commonly resulting in a zone of crushed and sheared or ductily deformed rock. In some  
840 cases, a fault zone can be mapped as an area bounded by discrete fault planes.

841 The character of a fault (discrete fault versus fault zone) is specified as a feature attribute in the geologic map  
842 database. In addition, a fault zone can be portrayed either by a specialized line symbol or, if the map scale  
843 allows, by a colored or patterned area (see Appendix A, Section 2). Unless otherwise stated on the map or in the  
844 geologic map database, a generic fault (that is, one not portrayed as an area or by a specialized line symbol)  
845 should be considered discrete at the scale of the map.

#### 846 **3.4.4 Folds**

847 In its simplest sense, a *fold* is a geologic structure that results when a flat-lying or otherwise undeformed  
848 geologic surface is warped and deformed into an undulating geologic surface. In reality, many fold structures  
849 further deform bodies of rock that may already be highly deformed and (or) metamorphosed. Thus, folds may  
850 form simple, symmetric structures, or they may form complex, multidimensional and multigenerational fold  
851 systems.

852 The *fold axis* or *hinge line* of a fold is a hypothetical line that traces the locus of maximum curvature of the fold  
853 structure. The *axial surface* or *axial plane* of a fold is a hypothetical planar surface that connects the fold axes  
854 or hinge lines of folded strata.

855 Folds can be classified as one of a number of fold types, depending on the geometry of the fold's axial surface  
856 and the geometry and the relative ages of the folded strata. Examples of fold types include the following:  
857 anticline, syncline, monocline; antiform, synform; symmetrical, asymmetrical, overturned, inverted, isoclinal,  
858 recumbent, and plunging.

859 Information about a fold's type is specified as a feature attribute in the geologic map database. In addition, such  
860 information is portrayed on the geologic map by specialized line symbols and line-symbol decorations (see  
861 Appendix A, Section 5). On a geologic map, a fold is mapped as a line where the trace of its axial surface  
862 intersects the ground surface. In some cases, the trace of a fold's *crest line* (highest point on a fold's crest) or  
863 *trough line* (lowest point in a fold's trough) can also be mapped.

864 The age of a fold also can be specified as a feature attribute in the geologic map database, but rarely is this  
865 characteristic symbolized on the geologic map; if desired, such information can be communicated through the  
866 addition of geologic point data or annotation placed along the trace of the fold. In addition, specific data  
867 collected about a fold's local orientation can be added as geologic point data and annotation placed along the  
868 trace of the fold where the observation was made.

#### 869 **3.5 LINEAR GEOLOGIC FEATURES**

870 A *linear geologic feature* is a one-dimensional geologic or geomorphic line, which may be either a real-world,

871 physical line (for example, a fault-scarp lineament or an outcrop-scale lineation) or a hypothetical line (for  
872 example, a hinge line of a fold or a paleocurrent direction). The geometry of the line may be straight, curved, or  
873 crenulated, and its orientation may be horizontal, inclined, or vertical.

874 The orientations of linear geologic features are mapped in the field and then plotted as lines on a base map.  
875 Information about the various types of linear geologic features is specified as a feature attribute in the geologic  
876 map database. In addition, such information is represented on a geologic map by a unique line symbol  
877 (Appendix A), each of which has a different width, pattern, ornamentation, or color; thus, a particular line  
878 symbol conveys specific information about the character and (or) geometry of each linear geologic feature.

### 879 **3.6 GEOLOGIC POINT FEATURES**

880 A *geologic point feature* consists of geologic or geomorphic information that has been collected at a particular  
881 point of observation in the field (except when that point feature is a line-symbol decoration; see discussion  
882 below in Section 3.6.3.2, entitled "Line-Symbol Decorations"). In some field situations, more than one  
883 observation can be taken at a single locality.

884 Geologic point data may pertain to a planar feature (for example, the orientation of bedded strata), a linear  
885 feature (for example, the plunge of a fold axis), or a single locality (for example, a fossil locality). Geologic  
886 point data also can be added as line-symbol decorations (for example, anticline arrows) that provide  
887 supplemental information about a particular part of a line on a geologic map.

888 Geologic point data are recorded in the field and then plotted as points on a base map. Information about the  
889 various types of geologic point data is specified as a feature attribute in the geologic map database. In addition,  
890 such information usually is represented on a geologic map by specialized point symbols and associated  
891 annotation (Appendix A).

#### 892 **3.6.1 Planar-Feature Geologic Point Data**

893 *Planar-feature geologic point data* consist of quantitative information about the character and the orientation of  
894 a geologic surface, which may be a physical surface (for example, a fault plane or bedded strata) or a  
895 hypothetical surface (for example, an axial surface of a fold or a plane of foliation). The geologic surface may  
896 be horizontal, inclined, vertical, or overturned.

897 Two measurements, the *strike* and the *dip*, define the orientation of a geologic surface in three-dimensional  
898 space:

- 899 • the *strike* of a surface is the azimuthal direction of a hypothetical line formed by the intersection of the  
900 surface with an imaginary horizontal surface, as measured in the direction that the observer is facing when  
901 the surface dips down to the right (this method of directional measurement follows the *right-hand rule*  
902 convention);
- 903 • the *dip* of a surface is the angle of departure of that surface downward from horizontal, as measured

904 perpendicular to the line of strike.

905 Information about the type of observation, as well as the values of strike and dip, is specified as feature  
906 attributes in the geologic map database. Such information also is represented on the geologic map by  
907 specialized point symbols and associated annotation: the strike value and the direction of dip are implicit in the  
908 orientation of the point symbol; the dip value is added as annotation.

### 909 ***3.6.1.1 Point Symbols for Planar Features, and Their Placement Relative to Point of Observation***

910 The point symbols for inclined or overturned planar features typically are made up of two parts: a long shaft  
911 oriented in the strike direction, and a short tick (or ornamentation such as a triangle) pointing in the downdip  
912 direction. The point symbol is placed on the map so that the intersection of its long shaft and short tick (or  
913 ornamentation) is at the point of observation. When data have been collected about the local orientation of a  
914 planar feature that has been represented on the map by a line symbol (for example, the dip of a contact or a  
915 fault), the point symbol is placed directly on the line symbol at the point of observation.

916 The point symbols for vertical planar features are similar to those for inclined surfaces, except that two short  
917 ticks (or ornamentations), not one, point away from the long shaft. The point symbol is placed on the map so  
918 that the intersection of its long shaft and short ticks (or ornamentations) is at the point of observation.

919 The point symbols for horizontal planar features, which display no directional information, are simply placed on  
920 the map at the point of observation.

### 921 ***3.6.1.2 Specialized Planar-Feature Point Symbols for Multiple Observations at One Locality***

922 In situations where more than one observation has been taken at a single locality, point symbols for planar  
923 features can be combined with other point symbols at the point of observation. In these cases, specialized point  
924 symbols may be used to avoid the overprinting of information. These specialized point symbols have the short  
925 ticks (or ornamentations such as triangles) moved down near the end of the long shafts; the symbols are joined  
926 at their endpoints (opposite the ticks or ornamentations) at the point of observation.

## 927 **3.6.2 Linear-Feature Geologic Point Data**

928 *Linear-feature geologic point data* consist of quantitative information about the orientation of a geologic or  
929 geomorphic linear feature, which may be a physical line (for example, a fault-plane groove or slickenline) or a  
930 hypothetical line (for example, the intersection of two surfaces of deformation). The geologic or geomorphic  
931 linear feature may be horizontal, inclined, or vertical.

932 Two measurements, the *bearing* and the *plunge*, define the orientation of a geologic or geomorphic line in  
933 three-dimensional space:

- 934 • the *bearing* of a line is the azimuthal direction of the trend of that line, as measured in its direction of plunge;
- 935 • the *plunge* of a line is the angle of departure of that line downward from horizontal.

936 Information about the type of observation, as well as the values of bearing and plunge, is specified as attributes  
937 in the geologic map database. Such information also is represented on the geologic map by specialized point  
938 symbols and associated annotation: the bearing value and the direction of plunge are implicit in the orientation  
939 of the point symbol; the plunge value is added as annotation.

#### 940 ***3.6.2.1 Point Symbols for Linear Features, and Their Placement Relative to Point of Observation***

941 The point symbols for inclined linear features typically are made up of two parts: a shaft oriented in the bearing  
942 direction, and an arrowhead pointing in the plunge direction. The symbol is placed on the map so that the end of  
943 its shaft opposite the arrowhead is at the point of observation. When data have been collected about the local  
944 orientation of a linear feature that has been represented on the map by a line symbol (for example, a lineation on  
945 a fault), the point symbol is placed directly on the line symbol at the point of observation.

946 The point symbols for horizontal linear features are similar to those for inclined linear features, except that  
947 arrowheads are at both ends of the long shaft. The symbol is placed on the map so that the middle of its shaft is  
948 at the point of observation.

949 The point symbols for vertical linear features, which display no directional information, are simply placed on  
950 the map at the point of observation.

951 In situations where more than one observation has been taken at a single locality, point symbols for linear  
952 features can be combined with other point symbols at the point of observation. When a single linear-feature  
953 observation and a single planar-feature observation are taken at a single locality, the symbols are combined so  
954 that the end of the arrow that represents the linear feature is placed at the intersection of the planar-feature point  
955 symbol's long shaft and short tick (or ornamentation). When more than two such observations are taken at a  
956 single locality, the point symbols for linear features are joined at their endpoints with the specialized point  
957 symbols for planar features (see Section 3.6.1.2 above, entitled "Specialized Planar-Feature Point Symbols for  
958 Multiple Observations at One Locality") at the point of observation.

#### 959 **3.6.3 Informational Geologic Point Data**

960 *Informational geologic point data* consist of geologic information that is supplemental to a typical geologic map  
961 or its features. Informational geologic point data are divided into two types: *locality-information point data*, and  
962 *line-symbol decorations*.

##### 963 ***3.6.3.1 Locality-Information Point Data***

964 *Locality-information point data* record information collected at a particular locality (for example, fossil  
965 localities or sample localities). The type of data collected at the locality is specified as a feature attribute in the  
966 geologic map database. In addition, such information commonly is represented on the geologic map by a  
967 specialized point symbol placed at the point of observation. Sample numbers or other identifying labels are  
968 added as annotation near the point symbols.

969 **3.6.3.2 Line-Symbol Decorations**

970 *Line-symbol decorations* are specialized point symbols that convey qualitative information about the character  
971 of a particular line or line segment (for example, anticline arrows or ball-and-bar symbols). The type of line-  
972 symbol decoration is specified as a feature attribute in the geologic map database. Line-symbol decorations are  
973 not placed at a specific point of observation because they do not represent information collected at a particular  
974 locality; instead, they should be placed at a strategic location (or locations) along the trace of a line symbol in  
975 order to clearly communicate information about the nature of that line.

976 **4. SCIENTIFIC CONFIDENCE AND LOCATIONAL ACCURACY OF GEOLOGIC**  
977 **FEATURES**

978 Another important concept in geologic mapping is a geologist's level of confidence in the interpretation of  
979 features observed in the field. Many factors can adversely affect a geologist's level of confidence when  
980 mapping, and field situations often arise in which the interpretation of a feature may be in question, as indicated  
981 by the following examples:

- 982 • a planar feature is well-exposed in outcrop, but it is not easily identifiable as either a contact or a fault;
- 983 • a contact is clearly exposed in a roadcut, but its trace cannot be followed away from that roadcut;
- 984 • a fault's trace is obscured by vegetation, and so both its location and its sense of offset cannot be definitively  
985 determined;
- 986 • a fault's trace is completely concealed beneath valley fill.

987 As these examples show, uncertainties can exist in either the scientific interpretation or the mapped location of a  
988 feature (or in both). Therefore, not only is it important to communicate to the map user the level of confidence  
989 in each geologic map feature, but also which type of uncertainty (scientific and (or) locational) may be  
990 associated with that feature.

991 Traditionally, a system of solid, dashed, dotted, or queried line symbol styles (see, for example, Ridgway, 1920,  
992 plate 2) has been used on geologic maps to show levels of locational accuracy of planar and linear geologic  
993 features observed in the field. This convention followed USGS Director Powell's 1888 policy, which stipulated  
994 that "fault lines (particularly when they are formation boundaries) shall be indicated when actually traced by  
995 somewhat heavy full lines in black; and when not actually traced, by similar broken lines" (Powell, 1890, p. 76).  
996 More guidance was provided in 1956 by USGS Chief Geologist W.H. Bradley, who, in a memorandum to  
997 USGS personnel regarding geologic map standards, stated, "The accuracy of location of faults and contacts  
998 should be shown by appropriate symbols ... Solid lines should be used to indicate accurate locations of features  
999 that are geologically identifiable within the plottable limits of the map ... Features that are only approximately  
1000 located should be shown by long dashed lines; those that are indefinite or inferred, by short dashed lines; and  
1001 those that are concealed, by dotted lines" (W.H. Bradley, written commun., 1956). To further encourage the use

1002 of such symbology, Bradley added, "The use of many dashed contacts or faults on a map is not to be construed  
1003 as a detraction from the quality of the map, and for many maps, it may be undesirable or impossible to achieve  
1004 sufficiently accurate locations to permit use of solid lines. The quality of the map is not impaired so long as the  
1005 reader can interpret the accuracy of location" (W.H. Bradley, written commun., 1956).

1006 In conjunction with these traditional line symbol styles, geologists at various times have used terms such as  
1007 "known," "probable," "certain," "uncertain," "accurately located," "approximately located," "inferred,"  
1008 "projected," "concealed," and "queried" to express the levels of confidence of planar and linear geologic  
1009 features. However, these terms and their associated line symbol styles have not been used consistently from  
1010 region to region or from map to map. Also, it has not been always clear whether they reflect uncertainty in a  
1011 feature's scientific interpretation, its mapped location, or both.

1012 To facilitate the communication of geologic map information, this standard clarifies the concepts of, and  
1013 establishes the attributes for, the levels of scientific confidence and locational accuracy of geologic map  
1014 features. In addition, to facilitate the cartographic representation of geologic map information, this standard  
1015 establishes new terminology that expresses both these concepts.

#### 1016 **4.1 SCIENTIFIC CONFIDENCE**

1017 *Scientific confidence* expresses a geologist's level of certainty regarding the nature, origin, geometry, identity,  
1018 and even the existence of a geologic feature. The characteristics of the geologic materials and structures, the  
1019 number of outcrops, and the availability of subsurface or geophysical data directly affect the level of scientific  
1020 confidence in any area. Experience and resources available to a geologist also affect scientific confidence.  
1021 These fundamental characteristics of geologic features can be grouped into two distinct but related concepts,  
1022 *identity* and *existence*.

##### 1023 **4.1.1 Identity**

1024 *Identity* expresses whether or not the observations and data support the stated nature, origin, or geometry of a  
1025 mapped geologic feature (for example, a contact versus a fault, or a normal fault versus a thrust fault). The  
1026 concept of identity is communicated in the following two ways:

- 1027 • in the geologic map database, the attribute describing the confidence in a feature's identity is specified as  
1028 either *certain* or *questionable*;
- 1029 • on the geologic map, the confidence in a feature's identity is communicated in the symbol explanation and  
1030 (or) the map unit description (see Section 4.1.3 below, entitled "Levels of Scientific Confidence") and also,  
1031 for some types of geologic map features, conveyed cartographically (see Section 4.1.4 below, entitled  
1032 "Cartographic Representation of Scientific Confidence").

##### 1033 **4.1.2 Existence**

1034 *Existence* expresses whether or not the observations and data support the continuity or existence of a concealed

1035 or an otherwise unseen geologic feature (for example, a postulated fault or a subsurface fault). The concept of  
1036 existence is communicated in the following two ways:

- 1037 • in the geologic map database, the attribute describing the confidence in a feature's existence is specified as  
1038 either *certain* or *questionable*;
- 1039 • on the geologic map, the confidence in a feature's existence is communicated in the symbol explanation and  
1040 (or) the map unit description (see Section 4.1.3 below, entitled "Levels of Scientific Confidence") and also,  
1041 for some types of geologic map features, conveyed cartographically (see Section 4.1.4 below, entitled  
1042 "Cartographic Representation of Scientific Confidence").

### 1043 **4.1.3 Levels of Scientific Confidence**

1044 A geologic map must communicate to the map user the level of scientific confidence associated with each  
1045 mapped feature (both its identity and its existence). In a geologic map database, this information is contained in  
1046 two attribute fields, identity (*certain, questionable*), and existence (*certain, questionable*). To facilitate the  
1047 communication of the two concepts of identity and existence on a geologic map, this standard sets forth the  
1048 following new terminology, which expresses clearly yet concisely the levels of scientific confidence of geologic  
1049 features (see figure 1 for the relation of this new terminology to historically used terminology):

1050 "*Identity and existence certain*" Both the identity and the existence of a feature can be determined using  
1051 relevant observations and scientific judgment; therefore, one can be  
1052 reasonably confident in the scientific credibility of this interpretation.  
1053 These criteria are met, for example, when a geologist reasons, "*I am*  
1054 *certain that the planar feature I see in this outcrop is a fault.*" This is the  
1055 default condition for all geologic map features unless otherwise stated on  
1056 the geologic map or in the geologic map database.

1057 "*Identity or existence questionable*" Either the identity or the existence of a feature cannot be determined using  
1058 relevant observations and scientific judgment; therefore, one cannot be  
1059 reasonably confident in the scientific credibility of this interpretation.  
1060 These criteria are met, for example, when a geologist reasons, "*I can see*  
1061 *some kind of planar feature in this outcrop, but I cannot be certain if it is a*  
1062 *contact or a fault,*" or, "*My interpretation requires that a thrust fault be*  
1063 *present to account for incongruities in the stratigraphy of these rocks, but I*  
1064 *can't be certain because I haven't yet seen one here.*"

1065 This new terminology is intended to be used when choosing a particular style of symbol to represent a feature  
1066 on a geologic map (fig. 2), as well as when describing that feature in the symbol explanation and (or) the map  
1067 unit description. If a feature is symbolized or described as "identity or existence questionable," the map user  
1068 should consult the geologic map database for more complete information.

1069

| Symbol style <sup>1</sup> | Examples of historically used terminology | Newly revised FGDC standard terminology                           | Scientific confidence |                     | Locational confidence                                       |  |
|---------------------------|---|---|-----------------------|---------------------|---|--|
|                           |   |   | Identity ...          | Existence ...       | Location (in field) ...                                     | Position (on map) ...                  |
| —————                     | certain; known; accurately located        | identity and existence certain, location accurate <sup>2</sup>    | certain               | certain             | observable  | within zone of confidence <sup>6</sup> |
| —————?                    | [not available for newly defined symbol]  | identity or existence questionable, location accurate             | may be questionable   | may be questionable | observable  | within zone of confidence              |
| —————                     | approximately located                     | identity and existence certain, location approximate <sup>3</sup> | certain               | certain             | observable  | may not be within zone of confidence   |
| —————?                    | approximately located, queried            | identity or existence questionable, location approximate          | may be questionable   | may be questionable | observable  | may not be within zone of confidence   |
| —————                     | inferred; probable; projected             | identity and existence certain, location inferred <sup>4</sup>    | certain               | certain             | inferred (between outcrops or beneath rubble or vegetation) | may not be within zone of confidence   |
| ---?---?---               | inferred, queried                         | identity or existence questionable, location inferred             | may be questionable   | may be questionable | inferred (between outcrops or beneath rubble or vegetation) | may not be within zone of confidence   |
| -----                     | concealed; projected                      | identity and existence certain, location concealed <sup>5</sup>   | certain               | certain             | concealed (beneath overlying map unit, ice, or water)       | may not be within zone of confidence   |
| -----?-----?              | concealed, queried                        | identity or existence questionable, location concealed            | may be questionable   | may be questionable | concealed (beneath overlying map unit, ice, or water)       | may not be within zone of confidence   |

<sup>1</sup> Queries are added to symbols to indicate that a feature's scientific confidence (that is, either its identity or its existence) may be in question.  
<sup>2</sup> The term "location accurate" is used when a feature is observable, and its plotted position on the map is within the zone of confidence.  
<sup>3</sup> The term "location approximate" is used when a feature is observable, but its plotted position on the map may not be within the zone of confidence.  
<sup>4</sup> The term "location inferred" is used when a feature's location must be inferred between outcrops or beneath rubble or vegetation, and so its plotted position on the map may not be within the zone of confidence.  
<sup>5</sup> The term "location concealed" is used when a feature is concealed beneath an overlying map unit, ice, or water, and so its plotted position on the map may not be within the zone of confidence.  
<sup>6</sup> The zone of confidence for a particular map or mapped area is specified by the mapping geologists and their agencies.

**Figure 1.** Diagram showing relation of new FGDC standard terminology to historically used terminology and to traditional line symbol styles.

1070



1073 **4.1.4 Cartographic Representation of Scientific Confidence**

1074 For most types of geologic map features, queries are used to communicate the lack of scientific confidence in a  
1075 feature. A queried line symbol indicates that either the identity or the existence of a planar or linear feature may  
1076 be in question (figs. 1,2; see also, Appendix A); the map user should consult the geologic map database for  
1077 more complete information. In contrast, a line symbol without a query most likely indicates that both the  
1078 identity and the existence of a planar or linear feature are certain, unless otherwise stated in the geologic map  
1079 database.

1080 For geologic point data, queries are not added to point symbols to indicate that the scientific confidence of a  
1081 feature may be in question. However, a limited amount of specialized symbology has evolved to express the  
1082 scientific confidence of certain types of geologic point information; for example, to indicate that the direction of  
1083 stratigraphic top is known, a small ball may be added to bedding and foliation symbols (see Appendix A,  
1084 Sections 6 and 8, respectively). In addition, queries may be added to dip or plunge values, both on the geologic  
1085 map and in the geologic map database, if those measurements are questionable.

1086 A queried map-unit label indicates that either the identity or existence of the geologic map unit may be in  
1087 question.

1088 **4.2 LOCATIONAL ACCURACY**

1089 *Locational accuracy* is based on the relation between a mapped feature's location in the field and its position on  
1090 the base map. Information about the locational accuracy of mapped features is important to all disciplines, even  
1091 those in which mapped features commonly are directly observable and can be positioned with a significant  
1092 degree of accuracy (for example, roads or utilities). It is especially critical in the natural sciences, however,  
1093 because many mapped features are either interpretive or not directly observable.

1094 The process of locating a feature in the field and then positioning it on a base map is complex, and the  
1095 locational accuracy of a mapped feature is not easily described or quantified. To evaluate the locational  
1096 accuracy of a mapped feature, a geologist must consider the following three factors:

- 1097 • the nature of the feature and its degree of exposure (for example, a contact may be gradational or sharp, and  
1098 either poorly exposed or well-exposed);
- 1099 • the quality of the base map (for example, whether the cultural or topographic features on the base map are  
1100 positioned accurately, according to the geologist's observations);
- 1101 • the confidence in accurately positioning the feature relative to the base-map information.

1102 Together, these factors determine a geologist's confidence in the locational accuracy of the features on the map.  
1103 Locational accuracy is expressed by two distinct but related concepts, *locatability* and *positioning*.

1104

1105 **4.2.1 Locatability**

1106 *Locatability* expresses whether or not a geologist can clearly observe a feature *in the field*, as indicated by the  
1107 following examples:

- 1108 • a planar or linear feature is observable in several outcrops along its trace;
- 1109 • a planar or linear feature is observable in only a few outcrops along its trace, but its physical characteristics  
1110 permit locating it between outcrops by indirect methods;
- 1111 • a planar or linear feature is not defined by a distinctive physical trace and so is not observable beneath either  
1112 vegetation, a thin veneer of unmapped geologic material (colluvium, eolian deposits, or residual soil), or  
1113 man-made features, therefore its location must be inferred by indirect means;
- 1114 • a planar or linear feature is not observable because it is concealed by an overlying geologic map unit,  
1115 although it may be observable nearby (for example, a thrust fault is visible on both sides of a glacial valley,  
1116 but its location within the valley is concealed by ice), and so its location must be projected beneath the  
1117 overlying map unit.

1118 As the above examples show, uncertainty in a feature's locatability can arise in a number of geologic situations.  
1119 The concept of locatability is communicated in the following two ways:

- 1120 • in the geologic map database, the attribute describing the confidence in a feature's locatability is specified as  
1121 either *observable*, *inferred*, or *concealed*;
- 1122 • on the geologic map, the confidence in a feature's locatability is communicated in the symbol explanation and  
1123 (or) the map unit description (see Section 4.2.3 below, entitled "Levels of Locational Accuracy") and also,  
1124 for some types of geologic map features, conveyed cartographically (see Section 4.2.4 below, entitled  
1125 "Cartographic Representation of Locational Accuracy").

1126 **4.2.2 Positioning**

1127 *Positioning* expresses the degree of confidence with which a feature is plotted *on the base map*. Commonly, a  
1128 feature can be accurately plotted on the map because the base-map information is accurate, detailed, and  
1129 distinctive. However, in some field situations, a feature cannot be confidently plotted on the base map, as  
1130 indicated by the following examples:

- 1131 • a feature is observable, but its position on the map cannot be plotted accurately because topographic contours,  
1132 drainage lines, or cultural information on the base map is insufficiently detailed for the feature to be  
1133 confidently located relative to the various base-map features (for example, a contact is observable in  
1134 outcrop, but its location in relatively featureless terrain prevents its position from being plotted accurately on  
1135 the base map);
- 1136 • a feature is observable, and its geographic coordinates can be determined in the field by using either a Global

1137 Positioning System (GPS) device or in the laboratory by using a georeferenced aerial photographic  
1138 stereopair; however, the geographic relation between these coordinates and the topographic or cultural  
1139 setting shown on the base map is not compatible (for example, a feature was mapped on a hillside, but the  
1140 GPS-derived coordinates, when plotted on the base map, place its position in a valley bottom).

1141 In such situations, either a feature can be plotted relative to the indistinct or incompatible base-map features, or  
1142 the locations of topographic contours or other base-map features can be adjusted (the latter approach is not  
1143 encouraged unless it is done systematically and is well-documented). In either case, the inherent uncertainty in a  
1144 feature's positioning must be communicated to the map user, both on the geologic map and in the geologic map  
1145 database (see discussion in Section 4.2.2.1 below, entitled "Specifying Positional Accuracy with the Zone of  
1146 Confidence").

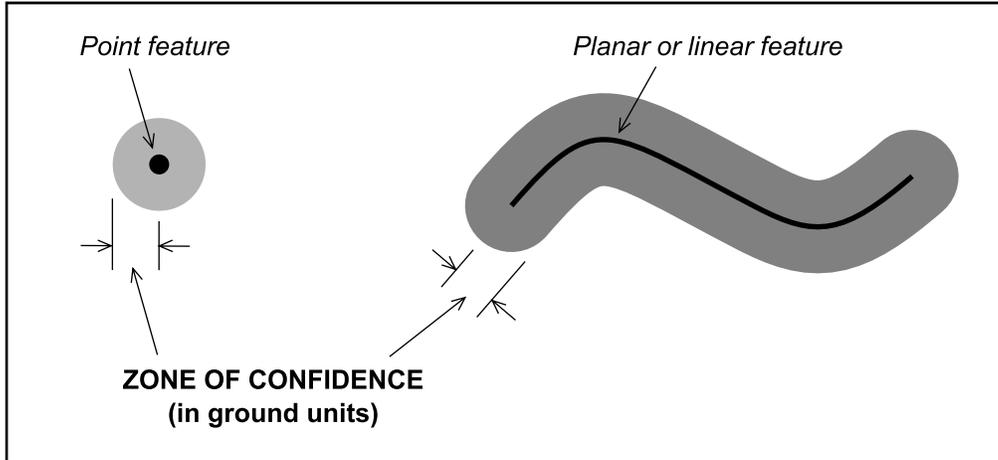
1147 In the USGS, stringent policies for the accuracy with which an observable feature can be positioned on the base  
1148 map have been put forth in the past. For example, Chief Geologist W.H. Bradley's 1956 memorandum to the  
1149 staff advocated a geologic map accuracy standard based on the United States National Map Accuracy Standards  
1150 (NMAPS) for topographic and other types of base maps. The geologic map adaptation of the NMAPS stipulated  
1151 that "features that ... can be located from exposures or other evidence [should be positioned] within 1/25 inch  
1152 [on the map] of their true map position" (W.H. Bradley, written commun., 1956; see also, U.S. Geological  
1153 Survey, 1995a, Part 1, p. 1.0-4). These earlier efforts to quantify the positional accuracy of geologic features  
1154 were not widely adopted by the geoscience community, likely in part because of (1) the difficulty in translating  
1155 to geologic mapping a concept designed for topographic and other types of base maps, (2) the impracticality of  
1156 requiring that all geologic map information meet the same accuracy criteria uniformly across the Nation, in all  
1157 types of geologic and topographic settings, and (3) the need to convert ground distance to publication-scale  
1158 cartographic units before evaluating if a feature is plotted accurately on a base map.

1159 In contrast, this standard advocates a more flexible and conceptually simpler approach in which the accuracy  
1160 criteria can be defined for each project so that the specified positional accuracy takes into account the character  
1161 of the geologic setting and other factors (see below). In addition, if the geologic map adaptation of the NMAPS  
1162 (1/25 inch on the map) has been used when mapping, this value can be specified (1/25 inch on the map must  
1163 first be converted to ground units).

#### 1164 ***4.2.2.1 Specifying Positional Accuracy with the Zone of Confidence***

1165 When a feature is drawn or digitized onto a base map, a geologist commonly has some sense of confidence  
1166 regarding whether or not the feature is positioned accurately, depending on the quality of the base map and the  
1167 ability to position features on that base map. This positioning confidence can be characterized as the likelihood  
1168 that the feature actually occurs within a certain, roughly defined distance from where it is positioned on the base  
1169 map. This hypothetical distance, which extends outward from a feature's position on the map, is herein defined  
1170 as the *zone of confidence*, and its numerical value quantifies a feature's positional accuracy as follows:

1171



**Figure 3.** Figure showing examples of the zone of confidence for planar, linear, and point features. The region within which a *point* feature can be considered to be accurately positioned (on a base map) is a circle (light-shaded area above) around the point, and the value of the zone of confidence is the radius of that circle, in ground units. For a *planar* or *linear* feature, the region is a buffer zone (dark-shaded area above) surrounding the line, and the value of the zone of confidence is the distance from the line to the edge of the buffer zone, in ground units.

1172

1173 • for planar and linear geologic features, the *zone of confidence* borders the feature along both sides, forming  
1174 what is described in GIS terminology as a buffer zone, and its numerical value is specified as the  
1175 approximate distance in ground units (feet or meters) from the feature to the edge of the buffer zone (fig. 3);

1176 • for geologic point features, the *zone of confidence* is concentric around the feature, forming a circle, and its  
1177 numerical value is the approximate radius of that circle (fig. 3).

1178 For any geologic map or mapped area, the numerical value of the zone of confidence will depend on a number  
1179 of factors: the area's geology, landscape terrain, vegetation cover, and (or) cultural features; the scale of  
1180 mapping; the quality and nature of the base map used; and (or) a particular project's allotted field-mapping time  
1181 or other logistical constraints. Because this standard recognizes that the factors affecting the value of the zone of  
1182 confidence will vary from region to region (and from map to map), and because different agencies have  
1183 differing mapping needs and mandates, a single, universally applicable value for the zone of confidence is not  
1184 herein established. Instead, this standard advocates that the responsibility for setting the value of the zone of  
1185 confidence for a particular geologic map or mapped area lies with each geoscience organization and each  
1186 mapping geologist.

1187 In the geologic map database, the attributes describing positioning confidence, which are expressed in terms of  
1188 the zone of confidence, are as follows:

1189 • a numerical value for the zone of confidence is specified (for example, *5 meters*);

1190 • a feature's positioning is specified as being either "*within zone of confidence*" or "*may not be within zone of*  
1191 *confidence*" (note that this standard does not stipulate that a feature whose positioning is specified as "may  
1192 not be within zone of confidence" must *necessarily* be located outside the zone of confidence, but simply  
1193 that it *may* be).

1194 On the geologic map, positioning confidence is communicated in the symbol explanation and (or) the map unit  
1195 description (see Section 4.2.3 below, entitled "Levels of Locational Accuracy") and also, for some types of  
1196 geologic map features, conveyed cartographically (see Section 4.2.4 below, entitled "Cartographic  
1197 Representation of Locational Accuracy"). In addition, the numerical value of the zone of confidence is  
1198 indicated, either in a general statement (if one value applies to the entire mapped area) or shown in an index  
1199 map (if different values apply to different mapped areas; see Section 4.2.2.2 below, entitled "Accommodating  
1200 Different Values of the Zone of Confidence"). Likewise, if the geologic map adaptation of the NMAS (1/25  
1201 inch on the map, converted to ground units) has been used during field mapping as a measure of positioning  
1202 confidence, or if a zone of confidence was not used during field mapping or map compilation, this also is  
1203 indicated.

#### 1204 ***4.2.2.2 Accommodating Different Values of the Zone of Confidence***

1205 For many geologic maps or mapped areas, especially those that are defined by latitude and longitude (for  
1206 example, quadrangle maps) or political boundaries (for example, state or county maps), one map may contain  
1207 areas of vastly contrasting geology, topography, vegetation cover, and (or) societal infrastructure, and so  
1208 different positional accuracy criteria can exist within a single map. For example, a geologic map may include  
1209 both a mountain range underlain by well-bedded sedimentary rocks and a broad alluvial valley underlain by  
1210 mostly surficial deposits. In the mountains, clear distinction among the sedimentary rocks, as well as their high  
1211 relief, may provide a geologist with a significantly higher sense of confidence in the position of contacts than in  
1212 the adjacent valley, where few topographic landmarks or contours exist and where contacts may be gradational  
1213 and obscured by vegetation and soil cover. In geologic settings as diverse as these, the levels of confidence in  
1214 positional accuracy will be different, and so a geologist has the following two choices:

- 1215 • express the differences in positioning confidence solely by differences in symbology (for example, specify  
1216 one zone of confidence value for both areas, which might result in mostly solid-line contacts in the  
1217 mountains and mostly dashed- or dotted-line contacts in the valley);
- 1218 • express the differences in positioning confidence by specifying different values of the zone of confidence for  
1219 each area (for example, specify the zone of confidence value as 5 meters in the mountains and 15 meters in  
1220 the valley).

1221 The choice might depend on the magnitude of the difference between the areas, or on the geologist's level of  
1222 confidence in the positional accuracy of features across the map area.

1223 Map compilations represent another example where different positional accuracy criteria can exist within a

1224 single map. A map compilation is made up of several source maps or mapped areas, each of which may have  
1225 had a different value specified for the zone of confidence (or perhaps no value had been specified). These  
1226 variations in the specified value of the zone of confidence should be preserved in the map compilation as well.  
1227 In situations in which the numerical values of the zone of confidence are different for different areas across the  
1228 geologic map, the differences must be communicated to the map user. In the geologic map database, variations  
1229 in the value of the zone of confidence can be readily accommodated because each feature is assigned (as an  
1230 attribute in the database) the value of the zone of confidence that has been specified for a particular area. On the  
1231 geologic map, areas that have different values of the zone of confidence should be shown in an index map.

### 1232 **4.2.3 Levels of Locational Accuracy**

1233 A geologic map must communicate to the map user the level of locational accuracy associated with each  
1234 mapped feature (both its locatability in the field and its positioning on the base map). In the geologic map  
1235 database, this information is contained in the following three attribute fields: (1) locatability (*observable,*  
1236 *inferred, concealed*); (2) positioning (*within zone of confidence, may not be within zone of confidence*); and (3)  
1237 the numerical value of the zone of confidence (for example, *5 meters*).

1238 To facilitate the communication of the two concepts of locatability and positioning on a geologic map, this  
1239 standard sets forth the following revised terminology, which expresses clearly yet concisely the levels of  
1240 locational accuracy of geologic features (see figure 1 for the relation of this revised terminology to historically  
1241 used terminology):

1242 "*Location accurate*" A feature is observable, and its plotted position on the map is within the declared zone  
1243 of confidence. These criteria are met, for example, when a geologist reasons, "*I can*  
1244 *clearly see this contact in outcrop, and I can accurately plot its position on the map.*"  
1245 This is the default condition for all geologic map features unless otherwise stated on  
1246 the geologic map or in the geologic map database.

1247 "*Location approximate*" A feature is observable, but its plotted position on the map may not be within the  
1248 declared zone of confidence. These criteria are met, for example, when a geologist  
1249 reasons, "*I can see this contact in outcrop, but I can't tell exactly where it is located*  
1250 *because I am surrounded by trees,*" or, "*I can see this contact in outcrop, but the poor*  
1251 *quality of my base map prohibits me from accurately plotting its position,*" or, "*I can*  
1252 *see that the width of the gradational contact between these two map units exceeds my*  
1253 *value of the zone of confidence, and so, although my base map is of high quality, my*  
1254 *confidence in the accuracy of its plotted position is not high.*"

1255 "*Location inferred*" A feature is not directly observable between outcrops or beneath rubble or vegetation,  
1256 so its location must be inferred by indirect means; by definition, its plotted position on  
1257 the map may not be within the declared zone of confidence. These criteria are met, for

1258 example, when a geologist reasons, "*I can see by the change in debris materials*  
1259 *visible around these gopher holes that a contact runs through here, but I can't locate*  
1260 *it very precisely.*"

1261 "*Location concealed*" A feature is not observable because it is completely concealed beneath an overlying  
1262 map unit or body of water or ice (although it may be observable nearby); by  
1263 definition, its plotted position on the map may not be within the declared zone of  
1264 confidence. These criteria are met, for example, when a geologist reasons, "*I can see*  
1265 *that a contact is present on both sides of this lake, but I can't tell where it is located*  
1266 *beneath the water.*"

1267 This revised terminology is intended to be used when choosing a particular style of symbol to represent a  
1268 feature on a geologic map (fig. 2), as well as when describing that feature in the symbol explanation and (or) the  
1269 map unit description.

#### 1270 **4.2.4 Cartographic Representation of Locational Accuracy**

1271 A system of solid, dashed, dotted, and queried line symbols has long been used on geologic maps to convey the  
1272 uncertainty of planar and linear geologic features (fig. 1), but it has not always been clear whether these line  
1273 symbol styles reflect uncertainty in a feature's scientific interpretation, its mapped location, or both. This  
1274 standard clarifies the use of these line symbols (figs. 1,2) by applying its revised terminology for locational  
1275 accuracy (see Section 4.2.3 above, entitled "Levels of Locational Accuracy") to the following line symbol  
1276 styles<sup>2</sup>:

- 1277 • a solid, continuous line symbol indicates that the location of a feature is accurate; that is, its location in the  
1278 field either is readily observable in outcrop or is revealed by the characteristic geomorphic expression of its  
1279 trace, without extensive cover of thin overlying surficial deposits, and is verifiable by shallow excavations;  
1280 in addition, it can be accurately plotted because base-map information is accurate, detailed, and distinctive,  
1281 and so its position on the base map is within the declared zone of confidence.
- 1282 • a long-dashed line symbol indicates that the location of a feature is approximate; that is, its location in the  
1283 field either is readily observable in outcrop or is revealed by the characteristic geomorphic expression of its  
1284 trace, without extensive cover of thin overlying surficial deposits, and is verifiable by shallow excavations;  
1285 however, it cannot be accurately plotted because base-map information is inaccurate, indistinct, or  
1286 incompatible with the location of the geologic feature, and so its position on the base map may not be within  
1287 the declared zone of confidence.
- 1288 • a short-dashed line symbol indicates that the location of a feature is inferred; that is, its location in the field  
1289 generally is obscured by overlying (unmapped) surficial deposits, debris materials, or vegetation that may

---

<sup>2</sup> Note that this standard restricts the use of queries to represent the lack of scientific confidence only (see discussion in Section 4.1.4 above, entitled "Cartographic Representation of Scientific Confidence").

1290 cover exposures and the geomorphic expression of its trace, and has therefore been projected between few  
1291 outcrops; by definition, its position on the base map may not be within the declared zone of confidence.

1292 • a dotted<sup>3</sup> line symbol indicates that the location of a feature is concealed; that is, its location in the field is  
1293 covered by an overlying, mapped geologic unit, ice, or water; by definition, its position on the base map may  
1294 not be within the declared zone of confidence.

1295 These types of line symbol styles (solid, long-dashed, short-dashed, and dotted) are intended to be used to  
1296 convey the various levels of locational accuracy of planar and most types of linear geologic features.

1297 The locational accuracy of a geologic map unit is not expressed by a specialized symbol but, instead, by the  
1298 style of line symbols representing the planar features (contacts and faults) that bound it.

1299 In most cases, specialized point symbols are not used to indicate that the locational accuracy of a geologic point  
1300 feature may be in question. One exception is the specialized symbols that are used to portray bedding attitudes  
1301 that have been determined using aerial photographs (see Appendix A, Section 6); however, these symbols also  
1302 may be used to indicate that the scientific confidence (the measurement of dip) is in question, and so, when  
1303 these types of symbols are used on a geologic map, the map user should consult the geologic map database for  
1304 more complete information.

## 1305 **5. GUIDELINES FOR MAP COLOR AND PATTERN SELECTION**

1306 The goal in color design is to enhance the legibility of the map, as well as to lend meaning to the data presented  
1307 by helping to focus attention on a particular map feature or group of features. Colors and patterns should not,  
1308 however, be so visually dominant as to distract from the purpose of the map. A well-balanced color design can  
1309 greatly improve the presentation of scientific information.

### 1310 **5.1 FACTORS THAT INFLUENCE COLOR AND PATTERN SELECTION**

#### 1311 **5.1.1 Purpose of Map**

1312 Color is used differently on different types of maps. For example, on geologic maps, color is primarily  
1313 determined by age and type of rock, although other rules may apply for terrane maps or maps that portray only a  
1314 limited range of ages or types of rocks. In addition, some map units, because of their geologic or economic  
1315 importance, may need to be emphasized by selected colors.

1316 Geophysical maps use several color schemes, depending on the purpose of the data being shown; usually a  
1317 range of colors from dark to light is used. One such scheme is a graduated set of hues of similar value (for  
1318 example, purple and magenta to orange and red). Another is a rainbow of hues in which the values alternate  
1319 between full color and lightly screened color.

---

<sup>3</sup> In reality, dotted line symbols that are thinner than a certain lineweight are difficult to produce with some software applications; therefore, this standard substitutes a very-short-dashed line symbol as the cartographic standard (see figures 1,2; see also, Appendix A).

1320 On slope-stability maps, the brightest colors are used on areas of highest instability. Similarly, on volcanic- or  
1321 earthquake-hazard maps, areas of greatest hazard usually are shown in red, whereas areas of lowest hazard are  
1322 shown in yellow or green.

1323 Data on hydrologic maps are frequently shown in two or three colors. On maps showing depth to water table,  
1324 color ranges from light blue at the shallowest depths to dark blue at the greatest depths. On maps showing  
1325 dissolved-solids concentrations, color ranges from dark blue where concentration is lowest to dark red where  
1326 concentration is highest.

### 1327 **5.1.2 Age and Type of Rock**

1328 Whenever possible, colors for ages and rock types on geologic maps should follow the scheme presented in the  
1329 diagram showing "Suggested Ranges of Map-Unit Colors for Volcanic and Plutonic Rocks and for Stratigraphic  
1330 Ages of Sedimentary and Metamorphic Rocks" (see Appendix A, Section 33). However, it may not always be  
1331 feasible to show map units in the suggested color; in these cases, other characteristics should be emphasized  
1332 with color.

1333 On surficial maps, for example, it may be desirable to show all glacial deposits in one color, landslide deposits  
1334 in another, lacustrine deposits in another, and alluvial deposits in yet another. On terrane maps, color may be  
1335 used to show lithotectonic relations between various groups of rocks.

1336 On maps that are mostly one age group, it is best to distinguish sedimentary rocks from volcanic rocks (usually  
1337 shown in reds or other bright colors) and plutonic rocks (usually shown in pinks). On maps that are mostly one  
1338 type of rock, differentiation between different rock sequences can be shown through the use of different colors.

1339 On maps that cover a broad range of ages and rock types, relations between rocks within one age group can be  
1340 shown by using similar colors, whereas relations between the same type of rock in different age groups can be  
1341 shown by using patterns (for example, all volcanic rocks may have the same "v" pattern). Patterns should be  
1342 used sparingly, however, as their use can create an overly busy appearance; use them only when the complexity  
1343 of the map requires the diversity achieved by the use of patterns.

1344 Although it is preferable to follow the aforementioned guidelines, some rock types defy such guidelines because  
1345 they traditionally have been shown in a particular color. For example, serpentinite and other ultramafic rocks  
1346 characteristically are shown in purple; limestone usually is shown in bright blue; and glacial till often is shown  
1347 in light green.

### 1348 **5.1.3 Size of Map-Unit Areas**

1349 In general, small map-unit areas should be shown in darker colors and large areas should be shown in lighter  
1350 colors. An exception to this may be in situations when numerous small bands of map units are shown; in this  
1351 case it may be best to alternate light and dark colors. In the case of map units that consist of both large and  
1352 small areas, add labels and leaders to the smaller map units to avoid confusion. For guidelines and

1353 recommendations on the placement of map-unit labels and leaders, see Section 6 below, entitled "Guidelines for  
1354 Map Labeling."

1355 Because it is more difficult to clearly distinguish color in small areas, it is very important to choose as unique a  
1356 color as possible for map units that are present only in small areas. The minimum size of map-unit area that can  
1357 show color is about two square millimeters; anything smaller will need to be labeled. In addition, exercise  
1358 caution when using patterns in small areas because small areas may fail to show enough of the pattern to  
1359 adequately identify a map unit; about one square centimeter is the minimum size to clearly show patterns. If  
1360 there can be any ambiguity in a map-unit area's identification, it is safest to add a label and leader.

#### 1361 **5.1.4 Contrast**

1362 Adequate contrast enhances readability. A key factor is not so much the difference in hue, such as blue or green,  
1363 but the difference in intensity. Contrast should not, however, be so great as to be glaring, but it should be  
1364 significant enough for easy legibility. Map units that need to be emphasized should be assigned colors that stand  
1365 out and contrast well with the colors of less important units. In addition, greater contrast is required for small  
1366 areas, whereas a more subtle contrast is sufficient for larger areas.

### 1367 **5.2 SPECIFYING COLOR FOR MAP-UNIT AREAS**

1368 To maintain control of color output, color on maps and illustrations should always be specified using process-  
1369 color (CMYK, cyan/magenta/yellow/black) inks, regardless of the intended output medium. If another non-ink  
1370 color scheme such as RGB (red/green/blue) or HSV (hue/saturation/value) is used, then the output device (be it  
1371 printer, plotter, or imagesetter) will automatically convert the non-CMYK values to CMYK during output, and  
1372 unwanted color shifts often will take place. To aid in the selection of color fill for map units, a chart showing a  
1373 wide variety of CMYK colors ("CMYK Color Chart") has been included herein.

1374 Color values must be high enough to provide adequate contrast but not so great that they prevent the map-unit  
1375 labels, structure symbols, and topographic base from showing clearly. Except in small areas, magenta and cyan  
1376 should be used in intensities of 50% or less. A greater intensity of cyan might obscure drainage features  
1377 (commonly shown in cyan), and a greater intensity of magenta might obscure magenta fold axes and dikes.

1378 As a general rule, use a combination of CMYK color values that, when added together, totals 100 or less (for  
1379 example, 30% cyan/40% magenta/20% yellow;  $30+40+20 = 90$ ), especially in larger areas.

1380 To maintain enough contrast between two colors, keep at least a 20% difference between the values of one of  
1381 the CMYK colors (for example, 30% cyan/8% magenta/20% yellow and 30% cyan/8% magenta/40% yellow).

1382 Avoid using 8% yellow because it is too light and cannot easily be distinguished from white. In addition, it may  
1383 be wise to avoid using 13% or 20% cyan, as these colors may look like a body of water.

1384 On maps that are to be offset printed, it may be best to use a solid (100%) single-ink color such as cyan,  
1385 magenta, or yellow in very small map-unit areas to avoid misregistration problems. For example, 100% cyan

1386 may be used to show small limestone blocks in melange, or 100% magenta may be used to show thin rhyolite  
1387 intrusions.

### 1388 **5.3 USE OF PATTERNS**

1389 Patterns can be printed either in black, in color, or as a dropout. Ideally, patterns should be used sparingly and  
1390 only when necessary for clarification, as they can add unnecessary complexity to a map. To select appropriate  
1391 patterns for a map, both the type of rock and the size and (or) orientation of map-unit areas must be considered.  
1392 To aid in the selection of patterns for map units, a chart showing a wide variety of geologic patterns ("Pattern  
1393 Chart") has been included herein.

1394 Although some flexibility exists in the use of patterns, some patterns are traditionally and exclusively used for  
1395 certain rock types: for example, "+" patterns are used for plutonic rocks, and irregular "v" patterns represent  
1396 volcanic rocks. For map units that are present only in small areas, a tight, random pattern will fit more of the  
1397 pattern elements into a particular area. Exercise caution, however, when choosing metamorphic patterns that  
1398 display a strong directionality, as their use may imply a general orientation of metamorphic fabric that in reality  
1399 is much more varied than the pattern may indicate.

#### 1400 **5.3.1 Overprint Patterns**

1401 Color overprint patterns are usually specified in either cyan or magenta, but sometimes a spot color such as red  
1402 is used. For offset printing, it is best to specify only one color for overprint patterns, as using more than one  
1403 color can cause misregistration problems. Color overprint patterns can be screened to reduce their intensity.

1404 Black overprint patterns are less effective than color in most situations, as they can conceal base-map  
1405 information or interfere with type or structure symbols. Thus, it may be best to restrict the use of 100% black  
1406 patterns to small, uncluttered areas; if a map-unit label is needed, it can be placed outside the area and leadered  
1407 in. Black patterns also can be screened to reduce their intensity.

#### 1408 **5.3.2 Dropout Patterns**

1409 Dropout patterns cause to be transparent one or more of the CMYK colors that combine to make a map-unit  
1410 color, thus allowing the remaining color(s) to show through. Their use can be especially effective on a map that  
1411 has a large amount of labeling or many structure symbols.

1412 For offset printing, only one color should be dropped out, as dropping out more than one will lead to  
1413 misregistration problems; in general, the most dominant color (the one with the highest value) other than yellow  
1414 should be the one dropped out. For output to a single-pass inkjet plotter, a dropout pattern may be applied to all  
1415 of the CMYK colors that make up a map-unit color; the dropout pattern would then show as white. Be aware,  
1416 however, that doing so may cause that map unit to stand out more than is desired.

1417

1418 **5.4 SPECIFYING COLOR FOR LINE AND POINT SYMBOLS**

1419 Color commonly is specified for many line and point symbols because it highlights these features. Whenever  
1420 possible, color for line and point symbols should be specified as either 100% cyan or 100% magenta, two of the  
1421 standard four process-color (CMYK, cyan/magenta/yellow/black) inks that are used for offset printing and in  
1422 most inkjet plotters (other non-ink color schemes such as RGB or HSV should be avoided so that unwanted  
1423 color shifts during output are prevented). However, in some cases it may not be practical or preferable to  
1424 specify cyan or magenta; for example, mineral resource assessment areas traditionally have been outlined in  
1425 red.

1426 Although it is possible to make a non-process color such as red from two or more process-color inks, this should  
1427 be avoided if the map is to be offset printed because of the difficulties in registering large, CMYK-separated  
1428 negatives. For maps that are to be offset printed, a Pantone color (single-ink spot color) should be specified.  
1429 Each Pantone color is imaged onto a separate piece of film, thereby avoiding misregistration problems caused  
1430 when a color is converted to CMYK and then is color separated onto more than one piece of film.

1431 **6. GUIDELINES FOR MAP LABELING**

1432 Map-unit labels are the most common labels on geologic maps. Other labels may include base-map information,  
1433 feature names, and data items such as dip values, gold concentrations, well depths, radiometric ages, and sample  
1434 locality numbers.

1435 Before the advent of digital technologies for mapmaking, labels were either drawn by hand or applied using  
1436 stick-up type. Nowadays, using digital mapmaking techniques, labels (and leaders) can be automatically plotted  
1437 from information in a database; however, this often results in labels overprinting other map features, requiring  
1438 them to be interactively repositioned or deleted. Regardless of the method employed, effective label placement  
1439 is an important factor in producing a useful map.

1440 **6.1 STRATEGIES FOR MAP LABELING**

1441 Enough features on the map should be labeled so that the reader can identify all of the various map elements; no  
1442 unlabeled map feature should leave the reader guessing. Labels (and leaders) should not, however, create an  
1443 overly "busy" or cluttered appearance, which makes recognition of map patterns and shapes and map-element  
1444 distribution difficult to discern. For a map to be easily read, labels and leaders should be placed where they are  
1445 clear and legible, taking care to avoid overprinting of linework, symbols, or other labels. In addition, they  
1446 should not obscure base-map features that are mentioned in the text or that may be useful in locating places on  
1447 the map.

1448 Commonly, color or pattern can be used to identify an unlabeled map-unit area if a nearby area of the same map  
1449 unit is labeled. Therefore, the color and pattern selection is critical when deciding whether or not to label a  
1450 particular map-unit area, and so it is important to complete the color and pattern design of the map before

1451 attempting to place and move map-unit labels, especially for complex maps or those that have many map units.

1452 There are no precise rules for which and how many of the map-unit areas on a map should be labeled, but the  
1453 following are some general guidelines. If a map unit has a unique and clearly distinguishable color or pattern, it  
1454 is not necessary to label every area of that map unit. Color and pattern can carry the identification of a group of  
1455 areas of the same unit as long as some of them are labeled. Use judgment when deciding whether the color for  
1456 that map unit is distinctive enough and (or) whether a particular unlabeled map-unit area can be visually or  
1457 logically associated with any nearby labeled areas of the same unit. In small map-unit areas, however, even the  
1458 most distinctive color or pattern may be difficult to discern. If there might be any doubt, add a label and leader.

1459 At least one area of every map unit within a "normal field of view" should be labeled. This field of view is the  
1460 area in focus when the map is viewed at a comfortable, readable distance. In uncluttered areas of the map or in  
1461 areas of relatively simple geology, this field of view might have a radius of about two or three inches; in  
1462 geologically complex or cluttered areas, however, it may be much smaller. The reader should not need to search  
1463 across the map trying to find a labeled map-unit area that has a color that matches an unlabeled map-unit area.

1464 In addition, maps that are to be downloaded from the Web will be sent to a plotter of unknown type, and there is  
1465 no guarantee that colors that appear distinct when plotted on your plotter will also be distinguishable when  
1466 plotted on other plotters. The more map-unit areas that are labeled, the less chance of ambiguity and confusion.

## 1467 **6.2 FONT SELECTION**

1468 For most type on a map (for example, unit labels, dip values, and fault names), a sans-serif font such as  
1469 Helvetica (or FGDC-GeoAge; see Appendix A, Section 32) should be used. Other sans-serif fonts such as  
1470 Univers or Arial also may be used, but consider that not all fonts will plot correctly on all output devices. Also  
1471 consider that combining FGDC-GeoAge with Univers or Arial will result in odd-looking character strings  
1472 because the character size and kerning (spacing of letters) of FGDC-GeoAge is based on that of Helvetica;  
1473 therefore, using Helvetica with FGDC-GeoAge is recommended. For base-map information, use a combination  
1474 of sans-serif (for example, Helvetica or Univers) and serif (for example, Times or Times New Roman) fonts;  
1475 the general rule is to follow the styles used on a published topographic map sheet.

1476 When placing labels digitally, it is important to use the same font that will be used for final publication because  
1477 the size and kerning of characters are different for different fonts, even those having the same point size. If  
1478 labels are placed carefully in tight areas using one font, but then another font is used for final publication, the  
1479 labels may overprint linework or other features because the new font may have longer character heights and  
1480 string lengths. Therefore, for best results, choose fonts early in a project, and then stay with that choice  
1481 throughout the project. In addition, the use of PostScript fonts may result in more consistent final output for  
1482 both print and digital publications.

1483

1484 **6.3 TYPE SIZE AND STYLE**

1485 The ideal size for map-unit labels is 8 pt, although labels as small as 6 pt may be substituted in places where  
1486 space is tight. Fractional font sizes may be used if needed, and different sizes can be mixed on the same map. If  
1487 unit labels contain subscripts or superscripts, the minimum unit-label size should be 7 pt; then the size for the  
1488 subscript or superscript character would be 5 pt, two point sizes smaller.

1489 Other sizes and styles are used to label different features. In general, use 8 pt type (all caps) for names of faults  
1490 and major structures, for sample locality numbers and radiometric ages, and for fault (U/D, A/T) and contact  
1491 (Y/O) ornamentation. Use 6 pt italic type for dip or plunge values. Use 12 pt italic type for cross-section labels.  
1492 For labels of larger features, type size and (or) kerning (letter spacing) may be increased to improve legibility.

1493 **6.4 LABEL PLACEMENT**

1494 Labels for linear map features should be aligned along those features. Other labels should have a logical or  
1495 comfortable orientation relative to the map. In rare cases it might be desirable to have labels run parallel to lines  
1496 of latitude, but in general they should be oriented horizontally.

1497 Map-unit labels and dip values should always be oriented horizontally. They should not overprint other map  
1498 elements such as linework, point symbols, or any other dip values and labels, nor should they obscure base-map  
1499 features that are referenced in text or are needed to orient the map in the field. Single labels can be used to  
1500 identify more than one map-unit area; use multiple leaders where necessary.

1501 Map-unit labels should not be placed in dark-colored map-unit areas or in densely patterned areas, both of  
1502 which would make the labels hard to read; instead, move labels outside such areas and add leaders. If a label  
1503 must be placed in a dark-colored or densely patterned map-unit area, it may be necessary to mask out the color  
1504 or pattern around the label to help make it more legible.

1505 **6.5 LEADER PLACEMENT**

1506 Leaders should be drawn as straight lines, not bent or curved. They should cross map-unit area boundaries at as  
1507 high an angle as possible, and they should not stop at the boundary but should extend well into the map-unit  
1508 area. Leaders should not cross through other map-unit areas to reach a particular map unit unless absolutely  
1509 necessary. Multiple leaders emanating from a single label should not be joined at their "label" ends.

1510 **7. TECHNICAL SPECIFICATIONS USED IN THE PREPARATION OF THIS**  
1511 **STANDARD**

1512 This new standard (contained in Appendix A) consists of geologic line and point symbols, geologic map-unit  
1513 colors and patterns, a geologic age symbol font, and related map marginalia. This section provides some  
1514 technical discussion regarding preparation of the standard and its implementations.

1515

## 1516 **7.1 UNITS FOR LINEWEIGHTS, LENGTHS, AND DISTANCES**

1517 In previous standards, lineweights were specified in thousandths-of-an-inch, which corresponded to the widths  
1518 of the engraving tools used to scribe the linework. Most lengths and distances also were given in inches. In this  
1519 standard, the cartographic specifications are given in millimeters, in accordance with the Federal standard for  
1520 metrification.

1521 The old thousandths-of-an-inch specifications have been converted to millimeters (table 1), and then most have  
1522 been rounded to the nearest .05 mm or .025 mm, for ease of use. Whenever possible, cartographic specifications  
1523 for lengths and distances have been given in whole- or half-integer values. However, when preparing the  
1524 symbols in this standard document, as well as in its PostScript implementation, lineweights, lengths, and  
1525 distances were specified in points, and the exact conversion values (from inches to points; see table 1) were  
1526 retained.

1527 As an example of the unit-conversion process, consider the symbol for faults, which in previous standards had a  
1528 lineweight of .015" specified. This original lineweight was converted to millimeters (.015" = .381 mm; table 1)  
1529 and then rounded to .375 mm, which is the value given as the cartographic specification in this standard (see p.  
1530 A-2-1, Appendix A). However, when preparing the fault symbol for inclusion in this standard document (and  
1531 in its PostScript implementation), the exact .015" lineweight was retained and directly converted to points  
1532 (.015" = 1.08 pt; table 1), and so the symbol lineweight was defined electronically as 1.08 pt.

1533 Complications from unit conversion can arise not just when designing line symbols but also when creating point  
1534 symbols and patterns, as most symbols are made of stroked lines. When creating symbols for a particular  
1535 application, the user should choose the unit of measure most easily used in an application and then use the  
1536 conversion table (table 1) to convert to those units.

## 1537 **7.2 TYPE SPECIFICATIONS**

1538 Most type in this standard is specified as either Helvetica (sans-serif) or Times (serif), two fonts that are  
1539 commonly used and widely available (see table 2 for abbreviations for type faces used in this standard); type  
1540 sizes are given in points. Other fonts such as Univers, Arial, or Times New Roman may be substituted, but  
1541 consider that they may not be installed on all common output devices and thus may not plot correctly.

1542 Geologic age characters have been specified as FGDC-GeoAge, a specialized sans-serif font designed by the  
1543 U.S. Geological Survey (see Appendix A, Section 32). The character size and kerning (spacing of letters) of  
1544 FGDC-GeoAge is based on that of Helvetica; therefore, using Helvetica with FGDC-GeoAge is recommended.

## 1545 **7.3 COLOR SPECIFICATIONS FOR LINE AND POINT SYMBOLS**

1546 Color has been specified as the cartographic standard for many line and point symbols in this standard, either  
1547 because of adherence to a long-established color convention or because using color for features such as folds  
1548 and dikes may help them to stand out better from other full-black linework such as contacts and faults. In most

1549 cases, another color or black may be substituted if the color specified as the standard would not be visible when  
1550 printed over an underlying map-unit color.

1551 Whenever possible, color has been specified as either cyan or magenta, two of the four process-color (CMYK,  
1552 cyan/magenta/yellow/black) inks that are used both in inkjet plotters and for offset printing. However, in some  
1553 cases it was not practical or preferable to specify cyan or magenta as the standard; for example, mineral  
1554 resource assessment areas traditionally have been outlined in red (see p. A-19-1, Appendix A).

1555 Although it is possible to make a non-process color such as red from two or more process-color inks, this should  
1556 be avoided if the map is to be offset printed because of the difficulties in registering large, CMYK-separated  
1557 negatives. Thus, in some cases a spot color (a single-ink, non-CMYK color) has been specified as the  
1558 cartographic standard.

1559 As a simple, general way of specifying spot colors, generic color names (for example, "red" and "green") have  
1560 been used in this standard. Specifying color as these generic color names, however, may not be appropriate for  
1561 use with certain output media. Therefore, the user must choose a method of specifying color that is appropriate  
1562 for a particular output device; table 3 shows suggestions for conversions of spot colors to other color models.

1563 For maps that are to be offset printed, a Pantone color (single-ink spot color) should be specified (table 3). Each  
1564 Pantone color is imaged onto a separate piece of film, thereby avoiding misregistration problems caused when  
1565 a color is converted to CMYK and then is color separated onto more than one piece of film. For output to an  
1566 inkjet plotter, however, specifying a spot color as one of the generic color names is satisfactory because, during  
1567 the plotter's RIP<sup>4</sup> of the file, the color will automatically be converted to the proper amounts of CMYK inks that  
1568 will combine to make the CMYK equivalent of that color. Misregistration is not a problem with single-pass  
1569 inkjet-plotter output.

1570 If simple, graphical map elements are to be published as part of a web page on the World Wide Web, it may be  
1571 best to choose colors from a "Web-safe" color palette<sup>5</sup> to avoid unwanted dithering on monitors that display  
1572 only 256 colors (Weinman, 1996). As an aid in doing so, an attempt was made to provide "Web-safe" color  
1573 equivalents of the Pantone spot colors used in this standard (table 3). These "Web-safe" color equivalents are  
1574 made up of the RGB (red/green/blue) values that are as close as possible to the directly converted RGB-  
1575 equivalent colors (table 3). Note, however, that it was impossible to exactly reproduce the directly converted  
1576 RGB-equivalent colors because, to make "Web-safe" colors, there are only six possible RGB values (000, 051,  
1577 102, 153, 204, and 255) from which to choose.

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<sup>4</sup> RIP = raster-image processing, a process that runs on all plotters, printers, and imagesetters and converts data (in either raster or vector format) to printer dots to produce an image.

<sup>5</sup> Industry opinions on using "Web-safe" colors (8-bit, 216 colors) are changing, owing to the large number of monitors now in use that can display more than 256 colors; Chris MacGregor (*in* Dennis, 1999) stated that using non-"Web-safe" colors may be acceptable to use in detailed areas, although she still recommends using "Web-safe" colors in large areas.

1578 **7.4 COLOR SPECIFICATIONS FOR MAP-UNIT AREAS**

1579 To aid in the selection of color fill for geologic map units, a chart showing a wide variety of CMYK colors  
1580 ("CMYK Color Chart") has been included in this standard. The CMYK Color Chart was designed in Adobe  
1581 Illustrator 8.0.1 to closely replicate the colors on the offset-printed color chart entitled "Printing Colors and  
1582 Screens in Use by the U.S. Geological Survey for Geologic and Hydrologic Maps" [yellow/magenta/cyan  
1583 version], which has been in use for many years at the USGS. The new color chart contains the same colors that  
1584 were in the original offset-printed USGS chart; however, the old color codes indicating the YMC  
1585 (yellow/magenta/cyan) values have been updated to show CMYK (cyan/magenta/yellow, with K=0) values, to  
1586 conform to industry standards. In addition, each color in the CMYK Color Chart has associated with it a generic  
1587 lookup-table number that, if desired, may be used to access the color from within digital applications.

1588 In addition, a diagram showing "Suggested Ranges of Map-Unit Colors for Volcanic and Plutonic Rocks and  
1589 for Stratigraphic Ages of Sedimentary and Metamorphic Rocks" (see Appendix A, Section 33) has been  
1590 included in this standard. This diagram was designed in Adobe Illustrator 8.0.1 to reproduce a similar diagram  
1591 in the old USGS Technical Cartographic Standards volume (U.S. Geological Survey, ca. 1975). In this new  
1592 version, however, the range of colors was modified slightly, a few new colors were added, and the old color  
1593 codes were updated to show CMYK (cyan/magenta/yellow, with K=0) values.

1594 **7.5 PATTERN SPECIFICATIONS**

1595 The old USGS Technical Cartographic Standards volume (U.S. Geological Survey, ca. 1975) contained no  
1596 cartographic specifications (lineweights, dot sizes, or size and spacing of pattern elements) for its patterns. The  
1597 volume dates back to a time when maps were conventionally prepared using hand-scribed linework and  
1598 peelcoats. In those days, patterns were preprinted onto large sheets of film, which were photomechanically  
1599 combined with the various peelcoats to make the CMYK negatives.

1600 For this standard, the patterns (see "Pattern Chart") were recreated by scanning the old pattern sheets and then  
1601 tracing the pattern elements in Adobe Illustrator 8.0.1. For most patterns, black, cyan, and magenta versions, as  
1602 well as dropout versions, were created. Yellow versions were not created because yellow patterns are not visible  
1603 over color fill. Also, red and (or) brown versions were created if red or brown patterns were specified as the  
1604 cartographic standard for a particular feature. Glacial and hydrologic patterns were created only in cyan and  
1605 black, as it is unlikely that magenta or other colors would be used for these types of patterns.

1606 To facilitate digital output, lineweights and dot sizes were in many cases increased. A few pattern tiles were  
1607 scaled to accommodate the increased lineweights, and some of the lined patterns were dropped because an  
1608 increased lineweight would fill in the pattern and because an increase in scale would cause the pattern to be too  
1609 similar to other patterns. The lineweights and dot sizes for the color and dropout versions were increased even  
1610 more than for the black versions, to help them show more clearly on maps.

1611 All patterns were renumbered, and suffixes indicating color were added so that all versions of the same pattern

1612 are referenced by the same number. In addition, each pattern in the Pattern Chart has associated with it a generic  
1613 lookup-table number that, if desired, may be used to access the pattern from within digital applications.

## 1614 **7.6 GEOLOGIC AGE SYMBOL FONT**

1615 A digital font named FGDC-GeoAge (see Appendix A, Section 32) has been created, in which 16 special  
1616 geologic age characters have been substituted into positions of normal keyboard characters. These characters  
1617 can be typed either directly or with the Shift key; no Option, Control, or Alt keys are needed to type these  
1618 characters (they are all in lower-order ASCII positions that have character ID numbers below 128), allowing the  
1619 same character positioning to work on different computer platforms without interfering with special control key  
1620 sequences.

## 1621 **8. ACKNOWLEDGMENTS**

1622 This standard owes its existence mostly to the well-established history and traditions of geologic map  
1623 cartography by the USGS. In particular, the editors and compilers of this standard wish to thank the many  
1624 cartographers, editors, and geologists who contributed to the informal USGS "Technical Cartographic  
1625 Standards" volume (U.S. Geological Survey, ca. 1975), as well as Mitchell Reynolds, James Queen, Richard  
1626 Taylor, and others who were responsible for preparing the earlier (1995) USGS proposed standard (U.S.  
1627 Geological Survey, 1995a,b), from which this standard has evolved. We especially wish to thank the many  
1628 members of the USGS Geologic Discipline's Western Publications Group who have made substantial  
1629 contributions to the design and preparation of this standard (see Section 2.3 above, entitled "Preparers of this  
1630 Standard").

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1633 previous versions of this standard: the 1995 USGS proposed standard (see Soller, 1996); the preliminary, beta  
1634 version of this standard; the Working Draft of this standard; and, most importantly, the Public Review Draft of  
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1639 historical documents and standard cartographic practices.

1640 **9. REFERENCES**

- 1641 Bates, Robert L., and Jackson, Julia A., eds., 1987, *Glossary of Geology* (3rd ed.): Alexandria, Va., American  
1642 Geological Institute, 788 p.
- 1643 Berggren, W.A., Kent, D.V., Aubry, M-P, and Hardenbol, Jan, eds., 1995, *Geochronology, time scales, and*  
1644 *global stratigraphic correlation: SEPM (Society for Sedimentary Geology), Special Publication 54*, 386 p.
- 1645 Dennis, Anita, ed., 1999, *101 hot tips: Publish*, v. 14, no. 9, p. 62.
- 1646 Dietrich, R.V., Dutro, J.T., Jr., and Foose, R.M, compilers, 1982, *AGI data sheets for geology in the field,*  
1647 *laboratory, and office* (2nd ed.): Alexandria, Va., American Geological Institute.
- 1648 Dutro, J.T., Jr., Dietrich, R.V., and Foose, R.M, compilers, 1989, *AGI data sheets for geology in the field,*  
1649 *laboratory, and office* (3rd ed.): Alexandria, Va., American Geological Institute.
- 1650 Federal Geographic Data Committee, 2000, *Public Review Draft – Digital cartographic standard for geologic*  
1651 *map symbolization: Reston, Va., Federal Geographic Data Committee*, 172 p., 2 plates.
- 1652 Gradstein, F.M., and Ogg, J.G., 1996, *A Phanerozoic time scale: Episodes*, v. 19, nos. 1-2, p. 3-5.
- 1653 Hansen, W.R., ed., 1991, *Suggestions to authors of the reports of the United States Geological Survey* (7th ed.):  
1654 Washington, D.C., U.S. Geological Survey, 289 p.
- 1655 Haq, B.U., and van Eysinga, F.W.B., 1998, *Geological time table* (5th ed.): New York, Elsevier Science  
1656 Publishing Co., 1 sheet.
- 1657 Harland, W.B., and others, 1982, *A geologic time scale: Cambridge, England, Cambridge University Press*, 131  
1658 p.
- 1659 Harland, W.B., and others, 1989, *A geologic time scale: Cambridge, England, Cambridge University Press*, 263  
1660 p.
- 1661 International Union of Geological Sciences (Juergen Remane, comp.), 1998, *International Stratigraphic Chart:*  
1662 *International Union of Geological Sciences*, 1 sheet and explanatory text.
- 1663 Jackson, Julia A., ed., 1997, *Glossary of Geology* (4th ed.): Alexandria, Va., American Geological Institute, 769  
1664 p.
- 1665 North American Commission on Stratigraphic Nomenclature, 1983, *North American stratigraphic code:*  
1666 *American Association of Petroleum Geologists Bulletin*, v. 67, no. 5, p. 841–75.
- 1667 Palmer, A.R., 1983, *The Decade of North American Geology 1983 Geologic Time Scale: Geology*, v. 11, no. 9,  
1668 p. 503–4.
- 1669 Palmer, A.R., and Geissman, J., 1999, *1999 Geologic Time Scale: Geological Society of America* [available on  
1670 World Wide Web at <http://www.geosociety.org/science/timescale/timescl.htm>].

- 1671 Powell, J.W., 1882a, Second Annual Report of the United States Geological Survey 1880-'81: Washington,  
1672 D.C., U.S. Government Printing Office, 588 p.
- 1673 Powell, J.W., 1882b, Sur la nomenclature générale, sur le coloriage et les signes conventionnels des Cartes  
1674 géologiques, *in* Congrès Géologique International, Compte Rendu de la 2me Session, Bologne, 1881:  
1675 Imprimerie Fava et Garagnani, Bologne, p. 627–41.
- 1676 Powell, J.W., 1888, Methods of geologic cartography in use by the United States Geological Survey, *in* Congrès  
1677 Géologique International, Compte Rendu de la 3me Session, Berlin, 1885: A.W. Schade's Buchdruckerei,  
1678 Berlin, p. 221–40.
- 1679 Powell, J.W., 1890, Tenth Annual Report of the United States Geological Survey 1888–'89, Part I – Geology:  
1680 Washington, D.C., U.S. Government Printing Office, 774 p.
- 1681 Ridgway, J.L., 1920, The preparation of illustrations for reports of the United States Geological Survey:  
1682 Washington, D.C., U.S. Government Printing Office, 101 p.
- 1683 Snelling, N.J., ed., 1985, The chronology of the geological record: Geological Society of London, p. 261–6.
- 1684 Soller, D.R., 1996, Review of USGS Open-File Report 95–525 ("Cartographic and digital standard for geologic  
1685 map information") and plans for development of Federal draft standards for geologic map information: U.S.  
1686 Geological Survey Open-File Report 96–725, 12 p.
- 1687 U.S. Geological Survey, ca. 1975, Technical cartographic standards volume: unpublished U.S. Geological  
1688 Survey internal standards document.
- 1689 U.S. Geological Survey, 1995a, Cartographic and digital standard for geologic map information: U.S.  
1690 Geological Survey Open-File Report 95–525, 257 p.
- 1691 U.S. Geological Survey, 1995b, Digital files of geologic map symbols with cartographic specifications: U.S.  
1692 Geological Survey Open-File Report 95–526, 2 disks.
- 1693 U.S. Geological Survey (prepared in cooperation with the Geologic Data Subcommittee of the Federal  
1694 Geographic Data Committee), 2000, Public Review Draft – Digital cartographic standard for geologic map  
1695 symbolization (PostScript implementation): U.S. Geological Survey Open-File Report 99–430 [available on  
1696 World Wide Web at <http://pubs.usgs.gov/of/1999/of99-430/>].
- 1697 U.S. Geological Survey (prepared in cooperation with the Geologic Data Subcommittee of the Federal  
1698 Geographic Data Committee), 2006, FGDC Digital cartographic standard for geologic map symbolization  
1699 (PostScript implementation): U.S. Geological Survey Techniques and Methods 11–A2 [available on World  
1700 Wide Web at <http://pubs.usgs.gov/tm/2005/11A02/>].
- 1701 Weinman, Lynda, 1996, Designing Web graphics: Indianapolis, Ind., New Riders Publishing, p. 49–72.

# APPENDIX A. GEOLOGIC MAP SYMBOLS, COLORS, AND PATTERNS

This [normative] appendix contains the geologic map symbols and their descriptions, their cartographic specifications, and notes on their usage. Also included are the CMYK Color Chart and the Pattern Chart (enclosed in sleeve on inside back cover), which contain colors and patterns for use on geologic maps.

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## PREFACE TO APPENDIX A

In this preface to Appendix A, we include some general guidelines for using the "FGDC Digital Cartographic Standard for Geologic Map Symbolization," as well as some basic information on the newly implemented standard for the scientific confidence and the locational accuracy of geologic features. For more specific information, please refer to the following sections in the accompanying introductory text: "Geologic Mapping Concepts and Definitions" (Section 3); "Scientific Confidence and Locational Accuracy of Geologic Features" (Section 4); "Guidelines for Map Color and Pattern Selection" (Section 5); "Guidelines for Map Labeling" (Section 6); and "Technical Specifications Used in the Preparation of this Standard" (Section 7).

### ABOUT THIS VERSION OF THE STANDARD

This now formally approved version of the standard incorporates revisions that reflect reviewers' responses to the "Public Review Draft — Digital Cartographic Standard for Geologic Map Symbolization" (Federal Geographic Data Committee, 2000). We thank all the reviewers for their contributions, and we are pleased that most of the comments and suggestions could be accommodated (see [http://ngmdb.usgs.gov/fgdc\\_gds/geolsymstd/prdresponse.html](http://ngmdb.usgs.gov/fgdc_gds/geolsymstd/prdresponse.html)). Note, however, that we were able to fully address suggestions for the inclusion of new symbols only if examples of the proposed symbol additions were provided.

We intend this standard to be a "living standard" — that is, we recognize that an existing symbol's usage may need to be modified, or a new symbol or set of symbols created, to more fully express local geologic conditions or to keep pace with evolving geologic mapping concepts and practices. Accordingly, such new or modified symbols, if found to be of wide applicability, will be incorporated into this standard through planned, periodic revisions. You are invited to submit comments and suggestions for updates or other improvements to this standard by email to [mapsymbol@flagmail.wr.usgs.gov](mailto:mapsymbol@flagmail.wr.usgs.gov).

In response to reviewers' comments, we tested various cartographic specifications for dashed and ornamented line symbols in several different software packages (Adobe Illustrator v.8.0.1, ArcInfo v.7x, and ArcGIS v.8x) to ensure that symbols would render correctly and consistently. As a result, we found it necessary to modify the cartographic specifications (dash/gap lengths and ornament spacings) of many line symbols in this standard from the specifications found in previous versions of the standard.

### HOW TO USE THIS STANDARD

The contents of this standard are not intended to be used inflexibly or in a manner that will limit one's ability to communicate the observations and interpretations gained from geologic mapping. On the contrary, we recognize that, in certain situations, a symbol or its usage might need to be modified in order to better represent a particular feature on a geologic map or cross section.

To that end, we emphasize that this standard allows the use of any symbol that doesn't conflict with others in the standard, provided that it is clearly explained on the map and in the database. In addition, modifying the size, color, and (or) lineweight of an existing symbol to suit the needs of a particular map or output device also is permitted, provided that the modified symbol's appearance is not too similar to another symbol on the map. Be aware, however, that reducing lineweights below .125 mm (.005 inch) may cause symbols to plot incorrectly if output at higher resolutions (1800 dpi or higher). For more information, please refer to Section 7 ("Technical Specifications Used in the Preparation of this Standard") in the accompanying introductory text.

To facilitate the use of this standard, we include in this preface tables showing conversion values from inches to points to millimeters (table 1), abbreviations used (table 2), and spot color specifications and their equivalent colors in other color models (table 3). We also offer the following illustrations of a few key terms and concepts used when preparing this standard:

| LINE SYMBOLS                   | POINT SYMBOLS  | TYPE EXAMPLES   |   |
|--------------------------------|--|---|---|
| <p><b>Right-Hand Rule:</b></p> | <p><b>Point of Observation (at center of cyan circle):</b></p> | <p><b>Sans-Serif Font:</b></p> <p>Ꞥv Qls<br/>                     HAYWARD FAULT</p> | <p><b>Serif Font:</b></p> <p>Triassic volcanic rocks<br/> <i>Columbia River</i></p> |

## THE NEWLY IMPLEMENTED STANDARD FOR THE SCIENTIFIC CONFIDENCE AND LOCALATIONAL ACCURACY OF GEOLOGIC MAP FEATURES

In response to reviewers' comments, we have implemented a new standard (concepts and terminology) for the scientific confidence and the locational accuracy of geologic map features (note that, at this time, we have applied these new concepts only to line features). Scientific confidence expresses a geologist's level of certainty about the identity or perhaps even the existence of a feature. Locational accuracy is based on the relation between a feature's location in the field and its position on the base map. For a more detailed discussion of these concepts and their associated terminology, please refer to Section 4, "Scientific Confidence and Locational Accuracy of Geologic Features," in the accompanying introductory text.

### FEATURE ATTRIBUTES FOR SCIENTIFIC CONFIDENCE AND LOCALATIONAL ACCURACY

The following is a list of the feature attributes (in *italics*) that are used to express these concepts:

Scientific Confidence:

Identity — '*certain*' or '*questionable*'

Existence — '*certain*' or '*questionable*'

Locational Accuracy:

Locatability — '*observable*,' '*inferred*' (between outcrops or beneath rubble or vegetation), or '*concealed*' (beneath overlying map unit, ice, or water)

Zone of Confidence — [*value, in ground units*]; [*unit of measurement*]

Positioning Confidence — '*within zone of confidence*' or '*may not be within zone of confidence*'

### LEVELS OF SCIENTIFIC CONFIDENCE AND LOCATIONAL ACCURACY

Discrete levels of scientific confidence and locational accuracy have been developed to use as a terminology that can clearly yet concisely communicate the identity, existence, locatability, and positioning of geologic map features. These levels are directly derived from, or are closely associated with, the feature attributes (for more information, see figures 1 and 2 in the accompanying introductory text). The following diagram shows how the various levels of scientific confidence and locational accuracy relate to the feature attributes; it also shows examples (in italics) of geologic situations to which the levels may be applied.

| SCIENTIFIC CONFIDENCE                                      |  |   |
|--|--|---|
| Feature Attributes for Scientific Confidence               |  | Levels of Scientific Confidence   |
| Identity:<br>• certain<br>• questionable                   | Existence:<br>• certain<br>• questionable  | Identity and existence certain ( <i>"I am certain that the planar feature I see in this outcrop is a fault"</i> )<br>Identity or existence questionable ( <i>"I can see some kind of planar feature in this outcrop, but I cannot be certain if it is a contact or a fault"</i> )   |
| LOCATIONAL ACCURACY  |  |   |
| Feature Attributes for Locational Accuracy                 |  | Levels of Locational Accuracy   |
| Locatability:<br>• observable<br>• inferred<br>• concealed | Zone of Confidence:<br>• [value, in ground units]<br>• [unit of measurement]<br><br>Positioning Confidence:<br>• within zone of confidence<br>• may not be within zone of confidence | Location accurate ( <i>"I can clearly see this contact in outcrop, and I can accurately plot its position on the map"</i> )<br>Location approximate ( <i>"I can see this contact in outcrop, but I can't tell exactly where it is located because I am surrounded by trees"</i> )<br>Location inferred ( <i>"I can see by the change in debris materials visible around these gopher holes that a contact runs through here, but I can't locate it precisely"</i> )<br>Location concealed ( <i>"I can see that a contact is present on both sides of this lake, but I can't tell where it is located beneath the water"</i> ) |

The levels of scientific confidence and locational accuracy have been used to identify and describe the line symbols in this standard. The following example is extracted from Appendix A (see p. A-1-1).

| DESCRIPTION  | SYMBOL        | DESCRIPTION  | SYMBOL            |
|--|---------------|--|-------------------|
| Contact—Identity and existence certain, location accurate        | —————         | Contact—Identity and existence certain, location inferred      | - - - - -         |
| Contact—Identity or existence questionable, location accurate    | ———?———       | Contact—Identity or existence questionable, location inferred  | - - - - ? - - - - |
| Contact—Identity and existence certain, location approximate     | - - - - -     | Contact—Identity and existence certain, location concealed     | .....             |
| Contact—Identity or existence questionable, location approximate | - - - ? - - - | Contact—Identity or existence questionable, location concealed | .....?.....       |

In the symbol explanation on a published map, the levels of scientific confidence and locational accuracy also are used to identify and describe the various types and styles of line symbols that appear on the map; however, not every style of a particular line symbol needs to be listed individually in the explanation, as the following two examples show.

|   |  |
|---|--|
| <p>————— <b>Contact</b>—Solid where location is accurate; long-dashed where location is approximate; short-dashed where location is inferred; dotted where location is concealed. Queries added where identity or existence may be questionable</p> <p>————— <b>Fault</b>—Solid where location is accurate; long-dashed where location is approximate; short-dashed where location is inferred; dotted where location is concealed. Queries added where identity or existence may be questionable</p> <p>▼▼ <b>Thrust fault</b>—Solid where location is accurate; long-dashed where location is approximate; short-dashed where location is inferred; dotted where location is concealed. Queries added where identity or existence may be questionable. Sawteeth on upper plate</p> <p><b>Folds</b>—Solid where location is accurate; long-dashed where location is approximate; dotted where location is concealed. Queries added where identity or existence may be questionable. Showing direction of plunge where appropriate</p> <p> <b>Anticline</b></p> <p> <b>Syncline</b></p> | <p style="text-align: center;"><b>SYMBOL EXPLANATION</b></p> <p>[For all line symbols: lines are solid where location is accurate; long-dashed where location is approximate; short-dashed where location is inferred; dotted where location is concealed. Queries added where identity or existence may be questionable]</p> <p>————— <b>Contact</b></p> <p>————— <b>Fault</b></p> <p>▼▼ <b>Thrust fault</b>—Sawteeth on upper plate</p> <p><b>Folds</b>—Showing direction of plunge where appropriate</p> <p> <b>Anticline</b></p> <p> <b>Syncline</b></p> |
|---|--|

**Table 1.** Chart showing conversion values from inches (in) to points (pts) to millimeters (mm).

| in    | pts   | mm    | in    | pts   | mm    | in    | pts    | mm    | in    | pts    | mm    |
|-------|-------|-------|-------|-------|-------|-------|--------|-------|-------|--------|-------|
| 0.001 | 0.072 | 0.025 | 0.051 | 3.672 | 1.295 | 0.101 | 7.272  | 2.565 | 0.151 | 10.872 | 3.835 |
| 0.002 | 0.144 | 0.051 | 0.052 | 3.744 | 1.321 | 0.102 | 7.344  | 2.591 | 0.152 | 10.944 | 3.861 |
| 0.003 | 0.216 | 0.076 | 0.053 | 3.816 | 1.346 | 0.103 | 7.416  | 2.616 | 0.153 | 11.016 | 3.886 |
| 0.004 | 0.288 | 0.102 | 0.054 | 3.888 | 1.372 | 0.104 | 7.488  | 2.642 | 0.154 | 11.088 | 3.912 |
| 0.005 | 0.360 | 0.127 | 0.055 | 3.960 | 1.397 | 0.105 | 7.560  | 2.667 | 0.155 | 11.160 | 3.937 |
| 0.006 | 0.432 | 0.152 | 0.056 | 4.032 | 1.422 | 0.106 | 7.632  | 2.692 | 0.156 | 11.232 | 3.962 |
| 0.007 | 0.504 | 0.178 | 0.057 | 4.104 | 1.448 | 0.107 | 7.704  | 2.718 | 0.157 | 11.304 | 3.988 |
| 0.008 | 0.576 | 0.203 | 0.058 | 4.176 | 1.473 | 0.108 | 7.776  | 2.743 | 0.158 | 11.376 | 4.013 |
| 0.009 | 0.648 | 0.229 | 0.059 | 4.248 | 1.499 | 0.109 | 7.848  | 2.769 | 0.159 | 11.448 | 4.039 |
| 0.010 | 0.720 | 0.254 | 0.060 | 4.320 | 1.524 | 0.110 | 7.920  | 2.794 | 0.160 | 11.520 | 4.064 |
| 0.011 | 0.792 | 0.279 | 0.061 | 4.392 | 1.549 | 0.111 | 7.992  | 2.819 | 0.161 | 11.592 | 4.089 |
| 0.012 | 0.864 | 0.305 | 0.062 | 4.464 | 1.575 | 0.112 | 8.064  | 2.845 | 0.162 | 11.664 | 4.115 |
| 0.013 | 0.936 | 0.330 | 0.063 | 4.536 | 1.600 | 0.113 | 8.136  | 2.870 | 0.163 | 11.736 | 4.140 |
| 0.014 | 1.008 | 0.356 | 0.064 | 4.608 | 1.626 | 0.114 | 8.208  | 2.896 | 0.164 | 11.808 | 4.166 |
| 0.015 | 1.080 | 0.381 | 0.065 | 4.680 | 1.651 | 0.115 | 8.280  | 2.921 | 0.165 | 11.880 | 4.191 |
| 0.016 | 1.152 | 0.406 | 0.066 | 4.752 | 1.676 | 0.116 | 8.352  | 2.946 | 0.166 | 11.952 | 4.216 |
| 0.017 | 1.224 | 0.432 | 0.067 | 4.824 | 1.702 | 0.117 | 8.424  | 2.972 | 0.167 | 12.024 | 4.242 |
| 0.018 | 1.296 | 0.457 | 0.068 | 4.896 | 1.727 | 0.118 | 8.496  | 2.997 | 0.168 | 12.096 | 4.267 |
| 0.019 | 1.368 | 0.483 | 0.069 | 4.968 | 1.753 | 0.119 | 8.568  | 3.023 | 0.169 | 12.168 | 4.293 |
| 0.020 | 1.440 | 0.508 | 0.070 | 5.040 | 1.778 | 0.120 | 8.640  | 3.048 | 0.170 | 12.240 | 4.318 |
| 0.021 | 1.512 | 0.533 | 0.071 | 5.112 | 1.803 | 0.121 | 8.712  | 3.073 | 0.171 | 12.312 | 4.343 |
| 0.022 | 1.584 | 0.559 | 0.072 | 5.184 | 1.829 | 0.122 | 8.784  | 3.099 | 0.172 | 12.384 | 4.369 |
| 0.023 | 1.656 | 0.584 | 0.073 | 5.256 | 1.854 | 0.123 | 8.856  | 3.124 | 0.173 | 12.456 | 4.394 |
| 0.024 | 1.728 | 0.610 | 0.074 | 5.328 | 1.880 | 0.124 | 8.928  | 3.150 | 0.174 | 12.528 | 4.420 |
| 0.025 | 1.800 | 0.635 | 0.075 | 5.400 | 1.905 | 0.125 | 9.000  | 3.175 | 0.175 | 12.600 | 4.445 |
| 0.026 | 1.872 | 0.660 | 0.076 | 5.472 | 1.930 | 0.126 | 9.072  | 3.200 | 0.176 | 12.672 | 4.470 |
| 0.027 | 1.944 | 0.686 | 0.077 | 5.544 | 1.956 | 0.127 | 9.144  | 3.226 | 0.177 | 12.744 | 4.496 |
| 0.028 | 2.016 | 0.711 | 0.078 | 5.616 | 1.981 | 0.128 | 9.216  | 3.251 | 0.178 | 12.816 | 4.521 |
| 0.029 | 2.088 | 0.737 | 0.079 | 5.688 | 2.007 | 0.129 | 9.288  | 3.277 | 0.179 | 12.888 | 4.547 |
| 0.030 | 2.160 | 0.762 | 0.080 | 5.760 | 2.032 | 0.130 | 9.360  | 3.302 | 0.180 | 12.960 | 4.572 |
| 0.031 | 2.232 | 0.787 | 0.081 | 5.832 | 2.057 | 0.131 | 9.432  | 3.327 | 0.181 | 13.032 | 4.597 |
| 0.032 | 2.304 | 0.813 | 0.082 | 5.904 | 2.083 | 0.132 | 9.504  | 3.353 | 0.182 | 13.104 | 4.623 |
| 0.033 | 2.376 | 0.838 | 0.083 | 5.976 | 2.108 | 0.133 | 9.576  | 3.378 | 0.183 | 13.176 | 4.648 |
| 0.034 | 2.448 | 0.864 | 0.084 | 6.048 | 2.134 | 0.134 | 9.648  | 3.404 | 0.184 | 13.248 | 4.674 |
| 0.035 | 2.520 | 0.889 | 0.085 | 6.120 | 2.159 | 0.135 | 9.720  | 3.429 | 0.185 | 13.320 | 4.699 |
| 0.036 | 2.592 | 0.914 | 0.086 | 6.192 | 2.184 | 0.136 | 9.792  | 3.454 | 0.186 | 13.392 | 4.724 |
| 0.037 | 2.664 | 0.940 | 0.087 | 6.264 | 2.210 | 0.137 | 9.864  | 3.480 | 0.187 | 13.464 | 4.750 |
| 0.038 | 2.736 | 0.965 | 0.088 | 6.336 | 2.235 | 0.138 | 9.936  | 3.505 | 0.188 | 13.536 | 4.775 |
| 0.039 | 2.808 | 0.991 | 0.089 | 6.408 | 2.261 | 0.139 | 10.008 | 3.531 | 0.189 | 13.608 | 4.801 |
| 0.040 | 2.880 | 1.016 | 0.090 | 6.480 | 2.286 | 0.140 | 10.080 | 3.556 | 0.190 | 13.680 | 4.826 |
| 0.041 | 2.952 | 1.041 | 0.091 | 6.552 | 2.311 | 0.141 | 10.152 | 3.581 | 0.191 | 13.752 | 4.851 |
| 0.042 | 3.024 | 1.067 | 0.092 | 6.624 | 2.337 | 0.142 | 10.224 | 3.607 | 0.192 | 13.824 | 4.877 |
| 0.043 | 3.096 | 1.092 | 0.093 | 6.696 | 2.362 | 0.143 | 10.296 | 3.632 | 0.193 | 13.896 | 4.902 |
| 0.044 | 3.168 | 1.118 | 0.094 | 6.768 | 2.388 | 0.144 | 10.368 | 3.658 | 0.194 | 13.968 | 4.928 |
| 0.045 | 3.240 | 1.143 | 0.095 | 6.840 | 2.413 | 0.145 | 10.440 | 3.683 | 0.195 | 14.040 | 4.953 |
| 0.046 | 3.312 | 1.168 | 0.096 | 6.912 | 2.438 | 0.146 | 10.512 | 3.708 | 0.196 | 14.112 | 4.978 |
| 0.047 | 3.384 | 1.194 | 0.097 | 6.984 | 2.464 | 0.147 | 10.584 | 3.734 | 0.197 | 14.184 | 5.004 |
| 0.048 | 3.456 | 1.219 | 0.098 | 7.056 | 2.489 | 0.148 | 10.656 | 3.759 | 0.198 | 14.256 | 5.029 |
| 0.049 | 3.528 | 1.245 | 0.099 | 7.128 | 2.515 | 0.149 | 10.728 | 3.785 | 0.199 | 14.328 | 5.055 |
| 0.050 | 3.600 | 1.270 | 0.100 | 7.200 | 2.540 | 0.150 | 10.800 | 3.810 | 0.200 | 14.400 | 5.080 |

**Table 2. Abbreviations used in this standard.**

| Abbreviation        | Meaning                              | Example of usage  |
|---------------------|--------------------------------------|---|
| B                   | brown [ink]                          | 422-B (pattern)   |
| C                   | cyan [ink]                           | 132-C (pattern)   |
| CMYK                | cyan/magenta/yellow/black            | CMYK color model  |
| DO                  | dropout [pattern]                    | 204-DO (pattern)  |
| FG-8                | FGDC-GeoAge [font], 8 pt type        | Tg (unit label containing geologic age character)               |
| H-8 <sup>1</sup>    | Helvetica [font], 8 pt type          | GOLDEN FAULT (name of fault)                                    |
| HB-8 <sup>1</sup>   | Helvetica Bold [font], 8 pt type     | ? (query indicating "identity or existence questionable" fault) |
| HI-6 <sup>1</sup>   | Helvetica Italic [font], 6 pt type   | 40 (dip value)  |
| HSV                 | hue/saturation/value                 | HSV color model   |
| K                   | black [ink]                          | 134-K (pattern)   |
| M                   | magenta [ink]                        | 313-M (pattern)   |
| R                   | red [ink]                            | 405-R (pattern)   |
| RGB                 | red/green/blue                       | RGB color model   |
| TBI-12 <sup>2</sup> | Times Bold Italic [font], 12 pt type | A—A' (cross section labels)                                     |
| TI-8 <sup>2</sup>   | Times Italic [font], 8 pt type       | Bass Lake (name of lake)  |
| Y                   | yellow [ink]                         | CMYK color model  |

<sup>1</sup> Although Helvetica has been specified, any sans-serif font (such as Univers or Arial) may be used. Note, however, that if other fonts are used, their appearance will not match that of FGDC-GeoAge, whose character size and spacing is based on Helvetica.

<sup>2</sup> Although Times has been specified, any serif font (such as Times New Roman or Souvenir) may be used.

**Table 3. Spot color specifications used in this standard, and their equivalent colors in other color models.**

[Abbreviations: C, cyan; M, magenta; Y, yellow; K, black (standard process-color inks combined during offset printing). CMYK, cyan/magenta/yellow/black color model. R, red; G, green; B, blue (primary colors transmitted by computer monitors and televisions). RGB, red/green/blue color model.]

| Spot color <sup>1</sup> | Pantone color <sup>2</sup> | Directly converted CMYK color <sup>3</sup> | Color on CMYK Color Chart <sup>4</sup> | Directly converted RGB color <sup>5</sup> | "Web-safe" RGB color <sup>6</sup> |
|-------------------------|----------------------------|--|--|---|-----------------------------------|
| red                     | 485 U                      | 0/100/91/0                                 | 0/100/100                              | 254/0/12                                  | 255/0/0                           |
| 50% red                 | 485 U<br>(screened 50%)    | 0/50/45.5/0                                | 0/50/40                                | 251/128/104                               | 255/102/102                       |
| green                   | 354 U                      | 91/0/83/0                                  | 100/0/100                              | 24/150/76                                 | 51/153/102                        |
| 50% green               | 354 U<br>(screened 50%)    | 45.5/0/41.5/0                              | 40/0/40                                | 139/207/144                               | 153/204/153                       |
| violet                  | 253 U                      | 47/91/0/0                                  | 50/100/0                               | 136/22/135                                | 153/0/153                         |
| purple                  | 2735 U                     | 100/94/0/0                                 | 100/100/0                              | 18/12/128                                 | 0/0/153                           |
| brown                   | 470 U                      | 0/56/94/34                                 | 30/70/100                              | 168/74/9                                  | 153/51/0                          |
| orange                  | 1585 U                     | 0/56/87/0                                  | 0/60/100                               | 254/112/24                                | 255/102/0                         |

<sup>1</sup> Generic name of spot color, as specified in this standard (note that cyan, magenta, yellow, and black are process-color inks, not spot colors, and so they have not been included in this table).

<sup>2</sup> Suggested Pantone color for offset printing on uncoated paper.

<sup>3</sup> Color value after direct conversion of suggested Pantone color to CMYK (C/M/Y/K) by Adobe Illustrator 8.0.1.

<sup>4</sup> Closest color on CMYK Color Chart (in pocket) to directly converted CMYK color value.

<sup>5</sup> Color value after direct conversion of suggested Pantone color to RGB (R/G/B) by Adobe Illustrator 8.0.1.

<sup>6</sup> Closest "web-safe" color (see discussion in Section 7.3, entitled "Color Specifications for Line and Point Symbols," in the introductory text) to directly converted RGB color value.

**1 – CONTACTS, KEY BEDS, AND DIKES**

| REF NO                | DESCRIPTION  | SYMBOL | CARTOGRAPHIC SPECIFICATIONS*         | NOTES ON USAGE*   |
|-----------------------|--|--------|--------------------------------------|---|
| <b>1.1 – Contacts</b> |  |        |                                      |   |
| 1.1.1                 | Contact—Identity and existence certain, location accurate                    | —————  | <i>lineweight .15 mm</i><br>         |   |
| 1.1.2                 | Contact—Identity or existence questionable, location accurate                | —————? |                                      |   |
| 1.1.3                 | Contact—Identity and existence certain, location approximate                 | -----  |                                      |   |
| 1.1.4                 | Contact—Identity or existence questionable, location approximate             | -----? |                                      |   |
| 1.1.5                 | Contact—Identity and existence certain, location inferred                    | -----  |                                      |   |
| 1.1.6                 | Contact—Identity or existence questionable, location inferred                | -----? |                                      |   |
| 1.1.7                 | Contact—Identity and existence certain, location concealed                   | -----  |                                      |   |
| 1.1.8                 | Contact—Identity or existence questionable, location concealed               | -----? |                                      |   |
| 1.1.9                 | Internal contact—Identity and existence certain, location accurate           | —————  | <i>lineweight .15 mm</i><br>         | Use to delineate individual debris flows, landslide blocks, alluvial fans, etc., within the same geologic map unit. |
| 1.1.10                | Internal contact—Identity or existence questionable, location accurate       | —————? |                                      |   |
| 1.1.11                | Internal contact—Identity and existence certain, location approximate        | -----  |                                      |   |
| 1.1.12                | Internal contact—Identity or existence questionable, location approximate    | -----? |                                      |   |
| 1.1.13                | Internal contact—Identity and existence certain, location inferred           | -----  |                                      |   |
| 1.1.14                | Internal contact—Identity or existence questionable, location inferred       | -----? |                                      |   |
| 1.1.15                | Internal contact—Identity and existence certain, location concealed          | -----  |                                      |   |
| 1.1.16                | Internal contact—Identity or existence questionable, location concealed      | -----? |                                      |   |
| 1.1.17                | Gradational contact—Identity and existence certain, location accurate        |        | <i>hachure lineweight .15 mm</i><br> | Use to indicate a gradual or continuous lithologic change from one geologic map unit to another.                    |
| 1.1.18                | Gradational contact—Identity or existence questionable, location accurate    | ?      |                                      |   |
| 1.1.19                | Gradational contact—Identity and existence certain, location approximate     |        |                                      |   |
| 1.1.20                | Gradational contact—Identity or existence questionable, location approximate | ?      |                                      |   |
| 1.1.21                | Gradational contact—Identity and existence certain, location inferred        |        |                                      |   |
| 1.1.22                | Gradational contact—Identity or existence questionable, location inferred    | ?      |                                      |   |
| 1.1.23                | Gradational contact—Identity and existence certain, location concealed       |        |                                      |   |
| 1.1.24                | Gradational contact—Identity or existence questionable, location concealed   | ?      |                                      |   |

**1—CONTACTS, KEY BEDS, AND DIKES (continued)**

| REF NO                          | DESCRIPTION  | SYMBOL | CARTOGRAPHIC SPECIFICATIONS* | NOTES ON USAGE*   |
|---------------------------------|--|--------|------------------------------|---|
| <b>1.1—Contacts (continued)</b> |  |        |                              |   |
| 1.1.25                          | Unconformable contact—Identity and existence certain, location accurate  |        |                              | May be used to show paraconformities or disconformities. Not intended for use to show angular unconformities or nonconformities.<br><br>Boundary of geologic map unit is center line (solid or dashed), not "sine-wave"-style line. |
| 1.1.26                          | Unconformable contact—Identity or existence questionable, location accurate  |        |                              |   |
| 1.1.27                          | Unconformable contact—Identity and existence certain, location approximate   |        | 3.5 mm<br>                   |   |
| 1.1.28                          | Unconformable contact—Identity or existence questionable, location approximate                                       |        | .75 mm .75 mm<br>            |   |
| 1.1.29                          | Unconformable contact—Identity and existence certain, location inferred  |        | 1.5 mm<br>                   |   |
| 1.1.30                          | Unconformable contact—Identity or existence questionable, location inferred  |        | .75 mm .75 mm<br>            |   |
| 1.1.31                          | Unconformable contact—Identity and existence certain, location concealed   |        | .5 mm<br>                    |   |
| 1.1.32                          | Unconformable contact—Identity or existence questionable, location concealed   |        | .75 mm .75 mm<br>            |   |
| 1.1.33                          | Incised-scarp sedimentary contact—Identity and existence certain, location accurate. Hachures point downscarp        |        | all lineweights .15 mm<br>   | Use to show where a younger surficial geologic unit has been deposited on an erosional scarp that has been incised into an older surficial geologic unit.   |
| 1.1.34                          | Incised-scarp sedimentary contact—Identity or existence questionable, location accurate. Hachures point downscarp    |        |                              |   |
| 1.1.35                          | Incised-scarp sedimentary contact—Identity and existence certain, location approximate. Hachures point downscarp     |        | 3.5 mm<br>                   |   |
| 1.1.36                          | Incised-scarp sedimentary contact—Identity or existence questionable, location approximate. Hachures point downscarp |        | .75 mm .75 mm<br>            |   |

\*For more information, see general guidelines on pages A-i to A-v.

**1—CONTACTS, KEY BEDS, AND DIKES (continued)**

| REF NO              | DESCRIPTION  | SYMBOL | CARTOGRAPHIC SPECIFICATIONS*                        | NOTES ON USAGE*   |
|---------------------|--|--------|---|---|
| <b>1.2—Key beds</b> |  |        |   |   |
| 1.2.1               | Key bed—Identity and existence certain, location accurate  |        | <i>lineweight .2 mm</i><br>                         | Use to show key beds that are too narrow to map as an area at map scale.<br>Add name of geologic map unit if more than one type of key bed is shown on map (see Section 1.4).<br>May also be shown in color.  |
| 1.2.2               | Key bed—Identity or existence questionable, location accurate                                    |        |   |   |
| 1.2.3               | Key bed—Identity and existence certain, location approximate                                     |        |   |   |
| 1.2.4               | Key bed—Identity or existence questionable, location approximate                                 |        |   |   |
| 1.2.5               | Key bed—Identity and existence certain, location inferred  |        |   |   |
| 1.2.6               | Key bed—Identity or existence questionable, location inferred                                    |        |   |   |
| 1.2.7               | Key bed—Identity and existence certain, location concealed                                       |        |   |   |
| 1.2.8               | Key bed—Identity or existence questionable, location concealed                                   |        |   |   |
| 1.2.9               | Clay bed—Identity and existence certain, location accurate                                       |        | <i>lineweight .3 mm</i> <i>color 100% green</i><br> | Use to show clay beds that are too narrow to map as an area at map scale.<br>Add name if more than one type is shown on map (see Section 1.4).<br>May also be shown in black or other colors.   |
| 1.2.10              | Clay bed—Identity or existence questionable, location accurate                                   |        |   |   |
| 1.2.11              | Clay bed—Identity and existence certain, location approximate                                    |        |   |   |
| 1.2.12              | Clay bed—Identity or existence questionable, location approximate                                |        |   |   |
| 1.2.13              | Clay bed—Identity and existence certain, location inferred                                       |        |   |   |
| 1.2.14              | Clay bed—Identity or existence questionable, location inferred                                   |        |   |   |
| 1.2.15              | Clay bed—Identity and existence certain, location concealed                                      |        |   |   |
| 1.2.16              | Clay bed—Identity or existence questionable, location concealed                                  |        |   |   |
| 1.2.17              | Bed of economically important commodity—Identity and existence certain, location accurate        |        | <i>lineweight .3 mm</i><br>                         | Use to show such economically important beds as gypsum, salt, bentonite, phosphate, or limestone that are too narrow to map as an area at map scale.<br>Do not use to show coal beds (see Section 1.2, ref. nos. 1.2.25-40).<br>Add name of commodity if more than one type is shown on map (see Section 1.4).<br>May also be shown in color. |
| 1.2.18              | Bed of economically important commodity—Identity or existence questionable, location accurate    |        |   |   |
| 1.2.19              | Bed of economically important commodity—Identity and existence certain, location approximate     |        |   |   |
| 1.2.20              | Bed of economically important commodity—Identity or existence questionable, location approximate |        |   |   |
| 1.2.21              | Bed of economically important commodity—Identity and existence certain, location inferred        |        |   |   |
| 1.2.22              | Bed of economically important commodity—Identity or existence questionable, location inferred    |        |   |   |
| 1.2.23              | Bed of economically important commodity—Identity and existence certain, location concealed       |        |   |   |
| 1.2.24              | Bed of economically important commodity—Identity or existence questionable, location concealed   |        |   |   |

**1—CONTACTS, KEY BEDS, AND DIKES (continued)**

| REF NO                          | DESCRIPTION   | SYMBOL | CARTOGRAPHIC SPECIFICATIONS*                                  | NOTES ON USAGE*   |
|---------------------------------|---|--------|---|---|
| <b>1.2—Key beds (continued)</b> |   |        |   |   |
| 1.2.25                          | Coal bed—Identity and existence certain, location accurate                      |        | lineweight .3 mm<br>color 100% red                            | Use to show coal beds that are too narrow to map as an area at map scale.<br>Add name if more than one type is shown on map (see Section 1.4).<br>May also be shown in black or other colors.   |
| 1.2.26                          | Coal bed—Identity or existence questionable, location accurate                  |        | HB-8 (100% red)<br>12.0 mm<br>.75 mm                          |   |
| 1.2.27                          | Coal bed—Identity and existence certain, location approximate                   |        | 3.5 mm  |   |
| 1.2.28                          | Coal bed—Identity or existence questionable, location approximate               |        | .75 mm .75 mm   |   |
| 1.2.29                          | Coal bed—Identity and existence certain, location inferred                      |        | 1.5 mm  |   |
| 1.2.30                          | Coal bed—Identity or existence questionable, location inferred                  |        | .75 mm .75 mm   |   |
| 1.2.31                          | Coal bed—Identity and existence certain, location concealed                     |        | .5 mm   |   |
| 1.2.32                          | Coal bed—Identity or existence questionable, location concealed                 |        | .75 mm .75 mm   |   |
| 1.2.33                          | Clinkered coal bed—Identity and existence certain, location accurate            |        | .375 mm<br>8 mm<br>H-8 (100% red)<br>2.0 mm<br>color 100% red | Use to show clinkered coal beds that are too narrow to map as an area at map scale.<br>Tops of V's follow trace of bed; V's point downward stratigraphically.<br>Add name if more than one type is shown on map (see Section 1.4).<br>May also be shown in black or other colors. |
| 1.2.34                          | Clinkered coal bed—Identity or existence questionable, location accurate        |        | lineweight .2 mm  |   |
| 1.2.35                          | Clinkered coal bed—Identity and existence certain, location approximate         |        | .375 mm   |   |
| 1.2.36                          | Clinkered coal bed—Identity or existence questionable, location approximate     |        | 2.0 mm 2.0 mm   |   |
| 1.2.37                          | Clinkered coal bed—Identity and existence certain, location inferred            |        | .375 mm   |   |
| 1.2.38                          | Clinkered coal bed—Identity or existence questionable, location inferred        |        | 2.0 mm 2.0 mm   |   |
| 1.2.39                          | Clinkered coal bed—Identity and existence certain, location concealed           |        |   |   |
| 1.2.40                          | Clinkered coal bed—Identity or existence questionable, location concealed       |        | 2.0 mm 2.0 mm   |   |
| 1.2.41                          | Area of clinkered coal bed  |        | contact [lineweight .15 mm] pattern 317-R                     | Add name if more than one type is shown on map (see Section 1.4).   |
| 1.2.42                          | Outcrop area of key bed or bed of economically important commodity (1st option) |        | scratch boundary [lineweight 0.0] 100% black                  | Outcrop areas may either overprint other geologic map units or be used as stand-alone geologic map units.<br>Each type of outcrop area may also be shown in other values of black or in other colors; add name(s) if more than one type is shown on map (see Section 1.4).        |
| 1.2.43                          | Outcrop area of key bed or bed of economically important commodity (2nd option) |        | scratch boundary [lineweight 0.0] 30% black                   |   |
| 1.2.44                          | Outcrop area of clay bed  |        | scratch boundary [lineweight 0.0] 100% green                  |   |
| 1.2.45                          | Outcrop area of coal bed  |        | scratch boundary [lineweight 0.0] 100% red                    |   |

\*For more information, see general guidelines on pages A-i to A-v.

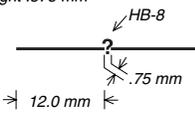
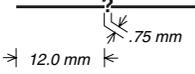
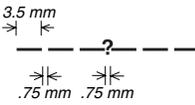
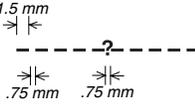
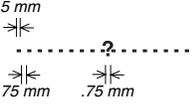
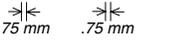


**1—CONTACTS, KEY BEDS, AND DIKES (continued)**

| REF NO   | DESCRIPTION   | SYMBOL | CARTOGRAPHIC SPECIFICATIONS*  | NOTES ON USAGE*  |
|--|---|--------|---|--|
| <b>1.4—Line-symbol decorations and notations for contacts, key beds, and dikes</b> |   |        |   |  |
| 1.4.1  | Inclined contact, dike, key bed, clay bed, coal bed, or bed of economically important commodity (1st option)—Showing dip value and direction  |        | tick length 1.75 mm; line weight .15 mm<br>35 ← H-6                           | Line-symbol decorations may be added to any type or style of contact, as well as to any type or style of key bed or dike (use proper line-weights, etc., to show clay beds, coal beds, dikes, etc.).<br><br>Place tick, arrow, or other line-symbol decoration where observation was made.<br><br>Add arrowhead or '90' to ticks showing dip if necessary for clarity. |
| 1.4.2  | Inclined contact, dike, key bed, clay bed, coal bed, or bed of economically important commodity (2nd option)—Showing dip value and direction  |        | tick length 1.375 mm; line weight .15 mm<br>15 ← H-6<br>30°                   |  |
| 1.4.3  | Vertical or near-vertical contact, dike, key bed, clay bed, coal bed, or bed of economically important commodity (1st option)   |        | tick length 2.5 mm; line weight .15 mm  |  |
| 1.4.4  | Vertical or near-vertical contact, dike, key bed, clay bed, coal bed, or bed of economically important commodity (2nd option)   |        | 90 ← H-6  |  |
| 1.4.5  | Overtaken contact, dike, key bed, clay bed, coal bed, or bed of economically important commodity (1st option)—Showing dip value and direction   |        | tick length 1.75 mm; line weight .15 mm<br>85 ← H-6<br>.625 mm radius         |  |
| 1.4.6  | Overtaken contact, dike, key bed, clay bed, coal bed, or bed of economically important commodity (2nd option)—Showing dip value and direction   |        | tick length 1.375 mm; line weight .15 mm<br>75 ← H-6<br>.625 mm radius<br>30° |  |
| 1.4.7  | Lineation on surface of contact, dike, key bed, clay bed, coal bed, or bed of economically important commodity—Showing bearing and plunge   |        | 6.0 mm<br>65 ← H-6<br>line weight .175 mm<br>25°<br>1.5 mm                    |  |
| 1.4.8  | Lineation on surface of inclined contact, dike, key bed, clay bed, coal bed, or bed of economically important commodity—Tick shows contact dip value and direction; arrow shows bearing and plunge of lineation |        | tick length 1.75 mm; line weight .15 mm<br>H-6 → 25<br>35                     |  |
| 1.4.9  | Contact—Showing relative age of intrusive or extrusive units where known: Y, younger; O, older  |        | H-7 → Y<br>H-7 → O  |  |
| 1.4.10   | Contact—Showing location where contact is particularly well exposed in field  |        | 1/20°<br>1.75 mm<br>.75 mm  |  |
| 1.4.11   | Key bed, clay bed, coal bed, bed of economically important commodity, or dike—Showing thickness and location where measured   |        | 1.5 ← H-6   | Use proper line-weights, etc., to show clay beds, coal beds, dikes, etc.   |
| 1.4.12   | Key bed—Showing name  |        | ds ← H-8  |  |
| 1.4.13   | Clay bed—Showing name   |        | sc ← H-8 (100% black)   |  |
| 1.4.14   | Bed of economically important commodity—Showing name  |        | gyp ← H-8   |  |
| 1.4.15   | Coal bed—Showing name   |        | lg ← H-8 (100% black)   |  |
| 1.4.16   | Clinkered coal bed—Showing name   |        | m ← H-8 (100% black)  |  |
| 1.4.17   | Area of clinkered coal bed—Showing name   |        | bg ← H-8 (100% black)   |  |
| 1.4.18   | Dike—Showing name   |        | Km ← H-8<br>leader line weight .175 mm  | Although only "dike (2nd option)" is shown labeled here, map-unit labels may be added to any type of dike symbol. Use a queried map-unit label if identity of dike is questionable.  |
| 1.4.19   | Dike of variable thickness—Showing name   |        | KJd ← H-8<br>leader line weight .175 mm                                       |  |
| 1.4.20   | Dike intruding fault (1st option)—Showing name  |        | Km ← H-8<br>leader line weight .175 mm  |  |
| 1.4.21   | Dike intruding fault (2nd option)—Showing name  |        | H-8 → Td<br>leader line weight .175 mm  |  |

\*For more information, see general guidelines on pages A-i to A-v.

**2—FAULTS**

| REF NO  | DESCRIPTION   | SYMBOL | CARTOGRAPHIC SPECIFICATIONS*   | NOTES ON USAGE*  |
|---|---|--------|--|--|
| <b>2.1—Faults (generic; vertical, subvertical, or high-angle; or unknown or unspecified orientation or sense of slip)</b> |   |        |  |  |
| 2.1.1   | Fault (generic; vertical, subvertical, or high-angle; or unknown or unspecified orientation or sense of slip)— Identity and existence certain, location accurate        | —————  | lineweight .375 mm<br> | Use generic, nonspecific (non-ornamented) fault symbols when orientation or sense of slip is not known or not specified; use also on small-scale maps to show regional fault patterns.<br><br>If orientation or sense of slip is known and if scale allows, use more specific types of ornamented fault symbols to indicate fault geometry and (or) relative motion. |
| 2.1.2   | Fault (generic; vertical, subvertical, or high-angle; or unknown or unspecified orientation or sense of slip)— Identity or existence questionable, location accurate    | —————? |                        |  |
| 2.1.3   | Fault (generic; vertical, subvertical, or high-angle; or unknown or unspecified orientation or sense of slip)— Identity and existence certain, location approximate     | -----  | 3.5 mm<br>             |  |
| 2.1.4   | Fault (generic; vertical, subvertical, or high-angle; or unknown or unspecified orientation or sense of slip)— Identity or existence questionable, location approximate | -----? |                        |  |
| 2.1.5   | Fault (generic; vertical, subvertical, or high-angle; or unknown or unspecified orientation or sense of slip)— Identity and existence certain, location inferred        | -----  | 1.5 mm<br>             |  |
| 2.1.6   | Fault (generic; vertical, subvertical, or high-angle; or unknown or unspecified orientation or sense of slip)— Identity or existence questionable, location inferred    | -----? |                        |  |
| 2.1.7   | Fault (generic; vertical, subvertical, or high-angle; or unknown or unspecified orientation or sense of slip)— Identity and existence certain, location concealed       | .....  | .5 mm<br>              |  |
| 2.1.8   | Fault (generic; vertical, subvertical, or high-angle; or unknown or unspecified orientation or sense of slip)— Identity or existence questionable, location concealed   | .....? |                        |  |

\*For more information, see general guidelines on pages A-i to A-v.

**2—FAULTS (continued)**

| REF NO                   | DESCRIPTION   | SYMBOL | CARTOGRAPHIC SPECIFICATIONS*                   | NOTES ON USAGE*   |  |
|--------------------------|---|--------|--|---|--|
| <b>2.2—Normal faults</b> |   |        |  |   |  |
| 2.2.1                    | Normal fault—Identity and existence certain, location accurate. Ball and bar on downthrown block                  |        | tick length 1.0 mm;<br>line weight .175 mm<br> | Ball and bar symbols are placed along a fault to indicate its overall fault type (normal fault). Ball and bar symbols may also be placed along other types of faults at specific localities where observations of normal (or apparent normal) offset have been made (see Section 2.11). |  |
| 2.2.2                    | Normal fault—Identity or existence questionable, location accurate. Ball and bar on downthrown block              |        |  |   |  |
| 2.2.3                    | Normal fault—Identity and existence certain, location approximate. Ball and bar on downthrown block               |        |  | Ball and bar symbols may be combined with paired arrows to show oblique offset (see Sections 2.7, 2.11). In cross section, use paired arrows to show relative motion of normal faults (see Section 2.11).   |  |
| 2.2.4                    | Normal fault—Identity or existence questionable, location approximate. Ball and bar on downthrown block           |        |  |   |  |
| 2.2.5                    | Normal fault—Identity and existence certain, location inferred. Ball and bar on downthrown block                  |        |  |   |  |
| 2.2.6                    | Normal fault—Identity or existence questionable, location inferred. Ball and bar on downthrown block              |        |  |   |  |
| 2.2.7                    | Normal fault—Identity and existence certain, location concealed. Ball and bar on downthrown block                 |        |  |   |  |
| 2.2.8                    | Normal fault—Identity or existence questionable, location concealed. Ball and bar on downthrown block             |        |  |   |  |
| 2.2.9                    | Low-angle normal fault—Identity and existence certain, location accurate. Half-circles on downthrown block        |        | line weight .375 mm<br>                        |   | Half-circles indicate overall fault type (low-angle normal fault); they are not placed at specific localities where observations have been made. |
| 2.2.10                   | Low-angle normal fault—Identity or existence questionable, location accurate. Half-circles on downthrown block    |        |  |   |  |
| 2.2.11                   | Low-angle normal fault—Identity and existence certain, location approximate. Half-circles on downthrown block     |        |  | In cross section, use paired arrows to show relative motion of low-angle normal faults (see Section 2.11).  |  |
| 2.2.12                   | Low-angle normal fault—Identity or existence questionable, location approximate. Half-circles on downthrown block |        |  |   |  |
| 2.2.13                   | Low-angle normal fault—Identity and existence certain, location inferred. Half-circles on downthrown block        |        |  |   |  |
| 2.2.14                   | Low-angle normal fault—Identity or existence questionable, location inferred. Half-circles on downthrown block    |        |  |   |  |
| 2.2.15                   | Low-angle normal fault—Identity and existence certain, location concealed. Half-circles on downthrown block       |        |  |   |  |
| 2.2.16                   | Low-angle normal fault—Identity or existence questionable, location concealed. Half-circles on downthrown block   |        |  |   |  |

\*For more information, see general guidelines on pages A-i to A-v.

**2—FAULTS (continued)**

| REF NO   | DESCRIPTION  | SYMBOL | CARTOGRAPHIC SPECIFICATIONS* | NOTES ON USAGE*  |
|--|--|--------|------------------------------|--|
| <b>2.3—Low-angle faults (unknown or unspecified sense of slip)</b> |  |        |                              |  |
| 2.3.1  | Low-angle fault (unknown or unspecified sense of slip)—Identity and existence certain, location accurate. Half-circles on upper plate        |        |                              | Use to show faults that exhibit low-angle geometry but for which relative motion cannot be (or has not been) specified.<br><br>Half-circles indicate overall fault type (low-angle fault, unknown or unspecified sense of slip); they are not placed at specific localities where observations have been made. |
| 2.3.2  | Low-angle fault (unknown or unspecified sense of slip)—Identity or existence questionable, location accurate. Half-circles on upper plate    |        |                              |  |
| 2.3.3  | Low-angle fault (unknown or unspecified sense of slip)—Identity and existence certain, location approximate. Half-circles on upper plate     |        |                              |  |
| 2.3.4  | Low-angle fault (unknown or unspecified sense of slip)—Identity or existence questionable, location approximate. Half-circles on upper plate |        |                              |  |
| 2.3.5  | Low-angle fault (unknown or unspecified sense of slip)—Identity and existence certain, location inferred. Half-circles on upper plate        |        |                              |  |
| 2.3.6  | Low-angle fault (unknown or unspecified sense of slip)—Identity or existence questionable, location inferred. Half-circles on upper plate    |        |                              |  |
| 2.3.7  | Low-angle fault (unknown or unspecified sense of slip)—Identity and existence certain, location concealed. Half-circles on upper plate       |        |                              |  |
| 2.3.8  | Low-angle fault (unknown or unspecified sense of slip)—Identity or existence questionable, location concealed. Half-circles on upper plate   |        |                              |  |
| <b>2.4—Reverse faults</b>  |  |        |                              |  |
| 2.4.1  | Reverse fault—Identity and existence certain, location accurate. Rectangles on upthrown block  |        |                              | Rectangles indicate overall fault type (reverse fault); they are not placed at specific localities where observations have been made.<br><br>In cross section, use paired arrows to show relative motion of reverse faults (see Section 2.11).   |
| 2.4.2  | Reverse fault—Identity or existence questionable, location accurate. Rectangles on upthrown block  |        |                              |  |
| 2.4.3  | Reverse fault—Identity and existence certain, location approximate. Rectangles on upthrown block   |        |                              |  |
| 2.4.4  | Reverse fault—Identity or existence questionable, location approximate. Rectangles on upthrown block   |        |                              |  |
| 2.4.5  | Reverse fault—Identity and existence certain, location inferred. Rectangles on upthrown block  |        |                              |  |
| 2.4.6  | Reverse fault—Identity or existence questionable, location inferred. Rectangles on upthrown block  |        |                              |  |
| 2.4.7  | Reverse fault—Identity and existence certain, location concealed. Rectangles on upthrown block   |        |                              |  |
| 2.4.8  | Reverse fault—Identity or existence questionable, location concealed. Rectangles on upthrown block   |        |                              |  |

\*For more information, see general guidelines on pages A-i to A-v.

**2—FAULTS (continued)**

| REF NO                                  | DESCRIPTION   | SYMBOL | CARTOGRAPHIC SPECIFICATIONS*  | NOTES ON USAGE*   |  |
|---|---|--------|-------------------------------|---|--|
| <b>2.5—Rotational or scissor faults</b> |   |        |                               |   |  |
| 2.5.1                                   | Rotational or scissor fault, reverse-slip offset— Identity and existence certain, location accurate. Rectangles on upthrown block         |        | <i>lineweight .375 mm</i><br> | Rectangles indicate overall fault type (rotational or scissor fault, reverse-slip offset); they are not placed at specific localities where observations have been made.<br><br>In cross section, use paired arrows to show relative motion of rotational or scissor faults (see Section 2.11). |  |
| 2.5.2                                   | Rotational or scissor fault, reverse-slip offset— Identity or existence questionable, location accurate. Rectangles on upthrown block     |        |                               |   |  |
| 2.5.3                                   | Rotational or scissor fault, reverse-slip offset— Identity and existence certain, location approximate. Rectangles on upthrown block      |        | 3.5 mm<br>                    |   |  |
| 2.5.4                                   | Rotational or scissor fault, reverse-slip offset— Identity or existence questionable, location approximate. Rectangles on upthrown block  |        |                               |   |  |
| 2.5.5                                   | Rotational or scissor fault, reverse-slip offset— Identity and existence certain, location inferred. Rectangles on upthrown block         |        | 1.5 mm      2.5 mm<br>        |   |  |
| 2.5.6                                   | Rotational or scissor fault, reverse-slip offset— Identity or existence questionable, location inferred. Rectangles on upthrown block     |        |                               |   |  |
| 2.5.7                                   | Rotational or scissor fault, reverse-slip offset— Identity and existence certain, location concealed. Rectangles on upthrown block        |        | .5 mm      2.5 mm<br>         |   |  |
| 2.5.8                                   | Rotational or scissor fault, reverse-slip offset— Identity or existence questionable, location concealed. Rectangles on upthrown block    |        |                               |   |  |
| 2.5.9                                   | Rotational or scissor fault, normal-slip offset— Identity and existence certain, location accurate. Rectangles on downthrown block        |        | <i>lineweight .375 mm</i><br> |   | Rectangles indicate overall fault type (rotational or scissor fault, normal-slip offset); they are not placed at specific localities where observations have been made.<br><br>In cross section, use paired arrows to show relative motion of rotational or scissor faults (see Section 2.11). |
| 2.5.10                                  | Rotational or scissor fault, normal-slip offset— Identity or existence questionable, location accurate. Rectangles on downthrown block    |        |                               |   |  |
| 2.5.11                                  | Rotational or scissor fault, normal-slip offset— Identity and existence certain, location approximate. Rectangles on downthrown block     |        | 3.5 mm<br>                    |   |  |
| 2.5.12                                  | Rotational or scissor fault, normal-slip offset— Identity or existence questionable, location approximate. Rectangles on downthrown block |        |                               |   |  |
| 2.5.13                                  | Rotational or scissor fault, normal-slip offset— Identity and existence certain, location inferred. Rectangles on downthrown block        |        | 1.5 mm      2.5 mm<br>        |   |  |
| 2.5.14                                  | Rotational or scissor fault, normal-slip offset— Identity or existence questionable, location inferred. Rectangles on downthrown block    |        |                               |   |  |
| 2.5.15                                  | Rotational or scissor fault, normal-slip offset— Identity and existence certain, location concealed. Rectangles on downthrown block       |        | .5 mm      2.5 mm<br>         |   |  |
| 2.5.16                                  | Rotational or scissor fault, normal-slip offset— Identity or existence questionable, location concealed. Rectangles on downthrown block   |        |                               |   |  |

\*For more information, see general guidelines on pages A-i to A-v.

**2—FAULTS (continued)**

| REF NO                        | DESCRIPTION   | SYMBOL | CARTOGRAPHIC SPECIFICATIONS* | NOTES ON USAGE*  |
|-------------------------------|---|--------|------------------------------|--|
| <b>2.6—Strike-slip faults</b> |   |        |                              |  |
| 2.6.1                         | Strike-slip fault, right-lateral offset—Identity and existence certain, location accurate. Arrows show relative motion        |        |                              | <p>Paired arrows are placed along a fault to indicate its overall type (strike-slip fault) and its relative motion.</p> <p>Paired arrows may also be placed along other types of faults at specific localities where observations of strike-slip (or apparent strike-slip) offset have been made (see Section 2.11).</p> <p>Paired arrows may be combined with ball and bar symbols to show oblique offset (see Sections 2.7, 2.11).</p> <p>In cross section, use either A/T or +/- notation to show relative motion of strike-slip faults (see Section 2.11).</p> |
| 2.6.2                         | Strike-slip fault, right-lateral offset—Identity or existence questionable, location accurate. Arrows show relative motion    |        |                              |  |
| 2.6.3                         | Strike-slip fault, right-lateral offset—Identity and existence certain, location approximate. Arrows show relative motion     |        |                              |  |
| 2.6.4                         | Strike-slip fault, right-lateral offset—Identity or existence questionable, location approximate. Arrows show relative motion |        |                              |  |
| 2.6.5                         | Strike-slip fault, right-lateral offset—Identity and existence certain, location inferred. Arrows show relative motion        |        |                              |  |
| 2.6.6                         | Strike-slip fault, right-lateral offset—Identity or existence questionable, location inferred. Arrows show relative motion    |        |                              |  |
| 2.6.7                         | Strike-slip fault, right-lateral offset—Identity and existence certain, location concealed. Arrows show relative motion       |        |                              |  |
| 2.6.8                         | Strike-slip fault, right-lateral offset—Identity or existence questionable, location concealed. Arrows show relative motion   |        |                              |  |
| 2.6.9                         | Strike-slip fault, left-lateral offset—Identity and existence certain, location accurate. Arrows show relative motion         |        |                              |  |
| 2.6.10                        | Strike-slip fault, left-lateral offset—Identity or existence questionable, location accurate. Arrows show relative motion     |        |                              |  |
| 2.6.11                        | Strike-slip fault, left-lateral offset—Identity and existence certain, location approximate. Arrows show relative motion      |        |                              |  |
| 2.6.12                        | Strike-slip fault, left-lateral offset—Identity or existence questionable, location approximate. Arrows show relative motion  |        |                              |  |
| 2.6.13                        | Strike-slip fault, left-lateral offset—Identity and existence certain, location inferred. Arrows show relative motion         |        |                              |  |
| 2.6.14                        | Strike-slip fault, left-lateral offset—Identity or existence questionable, location inferred. Arrows show relative motion     |        |                              |  |
| 2.6.15                        | Strike-slip fault, left-lateral offset—Identity and existence certain, location concealed. Arrows show relative motion        |        |                              |  |
| 2.6.16                        | Strike-slip fault, left-lateral offset—Identity or existence questionable, location concealed. Arrows show relative motion    |        |                              |  |

\*For more information, see general guidelines on pages A-i to A-v.

**2—FAULTS (continued)**

| REF NO                         | DESCRIPTION  | SYMBOL | CARTOGRAPHIC SPECIFICATIONS* | NOTES ON USAGE*  |
|--------------------------------|--|--------|------------------------------|--|
| <b>2.7—Oblique-slip faults</b> |  |        |                              |  |
| 2.7.1                          | Oblique-slip fault, right-lateral offset—Identity and existence certain, location accurate. Arrows show relative motion; ball and bar on downthrown block        |        |                              | Sets of paired arrows and ball and bar symbols are placed along a fault to indicate its overall type (oblique-slip fault) and its relative motion.<br><br>Sets of paired arrows and ball and bar symbols may also be placed along other types of faults at specific localities where observations of oblique-slip (or apparent oblique-slip) offset have been made (see Section 2.11).<br><br>In cross section, use paired arrows with either A/T or +/- notation to show relative motion of oblique-slip faults (see Section 2.11). |
| 2.7.2                          | Oblique-slip fault, right-lateral offset—Identity or existence questionable, location accurate. Arrows show relative motion; ball and bar on downthrown block    |        |                              |  |
| 2.7.3                          | Oblique-slip fault, right-lateral offset—Identity and existence certain, location approximate. Arrows show relative motion; ball and bar on downthrown block     |        |                              |  |
| 2.7.4                          | Oblique-slip fault, right-lateral offset—Identity or existence questionable, location approximate. Arrows show relative motion; ball and bar on downthrown block |        |                              |  |
| 2.7.5                          | Oblique-slip fault, right-lateral offset—Identity and existence certain, location inferred. Arrows show relative motion; ball and bar on downthrown block        |        |                              |  |
| 2.7.6                          | Oblique-slip fault, right-lateral offset—Identity or existence questionable, location inferred. Arrows show relative motion; ball and bar on downthrown block    |        |                              |  |
| 2.7.7                          | Oblique-slip fault, right-lateral offset—Identity and existence certain, location concealed. Arrows show relative motion; ball and bar on downthrown block       |        |                              |  |
| 2.7.8                          | Oblique-slip fault, right-lateral offset—Identity or existence questionable, location concealed. Arrows show relative motion; ball and bar on downthrown block   |        |                              |  |
| 2.7.9                          | Oblique-slip fault, left-lateral offset—Identity and existence certain, location accurate. Arrows show relative motion; ball and bar on downthrown block         |        |                              |  |
| 2.7.10                         | Oblique-slip fault, left-lateral offset—Identity or existence questionable, location accurate. Arrows show relative motion; ball and bar on downthrown block     |        |                              |  |
| 2.7.11                         | Oblique-slip fault, left-lateral offset—Identity and existence certain, location approximate. Arrows show relative motion; ball and bar on downthrown block      |        |                              |  |
| 2.7.12                         | Oblique-slip fault, left-lateral offset—Identity or existence questionable, location approximate. Arrows show relative motion; ball and bar on downthrown block  |        |                              |  |
| 2.7.13                         | Oblique-slip fault, left-lateral offset—Identity and existence certain, location inferred. Arrows show relative motion; ball and bar on downthrown block         |        |                              |  |
| 2.7.14                         | Oblique-slip fault, left-lateral offset—Identity or existence questionable, location inferred. Arrows show relative motion; ball and bar on downthrown block     |        |                              |  |
| 2.7.15                         | Oblique-slip fault, left-lateral offset—Identity and existence certain, location concealed. Arrows show relative motion; ball and bar on downthrown block        |        |                              |  |
| 2.7.16                         | Oblique-slip fault, left-lateral offset—Identity or existence questionable, location concealed. Arrows show relative motion; ball and bar on downthrown block    |        |                              |  |

\*For more information, see general guidelines on pages A-i to A-v.

**2—FAULTS (continued)**

| REF NO                   | DESCRIPTION   | SYMBOL | CARTOGRAPHIC SPECIFICATIONS* | NOTES ON USAGE*  |
|--------------------------|---|--------|------------------------------|--|
| <b>2.8—Thrust faults</b> |   |        |                              |  |
| 2.8.1                    | Thrust fault (1st option)—Identity and existence certain, location accurate. Sawteeth on upper (tectonically higher) plate        |        |                              | <p>Sawteeth indicate over-all fault type (thrust fault); they are not placed at specific localities where observations have been made.</p> <p>In cross section, use paired arrows to show relative motion of thrust faults (see Section 2.11).</p> <p>If desired, "2nd option" and "3rd option" symbols may be used to show other types or generations of thrust faults.</p> |
| 2.8.2                    | Thrust fault (1st option)—Identity or existence questionable, location accurate. Sawteeth on upper (tectonically higher) plate    |        |                              |  |
| 2.8.3                    | Thrust fault (1st option)—Identity and existence certain, location approximate. Sawteeth on upper (tectonically higher) plate     |        |                              |  |
| 2.8.4                    | Thrust fault (1st option)—Identity or existence questionable, location approximate. Sawteeth on upper (tectonically higher) plate |        |                              |  |
| 2.8.5                    | Thrust fault (1st option)—Identity and existence certain, location inferred. Sawteeth on upper (tectonically higher) plate        |        |                              |  |
| 2.8.6                    | Thrust fault (1st option)—Identity or existence questionable, location inferred. Sawteeth on upper (tectonically higher) plate    |        |                              |  |
| 2.8.7                    | Thrust fault (1st option)—Identity and existence certain, location concealed. Sawteeth on upper (tectonically higher) plate       |        |                              |  |
| 2.8.8                    | Thrust fault (1st option)—Identity or existence questionable, location concealed. Sawteeth on upper (tectonically higher) plate   |        |                              |  |
| 2.8.9                    | Thrust fault (2nd option)—Identity and existence certain, location accurate. Sawteeth on upper (tectonically higher) plate        |        |                              |  |
| 2.8.10                   | Thrust fault (2nd option)—Identity or existence questionable, location accurate. Sawteeth on upper (tectonically higher) plate    |        |                              |  |
| 2.8.11                   | Thrust fault (2nd option)—Identity and existence certain, location approximate. Sawteeth on upper (tectonically higher) plate     |        |                              |  |
| 2.8.12                   | Thrust fault (2nd option)—Identity or existence questionable, location approximate. Sawteeth on upper (tectonically higher) plate |        |                              |  |
| 2.8.13                   | Thrust fault (2nd option)—Identity and existence certain, location inferred. Sawteeth on upper (tectonically higher) plate        |        |                              |  |
| 2.8.14                   | Thrust fault (2nd option)—Identity or existence questionable, location inferred. Sawteeth on upper (tectonically higher) plate    |        |                              |  |
| 2.8.15                   | Thrust fault (2nd option)—Identity and existence certain, location concealed. Sawteeth on upper (tectonically higher) plate       |        |                              |  |
| 2.8.16                   | Thrust fault (2nd option)—Identity or existence questionable, location concealed. Sawteeth on upper (tectonically higher) plate   |        |                              |  |
| 2.8.17                   | Thrust fault (3rd option)—Identity and existence certain, location accurate. Sawteeth on upper (tectonically higher) plate        |        |                              |  |
| 2.8.18                   | Thrust fault (3rd option)—Identity or existence questionable, location accurate. Sawteeth on upper (tectonically higher) plate    |        |                              |  |
| 2.8.19                   | Thrust fault (3rd option)—Identity and existence certain, location approximate. Sawteeth on upper (tectonically higher) plate     |        |                              |  |
| 2.8.20                   | Thrust fault (3rd option)—Identity or existence questionable, location approximate. Sawteeth on upper (tectonically higher) plate |        |                              |  |
| 2.8.21                   | Thrust fault (3rd option)—Identity and existence certain, location inferred. Sawteeth on upper (tectonically higher) plate        |        |                              |  |
| 2.8.22                   | Thrust fault (3rd option)—Identity or existence questionable, location inferred. Sawteeth on upper (tectonically higher) plate    |        |                              |  |
| 2.8.23                   | Thrust fault (3rd option)—Identity and existence certain, location concealed. Sawteeth on upper (tectonically higher) plate       |        |                              |  |
| 2.8.24                   | Thrust fault (3rd option)—Identity or existence questionable, location concealed. Sawteeth on upper (tectonically higher) plate   |        |                              |  |

**2—FAULTS (continued)**

| REF NO                              | DESCRIPTION   | SYMBOL | CARTOGRAPHIC SPECIFICATIONS* | NOTES ON USAGE*  |
|-------------------------------------|---|--------|------------------------------|--|
| <b>2.9—Overturned thrust faults</b> |   |        |                              |  |
| 2.9.1                               | Overturned thrust fault (1st option)—Identity and existence certain, location accurate. Bars on tectonically higher plate (footwall); sawteeth in direction of dip        |        |                              | Bars and sawteeth indicate overall fault type (overturned thrust fault); they are not placed at specific localities where observations have been made.<br><br>In cross section, use paired arrows to show relative motion of overturned thrust faults (see Section 2.11).<br><br>If desired, "2nd option" and "3rd option" symbols may be used to show other types or generations of overturned thrust faults. |
| 2.9.2                               | Overturned thrust fault (1st option)—Identity or existence questionable, location accurate. Bars on tectonically higher plate (footwall); sawteeth in direction of dip    |        |                              |  |
| 2.9.3                               | Overturned thrust fault (1st option)—Identity and existence certain, location approximate. Bars on tectonically higher plate (footwall); sawteeth in direction of dip     |        |                              |  |
| 2.9.4                               | Overturned thrust fault (1st option)—Identity or existence questionable, location approximate. Bars on tectonically higher plate (footwall); sawteeth in direction of dip |        |                              |  |
| 2.9.5                               | Overturned thrust fault (1st option)—Identity and existence certain, location inferred. Bars on tectonically higher plate (footwall); sawteeth in direction of dip        |        |                              |  |
| 2.9.6                               | Overturned thrust fault (1st option)—Identity or existence questionable, location inferred. Bars on tectonically higher plate (footwall); sawteeth in direction of dip    |        |                              |  |
| 2.9.7                               | Overturned thrust fault (1st option)—Identity and existence certain, location concealed. Bars on tectonically higher plate (footwall); sawteeth in direction of dip       |        |                              |  |
| 2.9.8                               | Overturned thrust fault (1st option)—Identity or existence questionable, location concealed. Bars on tectonically higher plate (footwall); sawteeth in direction of dip   |        |                              |  |
| 2.9.9                               | Overturned thrust fault (2nd option)—Identity and existence certain, location accurate. Bars on tectonically higher plate (footwall); sawteeth in direction of dip        |        |                              |  |
| 2.9.10                              | Overturned thrust fault (2nd option)—Identity or existence questionable, location accurate. Bars on tectonically higher plate (footwall); sawteeth in direction of dip    |        |                              |  |
| 2.9.11                              | Overturned thrust fault (2nd option)—Identity and existence certain, location approximate. Bars on tectonically higher plate (footwall); sawteeth in direction of dip     |        |                              |  |
| 2.9.12                              | Overturned thrust fault (2nd option)—Identity or existence questionable, location approximate. Bars on tectonically higher plate (footwall); sawteeth in direction of dip |        |                              |  |
| 2.9.13                              | Overturned thrust fault (2nd option)—Identity and existence certain, location inferred. Bars on tectonically higher plate (footwall); sawteeth in direction of dip        |        |                              |  |
| 2.9.14                              | Overturned thrust fault (2nd option)—Identity or existence questionable, location inferred. Bars on tectonically higher plate (footwall); sawteeth in direction of dip    |        |                              |  |
| 2.9.15                              | Overturned thrust fault (2nd option)—Identity and existence certain, location concealed. Bars on tectonically higher plate (footwall); sawteeth in direction of dip       |        |                              |  |
| 2.9.16                              | Overturned thrust fault (2nd option)—Identity or existence questionable, location concealed. Bars on tectonically higher plate (footwall); sawteeth in direction of dip   |        |                              |  |
| 2.9.17                              | Overturned thrust fault (3rd option)—Identity and existence certain, location accurate. Bars on tectonically higher plate (footwall); sawteeth in direction of dip        |        |                              |  |
| 2.9.18                              | Overturned thrust fault (3rd option)—Identity or existence questionable, location accurate. Bars on tectonically higher plate (footwall); sawteeth in direction of dip    |        |                              |  |
| 2.9.19                              | Overturned thrust fault (3rd option)—Identity and existence certain, location approximate. Bars on tectonically higher plate (footwall); sawteeth in direction of dip     |        |                              |  |
| 2.9.20                              | Overturned thrust fault (3rd option)—Identity or existence questionable, location approximate. Bars on tectonically higher plate (footwall); sawteeth in direction of dip |        |                              |  |
| 2.9.21                              | Overturned thrust fault (3rd option)—Identity and existence certain, location inferred. Bars on tectonically higher plate (footwall); sawteeth in direction of dip        |        |                              |  |
| 2.9.22                              | Overturned thrust fault (3rd option)—Identity or existence questionable, location inferred. Bars on tectonically higher plate (footwall); sawteeth in direction of dip    |        |                              |  |
| 2.9.23                              | Overturned thrust fault (3rd option)—Identity and existence certain, location concealed. Bars on tectonically higher plate (footwall); sawteeth in direction of dip       |        |                              |  |
| 2.9.24                              | Overturned thrust fault (3rd option)—Identity or existence questionable, location concealed. Bars on tectonically higher plate (footwall); sawteeth in direction of dip   |        |                              |  |

**2—FAULTS (continued)**

| REF NO  | DESCRIPTION   | SYMBOL | CARTOGRAPHIC SPECIFICATIONS* | NOTES ON USAGE*  |
|---|---|--------|------------------------------|--|
| <b>2.10—Detachment faults (sense of slip unspecified)</b> |   |        |                              |  |
| 2.10.1  | Detachment fault (sense of slip unspecified) (1st option)—Identity and existence certain, location accurate. Hachures on upper plate        |        |                              | May be used to show either normal (extensional) or thrust (compressional) offset. Hachures indicate overall fault type (detachment fault); they are not placed at specific localities where observations have been made. In cross section, use paired arrows to show relative motion of detachment faults (see Section 2.11). If desired, "2nd option" and "3rd option" symbols may be used to show other types or generations of detachment faults. |
| 2.10.2  | Detachment fault (sense of slip unspecified) (1st option)—Identity or existence questionable, location accurate. Hachures on upper plate    |        |                              |  |
| 2.10.3  | Detachment fault (sense of slip unspecified) (1st option)—Identity and existence certain, location approximate. Hachures on upper plate     |        |                              |  |
| 2.10.4  | Detachment fault (sense of slip unspecified) (1st option)—Identity or existence questionable, location approximate. Hachures on upper plate |        |                              |  |
| 2.10.5  | Detachment fault (sense of slip unspecified) (1st option)—Identity and existence certain, location inferred. Hachures on upper plate        |        |                              |  |
| 2.10.6  | Detachment fault (sense of slip unspecified) (1st option)—Identity or existence questionable, location inferred. Hachures on upper plate    |        |                              |  |
| 2.10.7  | Detachment fault (sense of slip unspecified) (1st option)—Identity and existence certain, location concealed. Hachures on upper plate       |        |                              |  |
| 2.10.8  | Detachment fault (sense of slip unspecified) (1st option)—Identity or existence questionable, location concealed. Hachures on upper plate   |        |                              |  |
| 2.10.9  | Detachment fault (sense of slip unspecified) (2nd option)—Identity and existence certain, location accurate. Boxes on upper plate           |        |                              | May be used to show either normal (extensional) or thrust (compressional) offset. Boxes indicate overall fault type (detachment fault); they are not placed at specific localities where observations have been made. In cross section, use paired arrows to show relative motion of detachment faults (see Section 2.11). If desired, "2nd option" and "3rd option" symbols may be used to show other types or generations of detachment faults.    |
| 2.10.10   | Detachment fault (sense of slip unspecified) (2nd option)—Identity or existence questionable, location accurate. Boxes on upper plate       |        |                              |  |
| 2.10.11   | Detachment fault (sense of slip unspecified) (2nd option)—Identity and existence certain, location approximate. Boxes on upper plate        |        |                              |  |
| 2.10.12   | Detachment fault (sense of slip unspecified) (2nd option)—Identity or existence questionable, location approximate. Boxes on upper plate    |        |                              |  |
| 2.10.13   | Detachment fault (sense of slip unspecified) (2nd option)—Identity and existence certain, location inferred. Boxes on upper plate           |        |                              |  |
| 2.10.14   | Detachment fault (sense of slip unspecified) (2nd option)—Identity or existence questionable, location inferred. Boxes on upper plate       |        |                              |  |
| 2.10.15   | Detachment fault (sense of slip unspecified) (2nd option)—Identity and existence certain, location concealed. Boxes on upper plate          |        |                              |  |
| 2.10.16   | Detachment fault (sense of slip unspecified) (2nd option)—Identity or existence questionable, location concealed. Boxes on upper plate      |        |                              |  |
| 2.10.17   | Detachment fault (sense of slip unspecified) (3rd option)—Identity and existence certain, location accurate. Boxes on upper plate           |        |                              |  |
| 2.10.18   | Detachment fault (sense of slip unspecified) (3rd option)—Identity or existence questionable, location accurate. Boxes on upper plate       |        |                              |  |
| 2.10.19   | Detachment fault (sense of slip unspecified) (3rd option)—Identity and existence certain, location approximate. Boxes on upper plate        |        |                              |  |
| 2.10.20   | Detachment fault (sense of slip unspecified) (3rd option)—Identity or existence questionable, location approximate. Boxes on upper plate    |        |                              |  |
| 2.10.21   | Detachment fault (sense of slip unspecified) (3rd option)—Identity and existence certain, location inferred. Boxes on upper plate           |        |                              |  |
| 2.10.22   | Detachment fault (sense of slip unspecified) (3rd option)—Identity or existence questionable, location inferred. Boxes on upper plate       |        |                              |  |
| 2.10.23   | Detachment fault (sense of slip unspecified) (3rd option)—Identity and existence certain, location concealed. Boxes on upper plate          |        |                              |  |
| 2.10.24   | Detachment fault (sense of slip unspecified) (3rd option)—Identity or existence questionable, location concealed. Boxes on upper plate      |        |                              |  |

**2—FAULTS (continued)**

| REF NO  | DESCRIPTION   | SYMBOL | CARTOGRAPHIC SPECIFICATIONS*       | NOTES ON USAGE*   |   |
|---|---|--------|------------------------------------|---|---|
| <b>2.10—Detachment faults (sense of slip unspecified) (continued)</b> |   |        |                                    |   |   |
| 2.10.25   | Master detachment fault (sense of slip unspecified)<br>— Identity and existence certain, location accurate. Hachures on upper plate                   |        | <i>lineweight .375 mm</i> HB-8<br> | May be used to show either normal (extensional) or thrust (compressional) offset. Hachures indicate overall fault type (master detachment fault); they are not placed at specific localities where observations have been made. In cross section, use paired arrows to show relative motion of master detachment faults (see Section 2.11). |   |
| 2.10.26   | Master detachment fault (sense of slip unspecified)<br>— Identity or existence questionable, location accurate. Hachures on upper plate               |        |                                    |   |   |
| 2.10.27   | Master detachment fault (sense of slip unspecified)<br>— Identity and existence certain, location approximate. Hachures on upper plate                |        |                                    |   |   |
| 2.10.28   | Master detachment fault (sense of slip unspecified)<br>— Identity or existence questionable, location approximate. Hachures on upper plate            |        |                                    |   |   |
| 2.10.29   | Master detachment fault (sense of slip unspecified)<br>— Identity and existence certain, location inferred. Hachures on upper plate                   |        |                                    |   |   |
| 2.10.30   | Master detachment fault (sense of slip unspecified)<br>— Identity or existence questionable, location inferred. Hachures on upper plate               |        |                                    |   |   |
| 2.10.31   | Master detachment fault (sense of slip unspecified)<br>— Identity and existence certain, location concealed. Hachures on upper plate                  |        |                                    |   |   |
| 2.10.32   | Master detachment fault (sense of slip unspecified)<br>— Identity or existence questionable, location concealed. Hachures on upper plate              |        |                                    |   |   |
| 2.10.33   | Listric fault at head of detachment fault (sense of slip unspecified)— Identity and existence certain, location accurate. Ticks on upper plate        |        | <i>lineweight .375 mm</i> HB-8<br> |   | May be used to show either normal (extensional) or thrust (compressional) offset. Ticks indicate overall fault type (listric fault at head of detachment fault); they are not placed at specific localities where observations have been made. In cross section, use paired arrows to show relative motion of listric faults at head of detachment faults (see Section 2.11). |
| 2.10.34   | Listric fault at head of detachment fault (sense of slip unspecified)— Identity or existence questionable, location accurate. Ticks on upper plate    |        |                                    |   |   |
| 2.10.35   | Listric fault at head of detachment fault (sense of slip unspecified)— Identity and existence certain, location approximate. Ticks on upper plate     |        |                                    |   |   |
| 2.10.36   | Listric fault at head of detachment fault (sense of slip unspecified)— Identity or existence questionable, location approximate. Ticks on upper plate |        |                                    |   |   |
| 2.10.37   | Listric fault at head of detachment fault (sense of slip unspecified)— Identity and existence certain, location inferred. Ticks on upper plate        |        |                                    |   |   |
| 2.10.38   | Listric fault at head of detachment fault (sense of slip unspecified)— Identity or existence questionable, location inferred. Ticks on upper plate    |        |                                    |   |   |
| 2.10.39   | Listric fault at head of detachment fault (sense of slip unspecified)— Identity and existence certain, location concealed. Ticks on upper plate       |        |                                    |   |   |
| 2.10.40   | Listric fault at head of detachment fault (sense of slip unspecified)— Identity or existence questionable, location concealed. Ticks on upper plate   |        |                                    |   |   |

\*For more information, see general guidelines on pages A-i to A-v.

**2—FAULTS (continued)**

| REF NO   | DESCRIPTION   | SYMBOL              | CARTOGRAPHIC SPECIFICATIONS*  | NOTES ON USAGE*   |
|--|---|---------------------|---|---|
| <b>2.11—Line-symbol decorations and notations for faults</b> |   |                     |   |   |
| 2.11.1   | Fault showing local normal offset (1st option)—Ball and bar on downthrown block   |                     | tick length 1.0 mm;<br>lineweight .175 mm<br>lineweight .375 mm         | Place line-symbol decorations where observations have been made. Line-symbol decorations may be added to any type or style of fault to show local relative motion or geomorphic relations. Line-symbol decorations may also be added to faults in places where local geomorphic features may indicate an apparent offset but where true sense of displacement is unknown. |
| 2.11.2   | Fault showing local normal offset (2nd option)—U, upthrown block; D, downthrown block                                     |                     |   |   |
| 2.11.3   | Fault showing local reverse offset—Showing dip value and direction. U, upthrown block; D, downthrown block                |                     |   |   |
| 2.11.4   | Fault showing local right-lateral strike-slip offset—Arrows show relative motion  |                     |   |   |
| 2.11.5   | Fault showing local left-lateral strike-slip offset—Arrows show relative motion   |                     |   |   |
| 2.11.6   | Fault showing local right-lateral oblique-slip offset—Arrows show relative motion; ball and bar on downthrown block       |                     |   |   |
| 2.11.7   | Fault showing local left-lateral oblique-slip offset—Arrows show relative motion; ball and bar on downthrown block        |                     |   |   |
| 2.11.8   | Inclined fault (1st option)—Showing dip value and direction   |                     | tick length 1.75 mm;<br>lineweight .225 mm                              | Place tick, arrow, or other line-symbol decoration where observation was made. Add arrowhead or '90' to ticks showing dip if necessary for clarity.   |
| 2.11.9   | Inclined fault (2nd option)—Showing dip value and direction   |                     | tick length 1.375 mm;<br>lineweight .225 mm                             |   |
| 2.11.10  | Vertical or near-vertical fault (1st option)  |                     | tick length 2.5 mm;<br>lineweight .225 mm                               |   |
| 2.11.11  | Vertical or near-vertical fault (2nd option)  |                     | 90 ← H-6  |   |
| 2.11.12  | Lineation on fault surface—Showing bearing and plunge   |                     | 6.0 mm<br>65 ← H-6<br>lineweight .225 mm<br>25°<br>1.5 mm               |   |
| 2.11.13  | Lineation on inclined fault surface—Tick shows fault dip value and direction; arrow shows bearing and plunge of lineation |                     | tick length 1.75 mm;<br>lineweight .225 mm<br>H-6 → 25<br>35            |   |
| 2.11.14  | Fault—Showing amount of local displacement  |                     | 68 ← H-6  |   |
| 2.11.15  | Fault—Showing name  | <u>GOLDEN FAULT</u> | <u>GOLDEN FAULT</u> ← H-8   |   |
| 2.11.16  | Normal fault (in cross section)—Arrows show relative motion   |                     | 5.25 mm<br>arrow lineweight .2 mm                                       |   |
| 2.11.17  | Thrust fault or reverse fault (in cross section)—Arrows show relative motion  |                     |   |   |
| 2.11.18  | Detachment fault, movement of upper plate to left (in cross section)—Arrows show relative motion                          |                     | 5.25 mm<br>arrow lineweight .2 mm                                       |   |
| 2.11.19  | Detachment fault, movement of upper plate to right (in cross section)—Arrows show relative motion                         |                     |   |   |
| 2.11.20  | Strike-slip fault (in cross section) (1st option)—A, away from observer; T, toward observer                               |                     | H-7 → A   T ← H-7   | May be combined with paired arrows to show oblique-slip offset.   |
| 2.11.21  | Strike-slip fault (in cross section) (2nd option)—minus, away from observer; plus, toward observer                        |                     | circle diameters 1.75 mm; crossbar lengths 1.75 mm<br>lineweights .2 mm |   |
| 2.11.22  | Normal fault (on small-scale maps or figures)—Tick on downthrown side   |                     | tick length .8 mm;<br>lineweight .25 mm                                 | Usually reserved for use on page-size illustrations or on maps at scales of 1:1,000,000 or smaller.   |
| 2.11.23  | Reverse fault (on small-scale maps or figures)—R on upthrown block  |                     | H-6 (rotate parallel to fault)  |   |
| 2.11.24  | Thrust fault (on small-scale maps or figures)—T on upper (tectonically higher) plate                                      |                     | H-6 (rotate parallel to fault)  |   |

**2—FAULTS (continued)**

| REF NO                   | DESCRIPTION   | SYMBOL | CARTOGRAPHIC SPECIFICATIONS* | NOTES ON USAGE* |
|--------------------------|---|--------|------------------------------|-----------------|
| <b>2.12—Fault scarps</b> |   |        |                              |                 |
| 2.12.1                   | Scarp on fault (generic; vertical, subvertical, or high-angle; or unknown or unspecified orientation or sense of slip)—Identity and existence certain, location accurate. Hachures point downscarp        |        |                              |                 |
| 2.12.2                   | Scarp on fault (generic; vertical, subvertical, or high-angle; or unknown or unspecified orientation or sense of slip)—Identity or existence questionable, location accurate. Hachures point downscarp    |        |                              |                 |
| 2.12.3                   | Scarp on fault (generic; vertical, subvertical, or high-angle; or unknown or unspecified orientation or sense of slip)—Identity and existence certain, location approximate. Hachures point downscarp     |        |                              |                 |
| 2.12.4                   | Scarp on fault (generic; vertical, subvertical, or high-angle; or unknown or unspecified orientation or sense of slip)—Identity or existence questionable, location approximate. Hachures point downscarp |        |                              |                 |
| 2.12.5                   | Scarp on normal fault—Identity and existence certain, location accurate. Ball and bar on downthrown block. Hachures point downscarp   |        |                              |                 |
| 2.12.6                   | Scarp on normal fault—Identity or existence questionable, location accurate. Ball and bar on downthrown block. Hachures point downscarp   |        |                              |                 |
| 2.12.7                   | Scarp on normal fault—Identity and existence certain, location approximate. Ball and bar on downthrown block. Hachures point downscarp  |        |                              |                 |
| 2.12.8                   | Scarp on normal fault—Identity or existence questionable, location approximate. Ball and bar on downthrown block. Hachures point downscarp  |        |                              |                 |
| 2.12.9                   | Scarp on low-angle normal fault—Identity and existence certain, location accurate. Half-circles on downthrown block. Hachures point downscarp   |        |                              |                 |
| 2.12.10                  | Scarp on low-angle normal fault—Identity or existence questionable, location accurate. Half-circles on downthrown block. Hachures point downscarp   |        |                              |                 |
| 2.12.11                  | Scarp on low-angle normal fault—Identity and existence certain, location approximate. Half-circles on downthrown block. Hachures point downscarp  |        |                              |                 |
| 2.12.12                  | Scarp on low-angle normal fault—Identity or existence questionable, location approximate. Half-circles on downthrown block. Hachures point downscarp  |        |                              |                 |
| 2.12.13                  | Scarp on low-angle fault (unknown or unspecified sense of slip)—Identity and existence certain, location accurate. Half-circles on upper plate. Hachures point downscarp                                  |        |                              |                 |
| 2.12.14                  | Scarp on low-angle fault (unknown or unspecified sense of slip)—Identity or existence questionable, location accurate. Half-circles on upper plate. Hachures point downscarp                              |        |                              |                 |
| 2.12.15                  | Scarp on low-angle fault (unknown or unspecified sense of slip)—Identity and existence certain, location approximate. Half-circles on upper plate. Hachures point downscarp                               |        |                              |                 |
| 2.12.16                  | Scarp on low-angle fault (unknown or unspecified sense of slip)—Identity or existence questionable, location approximate. Half-circles on upper plate. Hachures point downscarp                           |        |                              |                 |
| 2.12.17                  | Scarp on reverse fault—Identity and existence certain, location accurate. Rectangles on upthrown block. Hachures point downscarp  |        |                              |                 |
| 2.12.18                  | Scarp on reverse fault—Identity or existence questionable, location accurate. Rectangles on upthrown block. Hachures point downscarp  |        |                              |                 |
| 2.12.19                  | Scarp on reverse fault—Identity and existence certain, location approximate. Rectangles on upthrown block. Hachures point downscarp   |        |                              |                 |
| 2.12.20                  | Scarp on reverse fault—Identity or existence questionable, location approximate. Rectangles on upthrown block. Hachures point downscarp   |        |                              |                 |

\*For more information, see general guidelines on pages A-i to A-v.

**2—FAULTS (continued)**

| REF NO                               | DESCRIPTION  | SYMBOL | CARTOGRAPHIC SPECIFICATIONS* | NOTES ON USAGE* |
|--------------------------------------|--|--------|------------------------------|-----------------|
| <b>2.12—Fault scarps (continued)</b> |  |        |                              |                 |
| 2.12.21                              | Scarp on rotational or scissor fault, reverse-slip offset— Identity and existence certain, location accurate. Rectangles on upthrown block. Hachures point downscarp                                 |        |                              |                 |
| 2.12.22                              | Scarp on rotational or scissor fault, reverse-slip offset— Identity or existence questionable, location accurate. Rectangles on upthrown block. Hachures point downscarp                             |        |                              |                 |
| 2.12.23                              | Scarp on rotational or scissor fault, reverse-slip offset— Identity and existence certain, location approximate. Rectangles on upthrown block. Hachures point downscarp                              |        |                              |                 |
| 2.12.24                              | Scarp on rotational or scissor fault, reverse-slip offset— Identity or existence questionable, location approximate. Rectangles on upthrown block. Hachures point downscarp                          |        |                              |                 |
| 2.12.25                              | Scarp on rotational or scissor fault, normal-slip offset— Identity and existence certain, location accurate. Rectangles on downthrown block. Hachures point downscarp                                |        |                              |                 |
| 2.12.26                              | Scarp on rotational or scissor fault, normal-slip offset— Identity or existence questionable, location accurate. Rectangles on downthrown block. Hachures point downscarp                            |        |                              |                 |
| 2.12.27                              | Scarp on rotational or scissor fault, normal-slip offset— Identity and existence certain, location approximate. Rectangles on downthrown block. Hachures point downscarp                             |        |                              |                 |
| 2.12.28                              | Scarp on rotational or scissor fault, normal-slip offset— Identity or existence questionable, location approximate. Rectangles on downthrown block. Hachures point downscarp                         |        |                              |                 |
| 2.12.29                              | Scarp on strike-slip fault, right-lateral offset— Identity and existence certain, location accurate. Arrows show relative motion. Hachures point downscarp   |        |                              |                 |
| 2.12.30                              | Scarp on strike-slip fault, right-lateral offset— Identity or existence questionable, location accurate. Arrows show relative motion. Hachures point downscarp                                       |        |                              |                 |
| 2.12.31                              | Scarp on strike-slip fault, right-lateral offset— Identity and existence certain, location approximate. Arrows show relative motion. Hachures point downscarp  |        |                              |                 |
| 2.12.32                              | Scarp on strike-slip fault, right-lateral offset— Identity or existence questionable, location approximate. Arrows show relative motion. Hachures point downscarp                                    |        |                              |                 |
| 2.12.33                              | Scarp on strike-slip fault, left-lateral offset— Identity and existence certain, location accurate. Arrows show relative motion. Hachures point downscarp  |        |                              |                 |
| 2.12.34                              | Scarp on strike-slip fault, left-lateral offset— Identity or existence questionable, location accurate. Arrows show relative motion. Hachures point downscarp  |        |                              |                 |
| 2.12.35                              | Scarp on strike-slip fault, left-lateral offset— Identity and existence certain, location approximate. Arrows show relative motion. Hachures point downscarp   |        |                              |                 |
| 2.12.36                              | Scarp on strike-slip fault, left-lateral offset— Identity or existence questionable, location approximate. Arrows show relative motion. Hachures point downscarp                                     |        |                              |                 |
| 2.12.37                              | Scarp on oblique-slip fault, right-lateral offset— Identity and existence certain, location accurate. Arrows show relative motion; ball and bar on downthrown block. Hachures point downscarp        |        |                              |                 |
| 2.12.38                              | Scarp on oblique-slip fault, right-lateral offset— Identity or existence questionable, location accurate. Arrows show relative motion; ball and bar on downthrown block. Hachures point downscarp    |        |                              |                 |
| 2.12.39                              | Scarp on oblique-slip fault, right-lateral offset— Identity and existence certain, location approximate. Arrows show relative motion; ball and bar on downthrown block. Hachures point downscarp     |        |                              |                 |
| 2.12.40                              | Scarp on oblique-slip fault, right-lateral offset— Identity or existence questionable, location approximate. Arrows show relative motion; ball and bar on downthrown block. Hachures point downscarp |        |                              |                 |
| 2.12.41                              | Scarp on oblique-slip fault, left-lateral offset— Identity and existence certain, location accurate. Arrows show relative motion; ball and bar on downthrown block. Hachures point downscarp         |        |                              |                 |
| 2.12.42                              | Scarp on oblique-slip fault, left-lateral offset— Identity or existence questionable, location accurate. Arrows show relative motion; ball and bar on downthrown block. Hachures point downscarp     |        |                              |                 |
| 2.12.43                              | Scarp on oblique-slip fault, left-lateral offset— Identity and existence certain, location approximate. Arrows show relative motion; ball and bar on downthrown block. Hachures point downscarp      |        |                              |                 |
| 2.12.44                              | Scarp on oblique-slip fault, left-lateral offset— Identity or existence questionable, location approximate. Arrows show relative motion; ball and bar on downthrown block. Hachures point downscarp  |        |                              |                 |

**2—FAULTS (continued)**

| REF NO                               | DESCRIPTION  | SYMBOL | CARTOGRAPHIC SPECIFICATIONS* | NOTES ON USAGE* |
|--------------------------------------|--|--------|------------------------------|-----------------|
| <b>2.12—Fault scarps (continued)</b> |  |        |                              |                 |
| 2.12.45                              | Scarp on thrust fault (1st option)—Identity and existence certain, location accurate. Sawteeth on upper (tectonically higher) plate. Hachures point downscarp  |        |                              |                 |
| 2.12.46                              | Scarp on thrust fault (1st option)—Identity or existence questionable, location accurate. Sawteeth on upper (tectonically higher) plate. Hachures point downscarp  |        |                              |                 |
| 2.12.47                              | Scarp on thrust fault (1st option)—Identity and existence certain, location approximate. Sawteeth on upper (tectonically higher) plate. Hachures point downscarp   |        |                              |                 |
| 2.12.48                              | Scarp on thrust fault (1st option)—Identity or existence questionable, location approximate. Sawteeth on upper (tectonically higher) plate. Hachures point downscarp   |        |                              |                 |
| 2.12.49                              | Scarp on thrust fault (2nd option)—Identity and existence certain, location accurate. Sawteeth on upper (tectonically higher) plate. Hachures point downscarp  |        |                              |                 |
| 2.12.50                              | Scarp on thrust fault (2nd option)—Identity or existence questionable, location accurate. Sawteeth on upper (tectonically higher) plate. Hachures point downscarp  |        |                              |                 |
| 2.12.51                              | Scarp on thrust fault (2nd option)—Identity and existence certain, location approximate. Sawteeth on upper (tectonically higher) plate. Hachures point downscarp   |        |                              |                 |
| 2.12.52                              | Scarp on thrust fault (2nd option)—Identity or existence questionable, location approximate. Sawteeth on upper (tectonically higher) plate. Hachures point downscarp   |        |                              |                 |
| 2.12.53                              | Scarp on thrust fault (3rd option)—Identity and existence certain, location accurate. Sawteeth on upper (tectonically higher) plate. Hachures point downscarp  |        |                              |                 |
| 2.12.54                              | Scarp on thrust fault (3rd option)—Identity or existence questionable, location accurate. Sawteeth on upper (tectonically higher) plate. Hachures point downscarp  |        |                              |                 |
| 2.12.55                              | Scarp on thrust fault (3rd option)—Identity and existence certain, location approximate. Sawteeth on upper (tectonically higher) plate. Hachures point downscarp   |        |                              |                 |
| 2.12.56                              | Scarp on thrust fault (3rd option)—Identity or existence questionable, location approximate. Sawteeth on upper (tectonically higher) plate. Hachures point downscarp   |        |                              |                 |
| 2.12.57                              | Scarp on overturned thrust fault (1st option)—Identity and existence certain, location accurate. Bars on tectonically higher plate (footwall); sawteeth in direction of dip. Hachures point downscarp        |        |                              |                 |
| 2.12.58                              | Scarp on overturned thrust fault (1st option)—Identity or existence questionable, location accurate. Bars on tectonically higher plate (footwall); sawteeth in direction of dip. Hachures point downscarp    |        |                              |                 |
| 2.12.59                              | Scarp on overturned thrust fault (1st option)—Identity and existence certain, location approximate. Bars on tectonically higher plate (footwall); sawteeth in direction of dip. Hachures point downscarp     |        |                              |                 |
| 2.12.60                              | Scarp on overturned thrust fault (1st option)—Identity or existence questionable, location approximate. Bars on tectonically higher plate (footwall); sawteeth in direction of dip. Hachures point downscarp |        |                              |                 |
| 2.12.61                              | Scarp on overturned thrust fault (2nd option)—Identity and existence certain, location accurate. Bars on tectonically higher plate (footwall); sawteeth in direction of dip. Hachures point downscarp        |        |                              |                 |
| 2.12.62                              | Scarp on overturned thrust fault (2nd option)—Identity or existence questionable, location accurate. Bars on tectonically higher plate (footwall); sawteeth in direction of dip. Hachures point downscarp    |        |                              |                 |
| 2.12.63                              | Scarp on overturned thrust fault (2nd option)—Identity and existence certain, location approximate. Bars on tectonically higher plate (footwall); sawteeth in direction of dip. Hachures point downscarp     |        |                              |                 |
| 2.12.64                              | Scarp on overturned thrust fault (2nd option)—Identity or existence questionable, location approximate. Bars on tectonically higher plate (footwall); sawteeth in direction of dip. Hachures point downscarp |        |                              |                 |
| 2.12.65                              | Scarp on overturned thrust fault (3rd option)—Identity and existence certain, location accurate. Bars on tectonically higher plate (footwall); sawteeth in direction of dip. Hachures point downscarp        |        |                              |                 |
| 2.12.66                              | Scarp on overturned thrust fault (3rd option)—Identity or existence questionable, location accurate. Bars on tectonically higher plate (footwall); sawteeth in direction of dip. Hachures point downscarp    |        |                              |                 |
| 2.12.67                              | Scarp on overturned thrust fault (3rd option)—Identity and existence certain, location approximate. Bars on tectonically higher plate (footwall); sawteeth in direction of dip. Hachures point downscarp     |        |                              |                 |
| 2.12.68                              | Scarp on overturned thrust fault (3rd option)—Identity or existence questionable, location approximate. Bars on tectonically higher plate (footwall); sawteeth in direction of dip. Hachures point downscarp |        |                              |                 |

**2—FAULTS (continued)**

| REF NO                               | DESCRIPTION  | SYMBOL | CARTOGRAPHIC SPECIFICATIONS*   | NOTES ON USAGE* |
|--------------------------------------|--|--------|--|-----------------|
| <b>2.12—Fault scarps (continued)</b> |  |        |  |                 |
| 2.12.69                              | Scarp on detachment fault (sense of slip unspecified) (1st option)—Identity and existence certain, location accurate. Long-hachure pairs on upper plate. Shorter, widely spaced hachures point downscarp                       |        | <i>hachure height 1.0 mm; linewidth .175 mm</i><br>HB-8<br>2.0 mm  |                 |
| 2.12.70                              | Scarp on detachment fault (sense of slip unspecified) (1st option)—Identity or existence questionable, location accurate. Long-hachure pairs on upper plate. Shorter, widely spaced hachures point downscarp                   |        | <i>linewidth .375 mm</i><br>.75 mm<br>12.0 mm<br>1.25 mm<br><i>hachure height 1.25 mm; linewidth .25 mm</i>          |                 |
| 2.12.71                              | Scarp on detachment fault (sense of slip unspecified) (1st option)—Identity and existence certain, location approximate. Long-hachure pairs on upper plate. Shorter, widely spaced hachures point downscarp                    |        | 3.5 mm   |                 |
| 2.12.72                              | Scarp on detachment fault (sense of slip unspecified) (1st option)—Identity or existence questionable, location approximate. Long-hachure pairs on upper plate. Shorter, widely spaced hachures point downscarp                |        | .75 mm .75 mm  |                 |
| 2.12.73                              | Scarp on detachment fault (sense of slip unspecified) (2nd option)—Identity and existence certain, location accurate. Boxes on upper plate. Hachures point downscarp   |        | <i>hachure height 1.0 mm; linewidth .175 mm</i><br>HB-8<br>2.0 mm  |                 |
| 2.12.74                              | Scarp on detachment fault (sense of slip unspecified) (2nd option)—Identity or existence questionable, location accurate. Boxes on upper plate. Hachures point downscarp   |        | <i>linewidth .375 mm</i><br>.75 mm<br>12.0 mm<br>1.25 mm<br><i>box height 1.25 mm; linewidth .25 mm</i>              |                 |
| 2.12.75                              | Scarp on detachment fault (sense of slip unspecified) (2nd option)—Identity and existence certain, location approximate. Boxes on upper plate. Hachures point downscarp  |        | 3.5 mm   |                 |
| 2.12.76                              | Scarp on detachment fault (sense of slip unspecified) (2nd option)—Identity or existence questionable, location approximate. Boxes on upper plate. Hachures point downscarp  |        | .75 mm .75 mm  |                 |
| 2.12.77                              | Scarp on detachment fault (sense of slip unspecified) (3rd option)—Identity and existence certain, location accurate. Boxes on upper plate. Hachures point downscarp   |        | <i>hachure height 1.0 mm; linewidth .175 mm</i><br>1.25 mm<br>2.0 mm<br>HB-8   |                 |
| 2.12.78                              | Scarp on detachment fault (sense of slip unspecified) (3rd option)—Identity or existence questionable, location accurate. Boxes on upper plate. Hachures point downscarp   |        | <i>linewidth .375 mm</i><br>.75 mm<br>12.0 mm<br>.625 mm<br><i>box height 1.25 mm; linewidth .25 mm</i>              |                 |
| 2.12.79                              | Scarp on detachment fault (sense of slip unspecified) (3rd option)—Identity and existence certain, location approximate. Boxes on upper plate. Hachures point downscarp  |        | 3.5 mm   |                 |
| 2.12.80                              | Scarp on detachment fault (sense of slip unspecified) (3rd option)—Identity or existence questionable, location approximate. Boxes on upper plate. Hachures point downscarp  |        | .75 mm .75 mm  |                 |
| 2.12.81                              | Scarp on master detachment fault (sense of slip unspecified)—Identity and existence certain, location accurate. Long-hachure triplets on upper plate. Shorter, widely spaced hachures point downscarp                          |        | <i>hachure height 1.0 mm; linewidth .175 mm</i><br>1.25 mm<br>2.0 mm<br>HB-8   |                 |
| 2.12.82                              | Scarp on master detachment fault (sense of slip unspecified)—Identity or existence questionable, location accurate. Long-hachure triplets on upper plate. Shorter, widely spaced hachures point downscarp                      |        | <i>linewidth .375 mm</i><br>.75 mm<br>12.0 mm<br>.625 mm<br><i>hachure height 1.25 mm; linewidth .25 mm</i>          |                 |
| 2.12.83                              | Scarp on master detachment fault (sense of slip unspecified)—Identity and existence certain, location approximate. Long-hachure triplets on upper plate. Shorter, widely spaced hachures point downscarp                       |        | 3.5 mm   |                 |
| 2.12.84                              | Scarp on master detachment fault (sense of slip unspecified)—Identity or existence questionable, location approximate. Long-hachure triplets on upper plate. Shorter, widely spaced hachures point downscarp                   |        | .75 mm .75 mm  |                 |
| 2.12.85                              | Scarp on listric fault at head of detachment fault (sense of slip unspecified)—Identity and existence certain, location accurate. Single (longer) ticks on upper plate. Shorter, widely spaced hachures point downscarp        |        | <i>linewidth .375 mm</i><br>HB-8<br>2.0 mm   |                 |
| 2.12.86                              | Scarp on listric fault at head of detachment fault (sense of slip unspecified)—Identity or existence questionable, location accurate. Single (longer) ticks on upper plate. Shorter, widely spaced hachures point downscarp    |        | <i>hachure height 1.0 mm; linewidth .175 mm</i><br>.75 mm<br>12.0 mm<br><i>tick height 1.25 mm; linewidth .25 mm</i> |                 |
| 2.12.87                              | Scarp on listric fault at head of detachment fault (sense of slip unspecified)—Identity and existence certain, location approximate. Single (longer) ticks on upper plate. Shorter, widely spaced hachures point downscarp     |        | 3.5 mm   |                 |
| 2.12.88                              | Scarp on listric fault at head of detachment fault (sense of slip unspecified)—Identity or existence questionable, location approximate. Single (longer) ticks on upper plate. Shorter, widely spaced hachures point downscarp |        | .75 mm .75 mm  |                 |

\*For more information, see general guidelines on pages A-i to A-v.

**2—FAULTS (continued)**

| REF NO   | DESCRIPTION   | SYMBOL | CARTOGRAPHIC SPECIFICATIONS* | NOTES ON USAGE*   |
|--|---|--------|------------------------------|---|
| <b>2.13—Quaternary faulting</b>                              |   |        |                              |   |
| 2.13.1   | Fault showing displacement during historic time (includes areas of known fault creep)           |        |                              | Although only shown here on "identity and existence certain, location accurate," generic faults, color may be added to any type or style of fault to highlight where geomorphic evidence indicates displacement during Quaternary time.                         |
| 2.13.2   | Fault showing displacement during Holocene time   |        |                              |   |
| 2.13.3   | Fault showing displacement during late Quaternary time  |        |                              |   |
| 2.13.4   | Fault showing displacement during Quaternary time (undifferentiated)                            |        |                              |   |
| <b>2.14—Shear zones; mylonite zones; fault-breccia zones</b> |   |        |                              |   |
| 2.14.1   | Ductile shear zone or mylonite zone—May or may not be associated with mappable faults           |        |                              | Orient S-shaped symbols to indicate linear trend of zone; spacing may be varied to show intensity of shear. Width of zones may vary. Patterns may either overprint other map units or be used as stand-alone map units (if zones have well-defined boundaries). |
| 2.14.2   | Zone of sheared rock within fault   |        |                              |   |
| 2.14.3   | Fault-breccia zone or zone of broken rock within fault  |        |                              |   |
| 2.14.4   | Fault-breccia zone or zone of broken rock around fault  |        |                              |   |
| <b>2.15—Small, minor faults</b>                              |   |        |                              |   |
| 2.15.1   | Small, minor inclined fault—Showing strike and dip  |        |                              | Use to show small, minor faults that are observed in outcrop but that cannot be traced away from that outcrop.  |
| 2.15.2   | Small, minor vertical or near-vertical fault—Showing strike                                     |        |                              |   |
| 2.15.3   | Small, minor shear fault—Showing dip. Arrow shows direction of relative horizontal displacement |        |                              |   |

\*For more information, see general guidelines on pages A-i to A-v.



### 4—LINEAMENTS AND JOINTS

| REF NO                         | DESCRIPTION   | SYMBOL                 | CARTOGRAPHIC SPECIFICATIONS*               | NOTES ON USAGE*   |
|--------------------------------|---|------------------------|--|---|
| <b>4.1—Lineaments</b>          |   |                        |  |   |
| 4.1.1                          | Lineament   |                        | lineweight .375 mm<br>                     | Use to show linear features that have been determined from aerial photographs or remotely sensed imagery but not identified on the ground.  |
| 4.1.2                          | Lineament—Showing name  | <u>OLYMPIC-WALLOWA</u> | <u>OLYMPIC-WALLOWA</u> ← H-7               |   |
| <b>4.2—Joints</b>              |   |                        |  |   |
| 4.2.1                          | Joint—Identity and existence certain, location accurate   |                        | lineweight .3 mm                           | Use to show regional joint patterns or single joints that are mappable beyond outcrop.<br>May also be shown in red or other colors.   |
| 4.2.2                          | Joint—Identity and existence certain, location approximate  |                        | 2.0 mm<br>                                 |   |
| 4.2.3                          | Inclined joint (1st option)—Showing dip value and direction   |                        | tick length 1.75 mm; lineweight .2 mm<br>  | Place tick where observation was made. Add arrowhead or '90' to tick if necessary for clarity.  |
| 4.2.4                          | Inclined joint (2nd option)—Showing dip value and direction   |                        | tick length 1.375 mm; lineweight .2 mm<br> |   |
| 4.2.5                          | Vertical or subvertical joint (1st option)  |                        | tick length 2.5 mm; lineweight .2 mm       |   |
| 4.2.6                          | Vertical or subvertical joint (2nd option)  |                        | 90 ← HI-6                                  |   |
| <b>4.3—Small, minor joints</b> |   |                        |  |   |
| 4.3.1                          | Small, minor horizontal joint (1st option)  |                        | lineweight .2 mm<br>                       | Use to show small, minor joints that are observed in outcrop but that cannot be traced away from that outcrop.<br>For symbols representing a single observation at one locality, point of observation is the midpoint of the strike line.<br>For multiple observations at one locality, joint symbols at the "tail" ends of the strike lines (opposite the ornamentation); the junction point is at point of observation. To obey the right-hand rule, use the "dip direction to right" symbols (use "dip direction to left" symbols only when necessary to prevent overcrowding).<br>May also be shown in red or other colors. |
| 4.3.2                          | Small, minor inclined joint (1st option)—Showing strike and dip   |                        | 1.125 mm<br>                               |   |
| 4.3.3                          | Small, minor vertical or near-vertical joint (1st option)—Showing strike  |                        | 1.125 mm<br>                               |   |
| 4.3.4                          | Small, minor inclined (dip direction to right) joint, for multiple observations at one locality (1st option)—Showing strike and dip |                        | 5.5 mm<br>                                 |   |
| 4.3.5                          | Small, minor inclined (dip direction to left) joint, for multiple observations at one locality (1st option)—Showing strike and dip  |                        |  |   |
| 4.3.6                          | Small, minor vertical or near-vertical joint, for multiple observations at one locality (1st option)—Showing strike                 |                        | 5.5 mm<br>                                 |   |
| 4.3.7                          | Small, minor horizontal joint (2nd option)  |                        | all lineweights .2 mm<br>                  |   |
| 4.3.8                          | Small, minor inclined joint (2nd option)—Showing strike and dip   |                        | 1.125 mm<br>                               |   |
| 4.3.9                          | Small, minor vertical or near-vertical joint (2nd option)—Showing strike  |                        | 1.125 mm<br>                               |   |
| 4.3.10                         | Small, minor inclined (dip direction to right) joint, for multiple observations at one locality (2nd option)—Showing strike and dip |                        | 5.5 mm<br>                                 |   |
| 4.3.11                         | Small, minor inclined (dip direction to left) joint, for multiple observations at one locality (2nd option)—Showing strike and dip  |                        |  |   |
| 4.3.12                         | Small, minor vertical or near-vertical joint, for multiple observations at one locality (2nd option)—Showing strike                 |                        | 5.5 mm<br>                                 |   |

\*For more information, see general guidelines on pages A-i to A-v.

**5—FOLDS**

| REF NO                | DESCRIPTION   | SYMBOL | CARTOGRAPHIC SPECIFICATIONS*  | NOTES ON USAGE*  |
|-----------------------|---|--------|---|--|
| <b>5.1—Anticlines</b> |   |        |   |  |
| 5.1.1                 | Anticline (1st option)—Identity and existence certain, location accurate        |        | arrow linewidth .2 mm<br>color 100% magenta<br>40°<br>HB-8<br>5.5 mm<br>12.0 mm<br>1.475 mm<br>.75 mm<br>linewidth .25 mm | Place fold trace where axial surface of anticline intersects the ground surface.<br>Place arrows at places along fold trace to indicate overall fold type (anticline); do not place at specific locality where observation was made. |
| 5.1.2                 | Anticline (1st option)—Identity or existence questionable, location accurate    |        |   |  |
| 5.1.3                 | Anticline (1st option)—Identity and existence certain, location approximate     |        | 3.5 mm<br>.75 mm<br>.75 mm  | Arrowheads may be added to show direction of plunge (see Section 5.10).<br>Open-armed ("2nd option") symbols may be used to show a second generation or another instance of a particular fold type.                                  |
| 5.1.4                 | Anticline (1st option)—Identity or existence questionable, location approximate |        |   |  |
| 5.1.5                 | Anticline (1st option)—Identity and existence certain, location inferred        |        | 1.5 mm<br>.75 mm<br>.75 mm  | May also be shown in black or other colors.  |
| 5.1.6                 | Anticline (1st option)—Identity or existence questionable, location inferred    |        |   |  |
| 5.1.7                 | Anticline (1st option)—Identity and existence certain, location concealed       |        | .5 mm<br>.75 mm<br>.75 mm   |  |
| 5.1.8                 | Anticline (1st option)—Identity or existence questionable, location concealed   |        |   |  |
| 5.1.9                 | Anticline (2nd option)—Identity and existence certain, location accurate        |        | arrow linewidth .2 mm<br>color 100% magenta<br>40°<br>HB-8<br>5.5 mm<br>12.0 mm<br>1.475 mm<br>.75 mm<br>linewidth .25 mm |  |
| 5.1.10                | Anticline (2nd option)—Identity or existence questionable, location accurate    |        |   |  |
| 5.1.11                | Anticline (2nd option)—Identity and existence certain, location approximate     |        | 3.5 mm<br>.75 mm<br>.75 mm  |  |
| 5.1.12                | Anticline (2nd option)—Identity or existence questionable, location approximate |        |   |  |
| 5.1.13                | Anticline (2nd option)—Identity and existence certain, location inferred        |        | 1.5 mm<br>.75 mm<br>.75 mm  |  |
| 5.1.14                | Anticline (2nd option)—Identity or existence questionable, location inferred    |        |   |  |
| 5.1.15                | Anticline (2nd option)—Identity and existence certain, location concealed       |        | .5 mm<br>.75 mm<br>.75 mm   |  |
| 5.1.16                | Anticline (2nd option)—Identity or existence questionable, location concealed   |        |   |  |

\*For more information, see general guidelines on pages A-i to A-v.

**5—FOLDS (continued)**

| REF NO               | DESCRIPTION  | SYMBOL | CARTOGRAPHIC SPECIFICATIONS* | NOTES ON USAGE*  |
|----------------------|--|--------|------------------------------|--|
| <b>5.2—Antiforms</b> |  |        |                              |  |
| 5.2.1                | Antiform (1st option)—Identity and existence certain, location accurate        |        |                              | Place fold trace where axial surface of antiform intersects the ground surface.<br>Place arrows at places along fold trace to indicate overall fold type (antiform); do not place at specific locality where observation was made. |
| 5.2.2                | Antiform (1st option)—Identity or existence questionable, location accurate    |        |                              |  |
| 5.2.3                | Antiform (1st option)—Identity and existence certain, location approximate     |        |                              | Arrowheads may be added to show direction of plunge (see Section 5.10).<br>Open-arrowed ("2nd option") symbols may be used to show a second generation or another instance of a particular fold type.                              |
| 5.2.4                | Antiform (1st option)—Identity or existence questionable, location approximate |        |                              |  |
| 5.2.5                | Antiform (1st option)—Identity and existence certain, location inferred        |        |                              | May also be shown in black or other colors.  |
| 5.2.6                | Antiform (1st option)—Identity or existence questionable, location inferred    |        |                              |  |
| 5.2.7                | Antiform (1st option)—Identity and existence certain, location concealed       |        |                              |  |
| 5.2.8                | Antiform (1st option)—Identity or existence questionable, location concealed   |        |                              |  |
| 5.2.9                | Antiform (2nd option)—Identity and existence certain, location accurate        |        |                              |  |
| 5.2.10               | Antiform (2nd option)—Identity or existence questionable, location accurate    |        |                              |  |
| 5.2.11               | Antiform (2nd option)—Identity and existence certain, location approximate     |        |                              |  |
| 5.2.12               | Antiform (2nd option)—Identity or existence questionable, location approximate |        |                              |  |
| 5.2.13               | Antiform (2nd option)—Identity and existence certain, location inferred        |        |                              |  |
| 5.2.14               | Antiform (2nd option)—Identity or existence questionable, location inferred    |        |                              |  |
| 5.2.15               | Antiform (2nd option)—Identity and existence certain, location concealed       |        |                              |  |
| 5.2.16               | Antiform (2nd option)—Identity or existence questionable, location concealed   |        |                              |  |

\*For more information, see general guidelines on pages A-i to A-v.

**5—FOLDS (continued)**

| REF NO   | DESCRIPTION   | SYMBOL | CARTOGRAPHIC SPECIFICATIONS* | NOTES ON USAGE*   |   |   |  |   |  |  |  |  |  |  |  |  |  |  |
|--|---|--------|------------------------------|---|---|---|--|---|--|--|--|--|--|--|--|--|--|--|
| <b>5.3—Asymmetric, overturned, and inverted anticlines</b> |   |        |                              |   |   |   |  |   |  |  |  |  |  |  |  |  |  |  |
| 5.3.1  | Asymmetric anticline (1st option)—Identity and existence certain, location accurate. Beds are upright; shorter arrow on steeper limb                            |        |                              | Place fold trace where axial surface of asymmetric anticline intersects the ground surface. |   |   |  |   |  |  |  |  |  |  |  |  |  |  |
| 5.3.2  | Asymmetric anticline (1st option)—Identity or existence questionable, location accurate. Beds are upright; shorter arrow on steeper limb                        |        |                              |   | Place arrows at places along fold trace to indicate overall fold type (asymmetric anticline); do not place at specific locality where observation was made. |   |  |   |  |  |  |  |  |  |  |  |  |  |
| 5.3.3  | Asymmetric anticline (1st option)—Identity and existence certain, location approximate. Beds are upright; shorter arrow on steeper limb                         |        |                              |   |   | Arrowheads may be added to show direction of plunge (see Section 5.10). |  |   |  |  |  |  |  |  |  |  |  |  |
| 5.3.4  | Asymmetric anticline (1st option)—Identity or existence questionable, location approximate. Beds are upright; shorter arrow on steeper limb                     |        |                              |   |   |   | Open-arrowed ("2nd option") symbols may be used to show a second generation or another instance of a particular fold type. |   |  |  |  |  |  |  |  |  |  |  |
| 5.3.5  | Asymmetric anticline (1st option)—Identity and existence certain, location inferred. Beds are upright; shorter arrow on steeper limb                            |        |                              |   |   |   |  | May also be shown in black or other colors. |  |  |  |  |  |  |  |  |  |  |
| 5.3.6  | Asymmetric anticline (1st option)—Identity or existence questionable, location inferred. Beds are upright; shorter arrow on steeper limb                        |        |                              |   |   |   |  |   |  |  |  |  |  |  |  |  |  |  |
| 5.3.7  | Asymmetric anticline (1st option)—Identity and existence certain, location concealed. Beds are upright; shorter arrow on steeper limb                           |        |                              |   |   |   |  |   |  |  |  |  |  |  |  |  |  |  |
| 5.3.8  | Asymmetric anticline (1st option)—Identity or existence questionable, location concealed. Beds are upright; shorter arrow on steeper limb                       |        |                              |   |   |   |  |   |  |  |  |  |  |  |  |  |  |  |
| 5.3.9  | Asymmetric anticline (2nd option)—Identity and existence certain, location accurate. Beds are upright; shorter arrow on steeper limb                            |        |                              |   |   |   |  |   |  |  |  |  |  |  |  |  |  |  |
| 5.3.10   | Asymmetric anticline (2nd option)—Identity or existence questionable, location accurate. Beds are upright; shorter arrow on steeper limb                        |        |                              |   |   |   |  |   |  |  |  |  |  |  |  |  |  |  |
| 5.3.11   | Asymmetric anticline (2nd option)—Identity and existence certain, location approximate. Beds are upright; shorter arrow on steeper limb                         |        |                              |   |   |   |  |   |  |  |  |  |  |  |  |  |  |  |
| 5.3.12   | Asymmetric anticline (2nd option)—Identity or existence questionable, location approximate. Beds are upright; shorter arrow on steeper limb                     |        |                              |   |   |   |  |   |  |  |  |  |  |  |  |  |  |  |
| 5.3.13   | Asymmetric anticline (2nd option)—Identity and existence certain, location inferred. Beds are upright; shorter arrow on steeper limb                            |        |                              |   |   |   |  |   |  |  |  |  |  |  |  |  |  |  |
| 5.3.14   | Asymmetric anticline (2nd option)—Identity or existence questionable, location inferred. Beds are upright; shorter arrow on steeper limb                        |        |                              |   |   |   |  |   |  |  |  |  |  |  |  |  |  |  |
| 5.3.15   | Asymmetric anticline (2nd option)—Identity and existence certain, location concealed. Beds are upright; shorter arrow on steeper limb                           |        |                              |   |   |   |  |   |  |  |  |  |  |  |  |  |  |  |
| 5.3.16   | Asymmetric anticline (2nd option)—Identity or existence questionable, location concealed. Beds are upright; shorter arrow on steeper limb                       |        |                              |   |   |   |  |   |  |  |  |  |  |  |  |  |  |  |
| 5.3.17   | Overturned anticline (1st option)—Identity and existence certain, location accurate. Beds on one limb are overturned; arrows show dip direction of limbs        |        |                              |   |   |   |  |   |  |  |  |  |  |  |  |  |  |  |
| 5.3.18   | Overturned anticline (1st option)—Identity or existence questionable, location accurate. Beds on one limb are overturned; arrows show dip direction of limbs    |        |                              |   |   |   |  |   |  |  |  |  |  |  |  |  |  |  |
| 5.3.19   | Overturned anticline (1st option)—Identity and existence certain, location approximate. Beds on one limb are overturned; arrows show dip direction of limbs     |        |                              |   |   |   |  |   |  |  |  |  |  |  |  |  |  |  |
| 5.3.20   | Overturned anticline (1st option)—Identity or existence questionable, location approximate. Beds on one limb are overturned; arrows show dip direction of limbs |        |                              |   |   |   |  |   |  |  |  |  |  |  |  |  |  |  |
| 5.3.21   | Overturned anticline (1st option)—Identity and existence certain, location inferred. Beds on one limb are overturned; arrows show dip direction of limbs        |        |                              |   |   |   |  |   |  |  |  |  |  |  |  |  |  |  |
| 5.3.22   | Overturned anticline (1st option)—Identity or existence questionable, location inferred. Beds on one limb are overturned; arrows show dip direction of limbs    |        |                              |   |   |   |  |   |  |  |  |  |  |  |  |  |  |  |
| 5.3.23   | Overturned anticline (1st option)—Identity and existence certain, location concealed. Beds on one limb are overturned; arrows show dip direction of limbs       |        |                              |   |   |   |  |   |  |  |  |  |  |  |  |  |  |  |
| 5.3.24   | Overturned anticline (1st option)—Identity or existence questionable, location concealed. Beds on one limb are overturned; arrows show dip direction of limbs   |        |                              |   |   |   |  |   |  |  |  |  |  |  |  |  |  |  |

**5—FOLDS (continued)**

| REF NO   | DESCRIPTION   | SYMBOL | CARTOGRAPHIC SPECIFICATIONS* | NOTES ON USAGE*  |
|--|---|--------|------------------------------|--|
| <b>5.3—Asymmetric, overturned, and inverted anticlines (continued)</b> |   |        |                              |  |
| 5.3.25   | Overturned anticline (2nd option)—Identity and existence certain, location accurate. Beds on one limb are overturned; arrows show dip direction of limbs        |        |                              | Place fold trace where axial surface of overturned anticline intersects the ground surface. Place arrows at places along fold trace to indicate overall fold type (overturned anticline); do not place at specific locality where observation was made. Arrowheads may be added to show direction of plunge (see Section 5.10). Open-arrowed ("2nd option") symbols may be used to show a second generation or another instance of a particular fold type. May also be shown in black or other colors. |
| 5.3.26   | Overturned anticline (2nd option)—Identity or existence questionable, location accurate. Beds on one limb are overturned; arrows show dip direction of limbs    |        |                              |  |
| 5.3.27   | Overturned anticline (2nd option)—Identity and existence certain, location approximate. Beds on one limb are overturned; arrows show dip direction of limbs     |        |                              |  |
| 5.3.28   | Overturned anticline (2nd option)—Identity or existence questionable, location approximate. Beds on one limb are overturned; arrows show dip direction of limbs |        |                              |  |
| 5.3.29   | Overturned anticline (2nd option)—Identity and existence certain, location inferred. Beds on one limb are overturned; arrows show dip direction of limbs        |        |                              |  |
| 5.3.30   | Overturned anticline (2nd option)—Identity or existence questionable, location inferred. Beds on one limb are overturned; arrows show dip direction of limbs    |        |                              |  |
| 5.3.31   | Overturned anticline (2nd option)—Identity and existence certain, location concealed. Beds on one limb are overturned; arrows show dip direction of limbs       |        |                              |  |
| 5.3.32   | Overturned anticline (2nd option)—Identity or existence questionable, location concealed. Beds on one limb are overturned; arrows show dip direction of limbs   |        |                              |  |
| 5.3.33   | Inverted anticline (1st option)—Identity and existence certain, location accurate. Beds on both limbs are overturned; arrows show dip direction of limbs        |        |                              |  |
| 5.3.34   | Inverted anticline (1st option)—Identity or existence questionable, location accurate. Beds on both limbs are overturned; arrows show dip direction of limbs    |        |                              |  |
| 5.3.35   | Inverted anticline (1st option)—Identity and existence certain, location approximate. Beds on both limbs are overturned; arrows show dip direction of limbs     |        |                              |  |
| 5.3.36   | Inverted anticline (1st option)—Identity or existence questionable, location approximate. Beds on both limbs are overturned; arrows show dip direction of limbs |        |                              |  |
| 5.3.37   | Inverted anticline (1st option)—Identity and existence certain, location inferred. Beds on both limbs are overturned; arrows show dip direction of limbs        |        |                              |  |
| 5.3.38   | Inverted anticline (1st option)—Identity or existence questionable, location inferred. Beds on both limbs are overturned; arrows show dip direction of limbs    |        |                              |  |
| 5.3.39   | Inverted anticline (1st option)—Identity and existence certain, location concealed. Beds on both limbs are overturned; arrows show dip direction of limbs       |        |                              |  |
| 5.3.40   | Inverted anticline (1st option)—Identity or existence questionable, location concealed. Beds on both limbs are overturned; arrows show dip direction of limbs   |        |                              |  |
| 5.3.41   | Inverted anticline (2nd option)—Identity and existence certain, location accurate. Beds on both limbs are overturned; arrows show dip direction of limbs        |        |                              |  |
| 5.3.42   | Inverted anticline (2nd option)—Identity or existence questionable, location accurate. Beds on both limbs are overturned; arrows show dip direction of limbs    |        |                              |  |
| 5.3.43   | Inverted anticline (2nd option)—Identity and existence certain, location approximate. Beds on both limbs are overturned; arrows show dip direction of limbs     |        |                              |  |
| 5.3.44   | Inverted anticline (2nd option)—Identity or existence questionable, location approximate. Beds on both limbs are overturned; arrows show dip direction of limbs |        |                              |  |
| 5.3.45   | Inverted anticline (2nd option)—Identity and existence certain, location inferred. Beds on both limbs are overturned; arrows show dip direction of limbs        |        |                              |  |
| 5.3.46   | Inverted anticline (2nd option)—Identity or existence questionable, location inferred. Beds on both limbs are overturned; arrows show dip direction of limbs    |        |                              |  |
| 5.3.47   | Inverted anticline (2nd option)—Identity and existence certain, location concealed. Beds on both limbs are overturned; arrows show dip direction of limbs       |        |                              |  |
| 5.3.48   | Inverted anticline (2nd option)—Identity or existence questionable, location concealed. Beds on both limbs are overturned; arrows show dip direction of limbs   |        |                              |  |

**5—FOLDS (continued)**

| REF NO                             | DESCRIPTION  | SYMBOL | CARTOGRAPHIC SPECIFICATIONS*  | NOTES ON USAGE*   |
|------------------------------------|--|--------|---|---|
| <b>5.4—Antiformal sheath folds</b> |  |        |   |   |
| 5.4.1                              | Antiformal sheath fold (1st option)—Identity and existence certain, location accurate        |        | color 100% magenta    arrow linewidth .2 mm<br>linewidth .25 mm    1.5 mm    HB-8<br>50°    1.475 mm    .75 mm<br>12.0 mm    1.25 mm radius | Place fold trace where axial surface of antiformal sheath fold intersects the ground surface.   |
| 5.4.2                              | Antiformal sheath fold (1st option)—Identity or existence questionable, location accurate    |        |   |   |
| 5.4.3                              | Antiformal sheath fold (1st option)—Identity and existence certain, location approximate     |        | 3.5 mm<br>.75 mm    .75 mm  | Place arrows at places along fold trace to indicate overall fold type (antiformal sheath fold); do not place at specific locality where observation was made.   |
| 5.4.4                              | Antiformal sheath fold (1st option)—Identity or existence questionable, location approximate |        |   |   |
| 5.4.5                              | Antiformal sheath fold (1st option)—Identity and existence certain, location inferred        |        | 1.5 mm<br>.75 mm    .75 mm  | Arrowheads may be added to show direction of plunge (see Section 5.10).<br>Open-arrowed ("2nd option") symbols may be used to show a second generation or another instance of a particular fold type. |
| 5.4.6                              | Antiformal sheath fold (1st option)—Identity or existence questionable, location inferred    |        |   |   |
| 5.4.7                              | Antiformal sheath fold (1st option)—Identity and existence certain, location concealed       |        | .5 mm<br>.75 mm    .75 mm   | May also be shown in black or other colors.   |
| 5.4.8                              | Antiformal sheath fold (1st option)—Identity or existence questionable, location concealed   |        |   |   |
| 5.4.9                              | Antiformal sheath fold (2nd option)—Identity and existence certain, location accurate        |        | color 100% magenta    arrow linewidth .2 mm<br>linewidth .25 mm    1.5 mm    HB-8<br>50°    1.475 mm    .75 mm<br>12.0 mm    1.25 mm radius | Place fold trace where axial surface of antiformal sheath fold intersects the ground surface.   |
| 5.4.10                             | Antiformal sheath fold (2nd option)—Identity or existence questionable, location accurate    |        |   |   |
| 5.4.11                             | Antiformal sheath fold (2nd option)—Identity and existence certain, location approximate     |        | 3.5 mm<br>.75 mm    .75 mm  |   |
| 5.4.12                             | Antiformal sheath fold (2nd option)—Identity or existence questionable, location approximate |        |   |   |
| 5.4.13                             | Antiformal sheath fold (2nd option)—Identity and existence certain, location inferred        |        | 1.5 mm<br>.75 mm    .75 mm  |   |
| 5.4.14                             | Antiformal sheath fold (2nd option)—Identity or existence questionable, location inferred    |        |   |   |
| 5.4.15                             | Antiformal sheath fold (2nd option)—Identity and existence certain, location concealed       |        | .5 mm<br>.75 mm    .75 mm   |   |
| 5.4.16                             | Antiformal sheath fold (2nd option)—Identity or existence questionable, location concealed   |        |   |   |

\*For more information, see general guidelines on pages A-i to A-v.

**5—FOLDS (continued)**

| REF NO               | DESCRIPTION  | SYMBOL | CARTOGRAPHIC SPECIFICATIONS*  | NOTES ON USAGE*  |
|----------------------|--|--------|---|--|
| <b>5.5—Synclines</b> |  |        |   |  |
| 5.5.1                | Syncline (1st option)—Identity and existence certain, location accurate        |        | arrow linewidth .2 mm<br>color 100% magenta<br>HB-8<br>40°<br>12.0 mm<br>2.725 mm<br>1.475 mm<br>1.0 mm<br>.75 mm<br>.75 mm | Place fold trace where axial surface of syncline intersects the ground surface.<br>Place arrows at places along fold trace to indicate overall fold type (syncline); do not place at specific locality where observation was made. |
| 5.5.2                | Syncline (1st option)—Identity or existence questionable, location accurate    |        |   |  |
| 5.5.3                | Syncline (1st option)—Identity and existence certain, location approximate     |        | 3.5 mm<br>.75 mm<br>.75 mm  | Arrowheads may be added to show direction of plunge (see Section 5.10).<br>Open-armed ("2nd option") symbols may be used to show a second generation or another instance of a particular fold type.                                |
| 5.5.4                | Syncline (1st option)—Identity or existence questionable, location approximate |        |   |  |
| 5.5.5                | Syncline (1st option)—Identity and existence certain, location inferred        |        | 1.5 mm<br>.75 mm<br>.75 mm  | May also be shown in black or other colors.  |
| 5.5.6                | Syncline (1st option)—Identity or existence questionable, location inferred    |        |   |  |
| 5.5.7                | Syncline (1st option)—Identity and existence certain, location concealed       |        | .5 mm<br>.75 mm<br>.75 mm   |  |
| 5.5.8                | Syncline (1st option)—Identity or existence questionable, location concealed   |        |   |  |
| 5.5.9                | Syncline (2nd option)—Identity and existence certain, location accurate        |        | arrow linewidth .2 mm<br>color 100% magenta<br>HB-8<br>40°<br>12.0 mm<br>2.725 mm<br>1.475 mm<br>1.0 mm<br>.75 mm<br>.75 mm |  |
| 5.5.10               | Syncline (2nd option)—Identity or existence questionable, location accurate    |        |   |  |
| 5.5.11               | Syncline (2nd option)—Identity and existence certain, location approximate     |        | 3.5 mm<br>.75 mm<br>.75 mm  |  |
| 5.5.12               | Syncline (2nd option)—Identity or existence questionable, location approximate |        |   |  |
| 5.5.13               | Syncline (2nd option)—Identity and existence certain, location inferred        |        | 1.5 mm<br>.75 mm<br>.75 mm  |  |
| 5.5.14               | Syncline (2nd option)—Identity or existence questionable, location inferred    |        |   |  |
| 5.5.15               | Syncline (2nd option)—Identity and existence certain, location concealed       |        | .5 mm<br>.75 mm<br>.75 mm   |  |
| 5.5.16               | Syncline (2nd option)—Identity or existence questionable, location concealed   |        |   |  |

\*For more information, see general guidelines on pages A-i to A-v.

**5—FOLDS (continued)**

| REF NO              | DESCRIPTION   | SYMBOL | CARTOGRAPHIC SPECIFICATIONS*   | NOTES ON USAGE*   |
|---------------------|---|--------|--|---|
| <b>5.6—Synforms</b> |   |        |  |   |
| 5.6.1               | Synform (1st option)—Identity and existence certain, location accurate        |        | <p>arrow linewidth .2 mm color 100% magenta HB-8</p> <p>60°</p> <p>linewidth .25 mm</p> <p>2.725 mm 12.0 mm 1.475 mm</p> <p>3.5 mm</p> <p>1.5 mm</p> <p>.5 mm</p> <p>.75 mm .75 mm</p> | <p>Place fold trace where axial surface of synform intersects the ground surface.</p> <p>Place arrows at places along fold trace to indicate overall fold type (synform); do not place at specific locality where observation was made.</p> <p>Arrowheads may be added to show direction of plunge (see Section 5.10).</p> <p>Open-armed ("2nd option") symbols may be used to show a second generation or another instance of a particular fold type.</p> <p>May also be shown in black or other colors.</p> |
| 5.6.2               | Synform (1st option)—Identity or existence questionable, location accurate    |        |  |   |
| 5.6.3               | Synform (1st option)—Identity and existence certain, location approximate     |        |  |   |
| 5.6.4               | Synform (1st option)—Identity or existence questionable, location approximate |        |  |   |
| 5.6.5               | Synform (1st option)—Identity and existence certain, location inferred        |        |  |   |
| 5.6.6               | Synform (1st option)—Identity or existence questionable, location inferred    |        |  |   |
| 5.6.7               | Synform (1st option)—Identity and existence certain, location concealed       |        |  |   |
| 5.6.8               | Synform (1st option)—Identity or existence questionable, location concealed   |        |  |   |
| 5.6.9               | Synform (2nd option)—Identity and existence certain, location accurate        |        |  |   |
| 5.6.10              | Synform (2nd option)—Identity or existence questionable, location accurate    |        |  |   |
| 5.6.11              | Synform (2nd option)—Identity and existence certain, location approximate     |        |  |   |
| 5.6.12              | Synform (2nd option)—Identity or existence questionable, location approximate |        |  |   |
| 5.6.13              | Synform (2nd option)—Identity and existence certain, location inferred        |        |  |   |
| 5.6.14              | Synform (2nd option)—Identity or existence questionable, location inferred    |        |  |   |
| 5.6.15              | Synform (2nd option)—Identity and existence certain, location concealed       |        |  |   |
| 5.6.16              | Synform (2nd option)—Identity or existence questionable, location concealed   |        |  |   |

\*For more information, see general guidelines on pages A-i to A-v.

**5—FOLDS (continued)**

| REF NO  | DESCRIPTION   | SYMBOL | CARTOGRAPHIC SPECIFICATIONS* | NOTES ON USAGE*   |
|---|---|--------|------------------------------|---|
| <b>5.7—Asymmetric, overturned, and inverted synclines</b> |   |        |                              |   |
| 5.7.1   | Asymmetric syncline (1st option)—Identity and existence certain, location accurate. Beds are upright; shorter arrow on steeper limb                           |        |                              | <p>Place fold trace where axial surface of asymmetric syncline intersects the ground surface.</p> <p>Place arrows at places along fold trace to indicate overall fold type (asymmetric syncline); do not place at specific locality where observation was made.</p> <p>Arrowheads may be added to show direction of plunge (see Section 5.10).</p> <p>Open-arrowed ("2nd option") symbols may be used to show a second generation or another instance of a particular fold type.</p> <p>May also be shown in black or other colors.</p> |
| 5.7.2   | Asymmetric syncline (1st option)—Identity or existence questionable, location accurate. Beds are upright; shorter arrow on steeper limb                       |        |                              |   |
| 5.7.3   | Asymmetric syncline (1st option)—Identity and existence certain, location approximate. Beds are upright; shorter arrow on steeper limb                        |        |                              |   |
| 5.7.4   | Asymmetric syncline (1st option)—Identity or existence questionable, location approximate. Beds are upright; shorter arrow on steeper limb                    |        |                              |   |
| 5.7.5   | Asymmetric syncline (1st option)—Identity and existence certain, location inferred. Beds are upright; shorter arrow on steeper limb                           |        |                              |   |
| 5.7.6   | Asymmetric syncline (1st option)—Identity or existence questionable, location inferred. Beds are upright; shorter arrow on steeper limb                       |        |                              |   |
| 5.7.7   | Asymmetric syncline (1st option)—Identity and existence certain, location concealed. Beds are upright; shorter arrow on steeper limb                          |        |                              |   |
| 5.7.8   | Asymmetric syncline (1st option)—Identity or existence questionable, location concealed. Beds are upright; shorter arrow on steeper limb                      |        |                              |   |
| 5.7.9   | Asymmetric syncline (2nd option)—Identity and existence certain, location accurate. Beds are upright; shorter arrow on steeper limb                           |        |                              |   |
| 5.7.10  | Asymmetric syncline (2nd option)—Identity or existence questionable, location accurate. Beds are upright; shorter arrow on steeper limb                       |        |                              |   |
| 5.7.11  | Asymmetric syncline (2nd option)—Identity and existence certain, location approximate. Beds are upright; shorter arrow on steeper limb                        |        |                              |   |
| 5.7.12  | Asymmetric syncline (2nd option)—Identity or existence questionable, location approximate. Beds are upright; shorter arrow on steeper limb                    |        |                              |   |
| 5.7.13  | Asymmetric syncline (2nd option)—Identity and existence certain, location inferred. Beds are upright; shorter arrow on steeper limb                           |        |                              |   |
| 5.7.14  | Asymmetric syncline (2nd option)—Identity or existence questionable, location inferred. Beds are upright; shorter arrow on steeper limb                       |        |                              |   |
| 5.7.15  | Asymmetric syncline (2nd option)—Identity and existence certain, location concealed. Beds are upright; shorter arrow on steeper limb                          |        |                              |   |
| 5.7.16  | Asymmetric syncline (2nd option)—Identity or existence questionable, location concealed. Beds are upright; shorter arrow on steeper limb                      |        |                              |   |
| 5.7.17  | Overtured syncline (1st option)—Identity and existence certain, location accurate. Beds on one limb are overturned; arrows show dip direction of limbs        |        |                              |   |
| 5.7.18  | Overtured syncline (1st option)—Identity or existence questionable, location accurate. Beds on one limb are overturned; arrows show dip direction of limbs    |        |                              |   |
| 5.7.19  | Overtured syncline (1st option)—Identity and existence certain, location approximate. Beds on one limb are overturned; arrows show dip direction of limbs     |        |                              |   |
| 5.7.20  | Overtured syncline (1st option)—Identity or existence questionable, location approximate. Beds on one limb are overturned; arrows show dip direction of limbs |        |                              |   |
| 5.7.21  | Overtured syncline (1st option)—Identity and existence certain, location inferred. Beds on one limb are overturned; arrows show dip direction of limbs        |        |                              |   |
| 5.7.22  | Overtured syncline (1st option)—Identity or existence questionable, location inferred. Beds on one limb are overturned; arrows show dip direction of limbs    |        |                              |   |
| 5.7.23  | Overtured syncline (1st option)—Identity and existence certain, location concealed. Beds on one limb are overturned; arrows show dip direction of limbs       |        |                              |   |
| 5.7.24  | Overtured syncline (1st option)—Identity or existence questionable, location concealed. Beds on one limb are overturned; arrows show dip direction of limbs   |        |                              |   |

**5—FOLDS (continued)**

| REF NO  | DESCRIPTION  | SYMBOL | CARTOGRAPHIC SPECIFICATIONS* | NOTES ON USAGE*   |
|---|--|--------|------------------------------|---|
| <b>5.7—Asymmetric, overturned, and inverted synclines (continued)</b> |  |        |                              |   |
| 5.7.25  | Overturned syncline (2nd option)—Identity and existence certain, location accurate. Beds on one limb are overturned; arrows show dip direction of limbs        |        |                              | Place fold trace where axial surface of overturned syncline intersects the ground surface. Place arrows at places along fold trace to indicate overall fold type (overturned syncline); do not place at specific locality where observation was made. |
| 5.7.26  | Overturned syncline (2nd option)—Identity or existence questionable, location accurate. Beds on one limb are overturned; arrows show dip direction of limbs    |        |                              |   |
| 5.7.27  | Overturned syncline (2nd option)—Identity and existence certain, location approximate. Beds on one limb are overturned; arrows show dip direction of limbs     |        |                              | Arrowheads may be added to show direction of plunge (see Section 5.10). Open-armed ("2nd option") symbols may be used to show a second generation or another instance of a particular fold type.  |
| 5.7.28  | Overturned syncline (2nd option)—Identity or existence questionable, location approximate. Beds on one limb are overturned; arrows show dip direction of limbs |        |                              |   |
| 5.7.29  | Overturned syncline (2nd option)—Identity and existence certain, location inferred. Beds on one limb are overturned; arrows show dip direction of limbs        |        |                              | May also be shown in black or other colors.   |
| 5.7.30  | Overturned syncline (2nd option)—Identity or existence questionable, location inferred. Beds on one limb are overturned; arrows show dip direction of limbs    |        |                              |   |
| 5.7.31  | Overturned syncline (2nd option)—Identity and existence certain, location concealed. Beds on one limb are overturned; arrows show dip direction of limbs       |        |                              |   |
| 5.7.32  | Overturned syncline (2nd option)—Identity or existence questionable, location concealed. Beds on one limb are overturned; arrows show dip direction of limbs   |        |                              |   |
| 5.7.33  | Inverted syncline (1st option)—Identity and existence certain, location accurate. Beds on both limbs are overturned; arrows show dip direction of limbs        |        |                              | Place fold trace where axial surface of inverted syncline intersects the ground surface. Place arrows at places along fold trace to indicate overall fold type (inverted syncline); do not place at specific locality where observation was made.     |
| 5.7.34  | Inverted syncline (1st option)—Identity or existence questionable, location accurate. Beds on both limbs are overturned; arrows show dip direction of limbs    |        |                              |   |
| 5.7.35  | Inverted syncline (1st option)—Identity and existence certain, location approximate. Beds on both limbs are overturned; arrows show dip direction of limbs     |        |                              | Arrowheads may be added to show direction of plunge (see Section 5.10). Open-armed ("2nd option") symbols may be used to show a second generation or another instance of a particular fold type.  |
| 5.7.36  | Inverted syncline (1st option)—Identity or existence questionable, location approximate. Beds on both limbs are overturned; arrows show dip direction of limbs |        |                              |   |
| 5.7.37  | Inverted syncline (1st option)—Identity and existence certain, location inferred. Beds on both limbs are overturned; arrows show dip direction of limbs        |        |                              | May also be shown in black or other colors.   |
| 5.7.38  | Inverted syncline (1st option)—Identity or existence questionable, location inferred. Beds on both limbs are overturned; arrows show dip direction of limbs    |        |                              |   |
| 5.7.39  | Inverted syncline (1st option)—Identity and existence certain, location concealed. Beds on both limbs are overturned; arrows show dip direction of limbs       |        |                              |   |
| 5.7.40  | Inverted syncline (1st option)—Identity or existence questionable, location concealed. Beds on both limbs are overturned; arrows show dip direction of limbs   |        |                              |   |
| 5.7.41  | Inverted syncline (2nd option)—Identity and existence certain, location accurate. Beds on both limbs are overturned; arrows show dip direction of limbs        |        |                              | Place fold trace where axial surface of inverted syncline intersects the ground surface. Place arrows at places along fold trace to indicate overall fold type (inverted syncline); do not place at specific locality where observation was made.     |
| 5.7.42  | Inverted syncline (2nd option)—Identity or existence questionable, location accurate. Beds on both limbs are overturned; arrows show dip direction of limbs    |        |                              |   |
| 5.7.43  | Inverted syncline (2nd option)—Identity and existence certain, location approximate. Beds on both limbs are overturned; arrows show dip direction of limbs     |        |                              | Arrowheads may be added to show direction of plunge (see Section 5.10). Open-armed ("2nd option") symbols may be used to show a second generation or another instance of a particular fold type.  |
| 5.7.44  | Inverted syncline (2nd option)—Identity or existence questionable, location approximate. Beds on both limbs are overturned; arrows show dip direction of limbs |        |                              |   |
| 5.7.45  | Inverted syncline (2nd option)—Identity and existence certain, location inferred. Beds on both limbs are overturned; arrows show dip direction of limbs        |        |                              | May also be shown in black or other colors.   |
| 5.7.46  | Inverted syncline (2nd option)—Identity or existence questionable, location inferred. Beds on both limbs are overturned; arrows show dip direction of limbs    |        |                              |   |
| 5.7.47  | Inverted syncline (2nd option)—Identity and existence certain, location concealed. Beds on both limbs are overturned; arrows show dip direction of limbs       |        |                              |   |
| 5.7.48  | Inverted syncline (2nd option)—Identity or existence questionable, location concealed. Beds on both limbs are overturned; arrows show dip direction of limbs   |        |                              |   |

**5—FOLDS (continued)**

| REF NO                            | DESCRIPTION   | SYMBOL | CARTOGRAPHIC SPECIFICATIONS*   | NOTES ON USAGE*  |
|-----------------------------------|---|--------|--|--|
| <b>5.8—Synformal sheath folds</b> |   |        |  |  |
| 5.8.1                             | Synformal sheath fold (1st option)—Identity and existence certain, location accurate        |        | color 100% magenta    arrow linewidth .2 mm<br>1.475 mm<br>HB-8<br>50°<br>1.5 mm<br>.75 mm<br>12.0 mm   1.25 mm radius<br>linewidth .25 mm | Place fold trace where axial surface of synformal sheath fold intersects the ground surface.<br><br>Place arrows at places along fold trace to indicate overall fold type (synformal sheath fold); do not place at specific locality where observation was made.<br><br>Arrowheads may be added to show direction of plunge (see Section 5.10).<br><br>Open-armed ("2nd option") symbols may be used to show a second generation or another instance of a particular fold type.<br><br>May also be shown in black or other colors. |
| 5.8.2                             | Synformal sheath fold (1st option)—Identity or existence questionable, location accurate    |        |  |  |
| 5.8.3                             | Synformal sheath fold (1st option)—Identity and existence certain, location approximate     |        | 3.5 mm<br>.75 mm    .75 mm   |  |
| 5.8.4                             | Synformal sheath fold (1st option)—Identity or existence questionable, location approximate |        |  |  |
| 5.8.5                             | Synformal sheath fold (1st option)—Identity and existence certain, location inferred        |        | 1.5 mm<br>.75 mm    .75 mm   |  |
| 5.8.6                             | Synformal sheath fold (1st option)—Identity or existence questionable, location inferred    |        |  |  |
| 5.8.7                             | Synformal sheath fold (1st option)—Identity and existence certain, location concealed       |        | .5 mm<br>.75 mm    .75 mm  |  |
| 5.8.8                             | Synformal sheath fold (1st option)—Identity or existence questionable, location concealed   |        |  |  |
| 5.8.9                             | Synformal sheath fold (2nd option)—Identity and existence certain, location accurate        |        | color 100% magenta    arrow linewidth .2 mm<br>1.475 mm<br>HB-8<br>50°<br>1.5 mm<br>.75 mm<br>12.0 mm   1.25 mm radius<br>linewidth .25 mm |  |
| 5.8.10                            | Synformal sheath fold (2nd option)—Identity or existence questionable, location accurate    |        |  |  |
| 5.8.11                            | Synformal sheath fold (2nd option)—Identity and existence certain, location approximate     |        | 3.5 mm<br>.75 mm    .75 mm   |  |
| 5.8.12                            | Synformal sheath fold (2nd option)—Identity or existence questionable, location approximate |        |  |  |
| 5.8.13                            | Synformal sheath fold (2nd option)—Identity and existence certain, location inferred        |        | 1.5 mm<br>.75 mm    .75 mm   |  |
| 5.8.14                            | Synformal sheath fold (2nd option)—Identity or existence questionable, location inferred    |        |  |  |
| 5.8.15                            | Synformal sheath fold (2nd option)—Identity and existence certain, location concealed       |        | .5 mm<br>.75 mm    .75 mm  |  |
| 5.8.16                            | Synformal sheath fold (2nd option)—Identity or existence questionable, location concealed   |        |  |  |

\*For more information, see general guidelines on pages A-i to A-v.

**5—FOLDS (continued)**

| REF NO                | DESCRIPTION   | SYMBOL | CARTOGRAPHIC SPECIFICATIONS* | NOTES ON USAGE*   |
|-----------------------|---|--------|------------------------------|---|
| <b>5.9—Monoclines</b> |   |        |                              |   |
| 5.9.1                 | Monocline (1st option)—Identity and existence certain, location accurate. Arrow shows direction of dip  |        |                              | Use to show monocline whose anticlinal and synclinal bends are too close together at map scale to show as separate fold traces.                           |
| 5.9.2                 | Monocline (1st option)—Identity or existence questionable, location accurate. Arrow shows direction of dip  |        |                              |   |
| 5.9.3                 | Monocline (1st option)—Identity and existence certain, location approximate. Arrow shows direction of dip   |        |                              | Place fold trace where dip of surface connecting anticlinal and synclinal bends is at its maximum angle.  |
| 5.9.4                 | Monocline (1st option)—Identity or existence questionable, location approximate. Arrow shows direction of dip   |        |                              |   |
| 5.9.5                 | Monocline (1st option)—Identity and existence certain, location inferred. Arrow shows direction of dip  |        |                              | Place arrow at places along fold trace to indicate overall fold type (monocline); do not place at specific locality where observation was made.           |
| 5.9.6                 | Monocline (1st option)—Identity or existence questionable, location inferred. Arrow shows direction of dip  |        |                              |   |
| 5.9.7                 | Monocline (1st option)—Identity and existence certain, location concealed. Arrow shows direction of dip   |        |                              | Arrowheads may be added to show direction of plunge (see Section 5.10).   |
| 5.9.8                 | Monocline (1st option)—Identity or existence questionable, location concealed. Arrow shows direction of dip   |        |                              |   |
| 5.9.9                 | Monocline (2nd option)—Identity and existence certain, location accurate. Arrow shows direction of dip  |        |                              | Open-arrowed ("2nd option") symbols may be used to show a second generation or another instance of a particular fold type.                                |
| 5.9.10                | Monocline (2nd option)—Identity or existence questionable, location accurate. Arrow shows direction of dip  |        |                              |   |
| 5.9.11                | Monocline (2nd option)—Identity and existence certain, location approximate. Arrow shows direction of dip   |        |                              | May also be shown in black or other colors.   |
| 5.9.12                | Monocline (2nd option)—Identity or existence questionable, location approximate. Arrow shows direction of dip   |        |                              |   |
| 5.9.13                | Monocline (2nd option)—Identity and existence certain, location inferred. Arrow shows direction of dip  |        |                              |   |
| 5.9.14                | Monocline (2nd option)—Identity or existence questionable, location inferred. Arrow shows direction of dip  |        |                              |   |
| 5.9.15                | Monocline (2nd option)—Identity and existence certain, location concealed. Arrow shows direction of dip   |        |                              |   |
| 5.9.16                | Monocline (2nd option)—Identity or existence questionable, location concealed. Arrow shows direction of dip   |        |                              |   |
| 5.9.17                | Monocline, anticlinal bend (1st option)—Identity and existence certain, location accurate. Arrows show direction of dip; shorter arrow on steeper limb        |        |                              | Place fold trace where axial surface of anticlinal bend of monocline intersects the ground surface.   |
| 5.9.18                | Monocline, anticlinal bend (1st option)—Identity or existence questionable, location accurate. Arrows show direction of dip; shorter arrow on steeper limb    |        |                              |   |
| 5.9.19                | Monocline, anticlinal bend (1st option)—Identity and existence certain, location approximate. Arrows show direction of dip; shorter arrow on steeper limb     |        |                              | Place arrows along fold trace to indicate overall fold type (anticlinal bend of monocline); do not place at specific locality where observation was made. |
| 5.9.20                | Monocline, anticlinal bend (1st option)—Identity or existence questionable, location approximate. Arrows show direction of dip; shorter arrow on steeper limb |        |                              |   |
| 5.9.21                | Monocline, anticlinal bend (1st option)—Identity and existence certain, location inferred. Arrows show direction of dip; shorter arrow on steeper limb        |        |                              | Arrowheads may be added to show direction of plunge (see Section 5.10).   |
| 5.9.22                | Monocline, anticlinal bend (1st option)—Identity or existence questionable, location inferred. Arrows show direction of dip; shorter arrow on steeper limb    |        |                              |   |
| 5.9.23                | Monocline, anticlinal bend (1st option)—Identity and existence certain, location concealed. Arrows show direction of dip; shorter arrow on steeper limb       |        |                              | Open-arrowed ("2nd option") symbols may be used to show a second generation or another instance of a particular fold type.                                |
| 5.9.24                | Monocline, anticlinal bend (1st option)—Identity or existence questionable, location concealed. Arrows show direction of dip; shorter arrow on steeper limb   |        |                              |   |

**5—FOLDS (continued)**

| REF NO                            | DESCRIPTION   | SYMBOL | CARTOGRAPHIC SPECIFICATIONS* | NOTES ON USAGE*  |
|-----------------------------------|---|--------|------------------------------|--|
| <b>5.9—Monoclines (continued)</b> |   |        |                              |  |
| 5.9.25                            | Monocline, anticlinal bend (2nd option)—Identity and existence certain, location accurate. Arrows show direction of dip; shorter arrow on steeper limb        |        |                              | Place fold trace where axial surface of anticlinal bend of monocline intersects the ground surface. Place arrows at places along fold trace to indicate overall fold type (anticlinal bend of monocline); do not place at specific locality where observation was made. Arrowheads may be added to show direction of plunge (see Section 5.10). Open-arrowed ("2nd option") symbols may be used to show a second generation or another instance of a particular fold type. May also be shown in black or other colors. |
| 5.9.26                            | Monocline, anticlinal bend (2nd option)—Identity or existence questionable, location accurate. Arrows show direction of dip; shorter arrow on steeper limb    |        |                              |  |
| 5.9.27                            | Monocline, anticlinal bend (2nd option)—Identity and existence certain, location approximate. Arrows show direction of dip; shorter arrow on steeper limb     |        |                              |  |
| 5.9.28                            | Monocline, anticlinal bend (2nd option)—Identity or existence questionable, location approximate. Arrows show direction of dip; shorter arrow on steeper limb |        |                              |  |
| 5.9.29                            | Monocline, anticlinal bend (2nd option)—Identity and existence certain, location inferred. Arrows show direction of dip; shorter arrow on steeper limb        |        |                              |  |
| 5.9.30                            | Monocline, anticlinal bend (2nd option)—Identity or existence questionable, location inferred. Arrows show direction of dip; shorter arrow on steeper limb    |        |                              |  |
| 5.9.31                            | Monocline, anticlinal bend (2nd option)—Identity and existence certain, location concealed. Arrows show direction of dip; shorter arrow on steeper limb       |        |                              |  |
| 5.9.32                            | Monocline, anticlinal bend (2nd option)—Identity or existence questionable, location concealed. Arrows show direction of dip; shorter arrow on steeper limb   |        |                              |  |
| 5.9.33                            | Monocline, synclinal bend (1st option)—Identity and existence certain, location accurate. Arrows show direction of dip; shorter arrow on steeper limb         |        |                              | Place fold trace where axial surface of synclinal bend of monocline intersects the ground surface. Place arrows at places along fold trace to indicate overall fold type (synclinal bend of monocline); do not place at specific locality where observation was made. Arrowheads may be added to show direction of plunge (see Section 5.10). Open-arrowed ("2nd option") symbols may be used to show a second generation or another instance of a particular fold type. May also be shown in black or other colors.   |
| 5.9.34                            | Monocline, synclinal bend (1st option)—Identity or existence questionable, location accurate. Arrows show direction of dip; shorter arrow on steeper limb     |        |                              |  |
| 5.9.35                            | Monocline, synclinal bend (1st option)—Identity and existence certain, location approximate. Arrows show direction of dip; shorter arrow on steeper limb      |        |                              |  |
| 5.9.36                            | Monocline, synclinal bend (1st option)—Identity or existence questionable, location approximate. Arrows show direction of dip; shorter arrow on steeper limb  |        |                              |  |
| 5.9.37                            | Monocline, synclinal bend (1st option)—Identity and existence certain, location inferred. Arrows show direction of dip; shorter arrow on steeper limb         |        |                              |  |
| 5.9.38                            | Monocline, synclinal bend (1st option)—Identity or existence questionable, location inferred. Arrows show direction of dip; shorter arrow on steeper limb     |        |                              |  |
| 5.9.39                            | Monocline, synclinal bend (1st option)—Identity and existence certain, location concealed. Arrows show direction of dip; shorter arrow on steeper limb        |        |                              |  |
| 5.9.40                            | Monocline, synclinal bend (1st option)—Identity or existence questionable, location concealed. Arrows show direction of dip; shorter arrow on steeper limb    |        |                              |  |
| 5.9.41                            | Monocline, synclinal bend (2nd option)—Identity and existence certain, location accurate. Arrows show direction of dip; shorter arrow on steeper limb         |        |                              |  |
| 5.9.42                            | Monocline, synclinal bend (2nd option)—Identity or existence questionable, location accurate. Arrows show direction of dip; shorter arrow on steeper limb     |        |                              |  |
| 5.9.43                            | Monocline, synclinal bend (2nd option)—Identity and existence certain, location approximate. Arrows show direction of dip; shorter arrow on steeper limb      |        |                              |  |
| 5.9.44                            | Monocline, synclinal bend (2nd option)—Identity or existence questionable, location approximate. Arrows show direction of dip; shorter arrow on steeper limb  |        |                              |  |
| 5.9.45                            | Monocline, synclinal bend (2nd option)—Identity and existence certain, location inferred. Arrows show direction of dip; shorter arrow on steeper limb         |        |                              |  |
| 5.9.46                            | Monocline, synclinal bend (2nd option)—Identity or existence questionable, location inferred. Arrows show direction of dip; shorter arrow on steeper limb     |        |                              |  |
| 5.9.47                            | Monocline, synclinal bend (2nd option)—Identity and existence certain, location concealed. Arrows show direction of dip; shorter arrow on steeper limb        |        |                              |  |
| 5.9.48                            | Monocline, synclinal bend (2nd option)—Identity or existence questionable, location concealed. Arrows show direction of dip; shorter arrow on steeper limb    |        |                              |  |

**5—FOLDS (continued)**

| REF NO  | DESCRIPTION  | SYMBOL | CARTOGRAPHIC SPECIFICATIONS* | NOTES ON USAGE*   |
|---|--|--------|------------------------------|---|
| <b>5.10—Line-symbol decorations and notations for folds</b> |  |        |                              |   |
| 5.10.1  | Fold having inclined axial surface (1st option)—Tick shows dip value and direction |        | HI-6 (100% black)            | Although only shown here on anticlines, line-symbol decorations and notations may be added to any type or style of fold.<br><br>Add arrowhead or '90' to ticks showing dip if necessary for clarity. Place where observation was made.  |
| 5.10.2  | Fold having inclined axial surface (2nd option)—Tick shows dip value and direction |        | HI-6 (100% black)            |   |
| 5.10.3  | Fold having vertical or near-vertical axial surface (1st option)                   |        |                              |   |
| 5.10.4  | Fold having vertical or near-vertical axial surface (2nd option)                   |        | HI-6 (100% black)            |   |
| 5.10.5  | Plunging anticline—Large arrowhead shows direction of plunge                       |        |                              | Although only shown here on anticlines and synclines, line-symbol decorations and notations may be added to any type or style of fold.<br><br>Place arrowhead(s) showing plunge at end(s) of, or along, any type or style of fold to indicate general plunge direction(s); do not add plunge angle. |
| 5.10.6  | Doubly plunging anticline  |        |                              |   |
| 5.10.7  | Plunging syncline—Large arrowhead shows direction of plunge                        |        |                              |   |
| 5.10.8  | Doubly plunging syncline   |        |                              |   |
| 5.10.9  | Fold having near-vertical fold limbs—Half-circle shows direction of closure        |        |                              | Although only shown here on anticlines and synclines, line-symbol decorations and notations may be added to any type or style of fold.  |
| 5.10.10   | Crest line (CL) of fold where it diverges from axial surface of anticline          |        | H-7                          |   |
| 5.10.11   | Trough line (TL) of fold where it diverges from axial surface of syncline          |        | H-7                          |   |
| 5.10.12   | Fold—Showing name  |        | H-8                          |   |

\*For more information, see general guidelines on pages A-i to A-v.

**5—FOLDS (continued)**

| REF NO                         | DESCRIPTION  | SYMBOL | CARTOGRAPHIC SPECIFICATIONS*  | NOTES ON USAGE*  |
|--------------------------------|--|--------|---|--|
| <b>5.11—Small, minor folds</b> |  |        |   |  |
| 5.11.1                         | Small, minor fold, horizontal axial surface  |        | color 100% magenta<br>circle diameter 3.0 mm; linewidth .2 mm<br>crossbar linewidth .25 mm                                | Use when beds are too tightly folded to show traces of individual folds or when small, minor folds are observed in outcrop but cannot be traced away from that outcrop.<br>Open-armed ("2nd option") symbols may be used to show a second generation or another instance of a particular fold type.<br>May also be shown in black or other colors. |
| 5.11.2                         | Small, minor dome  |        | color 100% magenta<br>5.5 mm<br>40°<br>linewidth .2 mm<br>1.475 mm  |  |
| 5.11.3                         | Small, minor basin   |        | color 100% magenta<br>5.5 mm<br>40°<br>linewidth .2 mm<br>1.475 mm  |  |
| 5.11.4                         | Small, minor anticline, vertical or near-vertical axial surface (1st option)—Showing strike            |        | color 100% magenta<br>2.75 mm<br>40°<br>arrow linewidth .2 mm<br>6.0 mm<br>1.475 mm<br>linewidth .25 mm                   |  |
| 5.11.5                         | Small, minor anticline, inclined axial surface (1st option)—Showing strike and dip                     |        | HI-6 (100% black)<br>35<br>tick length 1.75 mm; linewidth .2 mm; color 100% magenta<br>9.0 mm                             |  |
| 5.11.6                         | Small, minor anticline, vertical or near-vertical axial surface (2nd option)—Showing strike            |        | color 100% magenta<br>2.75 mm<br>40°<br>arrow linewidth .2 mm<br>6.0 mm<br>1.475 mm<br>linewidth .25 mm                   |  |
| 5.11.7                         | Small, minor anticline, inclined axial surface (2nd option)—Showing strike and dip                     |        | HI-6 (100% black)<br>35<br>tick length 1.75 mm; linewidth .2 mm; color 100% magenta<br>9.0 mm                             |  |
| 5.11.8                         | Small, minor antiform, vertical or near-vertical axial surface (1st option)—Showing strike             |        | color 100% magenta<br>2.75 mm<br>60°<br>arrow linewidth .2 mm<br>6.0 mm<br>1.475 mm<br>linewidth .25 mm                   |  |
| 5.11.9                         | Small, minor antiform, inclined axial surface (1st option)—Showing strike and dip                      |        | HI-6 (100% black)<br>35<br>tick length 1.75 mm; linewidth .2 mm; color 100% magenta<br>9.0 mm                             |  |
| 5.11.10                        | Small, minor antiform, vertical or near-vertical axial surface (2nd option)—Showing strike             |        | color 100% magenta<br>2.75 mm<br>60°<br>arrow linewidth .2 mm<br>6.0 mm<br>1.475 mm<br>linewidth .25 mm                   |  |
| 5.11.11                        | Small, minor antiform, inclined axial surface (2nd option)—Showing strike and dip                      |        | HI-6 (100% black)<br>35<br>tick length 1.75 mm; linewidth .2 mm; color 100% magenta<br>9.0 mm                             |  |
| 5.11.12                        | Small, minor asymmetric anticline, vertical or near-vertical axial surface (1st option)—Showing strike |        | color 100% magenta<br>2.25 mm<br>40°<br>arrow linewidth .2 mm<br>6.0 mm<br>1.475 mm<br>linewidth .25 mm<br>3.5 mm         |  |
| 5.11.13                        | Small, minor asymmetric anticline, inclined axial surface (1st option)—Showing strike and dip          |        | HI-6 (100% black)<br>35<br>tick length 1.75 mm; linewidth .2 mm; color 100% magenta<br>9.0 mm                             |  |
| 5.11.14                        | Small, minor asymmetric anticline, vertical or near-vertical axial surface (2nd option)—Showing strike |        | color 100% magenta<br>2.25 mm<br>40°<br>arrow linewidth .2 mm<br>6.0 mm<br>1.475 mm<br>linewidth .25 mm<br>3.5 mm         |  |
| 5.11.15                        | Small, minor asymmetric anticline, inclined axial surface (2nd option)—Showing strike and dip          |        | HI-6 (100% black)<br>35<br>tick length 1.75 mm; linewidth .2 mm; color 100% magenta<br>9.0 mm                             |  |
| 5.11.16                        | Small, minor overturned anticline, vertical or near-vertical axial surface (1st option)—Showing strike |        | color 100% magenta<br>2.275 mm<br>40°<br>arrow linewidth .2 mm<br>1.0 mm radius<br>6.0 mm<br>1.475 mm<br>linewidth .25 mm |  |
| 5.11.17                        | Small, minor overturned anticline, inclined axial surface (1st option)—Showing strike and dip          |        | HI-6 (100% black)<br>35<br>tick length 1.75 mm; linewidth .2 mm; color 100% magenta<br>9.0 mm                             |  |
| 5.11.18                        | Small, minor overturned anticline, vertical or near-vertical axial surface (2nd option)—Showing strike |        | color 100% magenta<br>2.275 mm<br>40°<br>arrow linewidth .2 mm<br>1.0 mm radius<br>6.0 mm<br>1.475 mm<br>linewidth .25 mm |  |
| 5.11.19                        | Small, minor overturned anticline, inclined axial surface (2nd option)—Showing strike and dip          |        | HI-6 (100% black)<br>35<br>tick length 1.75 mm; linewidth .2 mm; color 100% magenta<br>9.0 mm                             |  |
| 5.11.20                        | Small, minor inverted anticline, vertical or near-vertical axial surface (1st option)—Showing strike   |        | color 100% magenta<br>.875 mm radius<br>40°<br>arrow linewidth .2 mm<br>6.0 mm<br>1.475 mm<br>linewidth .25 mm<br>2.25 mm |  |
| 5.11.21                        | Small, minor inverted anticline, inclined axial surface (1st option)—Showing strike and dip            |        | HI-6 (100% black)<br>35<br>tick length 1.75 mm; linewidth .2 mm; color 100% magenta<br>9.0 mm                             |  |
| 5.11.22                        | Small, minor inverted anticline, vertical or near-vertical axial surface (2nd option)—Showing strike   |        | color 100% magenta<br>.875 mm radius<br>40°<br>arrow linewidth .2 mm<br>6.0 mm<br>1.475 mm<br>linewidth .25 mm<br>2.25 mm |  |
| 5.11.23                        | Small, minor inverted anticline, inclined axial surface (2nd option)—Showing strike and dip            |        | HI-6 (100% black)<br>35<br>tick length 1.75 mm; linewidth .2 mm; color 100% magenta<br>9.0 mm                             |  |

\*For more information, see general guidelines on pages A-i to A-v.

**5—FOLDS (continued)**

| REF NO                                     | DESCRIPTION   | SYMBOL | CARTOGRAPHIC SPECIFICATIONS*  | NOTES ON USAGE*  |
|--|---|--------|---|--|
| <b>5.11—Small, minor folds (continued)</b> |   |        |   |  |
| 5.11.24                                    | Small, minor syncline, vertical or near-vertical axial surface (1st option)—Showing strike            |        | color 2.75 mm ↘ 40° ↗ arrow linewidth .2 mm<br>100% magenta ↘ 6.0 mm ↗ ↘ 1.475 mm ↗<br>2.75 mm ↗ ↘ ↘ linewidth .25 mm               | Use when beds are too tightly folded to show traces of individual folds or when small, minor folds are observed in outcrop but cannot be traced away from that outcrop.<br>Open-arrowed ("2nd option") symbols may be used to show a second generation or another instance of a particular fold type.<br>May also be shown in black or other colors. |
| 5.11.25                                    | Small, minor syncline, inclined axial surface (1st option)—Showing strike and dip                     |        | HI-6 (100% black) ↘ 35 ↗ tick length 1.75 mm; linewidth .2 mm; color 100% magenta<br>↘ 9.0 mm ↗ ↘ 100% magenta                      |  |
| 5.11.26                                    | Small, minor syncline, vertical or near-vertical axial surface (2nd option)—Showing strike            |        | color 2.75 mm ↘ 40° ↗ arrow linewidth .2 mm<br>100% magenta ↘ 6.0 mm ↗ ↘ 1.475 mm ↗<br>2.75 mm ↗ ↘ ↘ linewidth .25 mm               |  |
| 5.11.27                                    | Small, minor syncline, inclined axial surface (2nd option)—Showing strike and dip                     |        | HI-6 (100% black) ↘ 35 ↗ tick length 1.75 mm; linewidth .2 mm; color 100% magenta<br>↘ 9.0 mm ↗ ↘ 100% magenta                      |  |
| 5.11.28                                    | Small, minor synform, vertical or near-vertical axial surface (1st option)—Showing strike             |        | color 2.75 mm ↘ 60° ↗ arrow linewidth .2 mm<br>100% magenta ↘ 6.0 mm ↗ ↘ 1.475 mm ↗<br>2.75 mm ↗ ↘ ↘ linewidth .25 mm               |  |
| 5.11.29                                    | Small, minor synform, inclined axial surface (1st option)—Showing strike and dip                      |        | HI-6 (100% black) ↘ 35 ↗ tick length 1.75 mm; linewidth .2 mm; color 100% magenta<br>↘ 9.0 mm ↗ ↘ 100% magenta                      |  |
| 5.11.30                                    | Small, minor synform, vertical or near-vertical axial surface (2nd option)—Showing strike             |        | color 2.75 mm ↘ 60° ↗ arrow linewidth .2 mm<br>100% magenta ↘ 6.0 mm ↗ ↘ 1.475 mm ↗<br>2.75 mm ↗ ↘ ↘ linewidth .25 mm               |  |
| 5.11.31                                    | Small, minor synform, inclined axial surface (2nd option)—Showing strike and dip                      |        | HI-6 (100% black) ↘ 35 ↗ tick length 1.75 mm; linewidth .2 mm; color 100% magenta<br>↘ 9.0 mm ↗ ↘ 100% magenta                      |  |
| 5.11.32                                    | Small, minor asymmetric syncline, vertical or near-vertical axial surface (1st option)—Showing strike |        | color 2.25 mm ↘ 40° ↗ arrow linewidth .2 mm<br>100% magenta ↘ 6.0 mm ↗ ↘ 1.475 mm ↗<br>3.5 mm ↗ ↘ ↘ linewidth .25 mm                |  |
| 5.11.33                                    | Small, minor asymmetric syncline, inclined axial surface (1st option)—Showing strike and dip          |        | HI-6 (100% black) ↘ 35 ↗ tick length 1.75 mm; linewidth .2 mm; color 100% magenta<br>↘ 9.0 mm ↗ ↘ 100% magenta                      |  |
| 5.11.34                                    | Small, minor asymmetric syncline, vertical or near-vertical axial surface (2nd option)—Showing strike |        | color 2.25 mm ↘ 40° ↗ arrow linewidth .2 mm<br>100% magenta ↘ 6.0 mm ↗ ↘ 1.475 mm ↗<br>3.5 mm ↗ ↘ ↘ linewidth .25 mm                |  |
| 5.11.35                                    | Small, minor asymmetric syncline, inclined axial surface (2nd option)—Showing strike and dip          |        | HI-6 (100% black) ↘ 35 ↗ tick length 1.75 mm; linewidth .2 mm; color 100% magenta<br>↘ 9.0 mm ↗ ↘ 100% magenta                      |  |
| 5.11.36                                    | Small, minor overturned syncline, vertical or near-vertical axial surface (1st option)—Showing strike |        | color 2.275 mm ↘ 40° ↗ arrow linewidth .2 mm<br>100% magenta 1.0 mm radius ↘ 6.0 mm ↗ ↘ 1.475 mm ↗<br>6.0 mm ↗ ↘ ↘ linewidth .25 mm |  |
| 5.11.37                                    | Small, minor overturned syncline, inclined axial surface (1st option)—Showing strike and dip          |        | HI-6 (100% black) ↘ 35 ↗ tick length 1.75 mm; linewidth .2 mm; color 100% magenta<br>↘ 9.0 mm ↗ ↘ 100% magenta                      |  |
| 5.11.38                                    | Small, minor overturned syncline, vertical or near-vertical axial surface (2nd option)—Showing strike |        | color 2.275 mm ↘ 40° ↗ arrow linewidth .2 mm<br>100% magenta 1.0 mm radius ↘ 6.0 mm ↗ ↘ 1.475 mm ↗<br>6.0 mm ↗ ↘ ↘ linewidth .25 mm |  |
| 5.11.39                                    | Small, minor overturned syncline, inclined axial surface (2nd option)—Showing strike and dip          |        | HI-6 (100% black) ↘ 35 ↗ tick length 1.75 mm; linewidth .2 mm; color 100% magenta<br>↘ 9.0 mm ↗ ↘ 100% magenta                      |  |
| 5.11.40                                    | Small, minor inverted syncline, vertical or near-vertical axial surface (1st option)—Showing strike   |        | color .875 mm radius ↘ 40° ↗ arrow linewidth .2 mm<br>100% magenta ↘ 6.0 mm ↗ ↘ 1.475 mm ↗<br>2.25 mm ↗ ↘ ↘ linewidth .25 mm        |  |
| 5.11.41                                    | Small, minor inverted syncline, inclined axial surface (1st option)—Showing strike and dip            |        | HI-6 (100% black) ↘ 35 ↗ tick length 1.75 mm; linewidth .2 mm; color 100% magenta<br>↘ 9.0 mm ↗ ↘ 100% magenta                      |  |
| 5.11.42                                    | Small, minor inverted syncline, vertical or near-vertical axial surface (2nd option)—Showing strike   |        | color .875 mm radius ↘ 40° ↗ arrow linewidth .2 mm<br>100% magenta ↘ 6.0 mm ↗ ↘ 1.475 mm ↗<br>2.25 mm ↗ ↘ ↘ linewidth .25 mm        |  |
| 5.11.43                                    | Small, minor inverted syncline, inclined axial surface (2nd option)—Showing strike and dip            |        | HI-6 (100% black) ↘ 35 ↗ tick length 1.75 mm; linewidth .2 mm; color 100% magenta<br>↘ 9.0 mm ↗ ↘ 100% magenta                      |  |

\*For more information, see general guidelines on pages A-i to A-v.

**6—BEDDING**

| REF NO | DESCRIPTION   | SYMBOL | CARTOGRAPHIC SPECIFICATIONS*  | NOTES ON USAGE*   |
|--------|---|--------|---|---|
| 6.1    | Horizontal bedding  |        | all lineweights .2 mm<br>circle diameter 2.5 mm                             | Inclined (upright) and overturned bedding symbols are used when the top direction of beds is known to a reasonable degree of certainty.   |
| 6.2    | Inclined bedding—Showing strike and dip   |        | 1.0 mm<br>40 HI-6<br>5.0 mm<br>all lineweights .2 mm                        | On maps where determination of top direction is "known" at some places and "unknown" at others, such symbols also may be used to indicate where top direction is "unknown" (compare with ref. nos. 6.14-24). Symbols may be used without a dip value to indicate the generalized strike and direction of dip of beds. |
| 6.3    | Vertical bedding—Showing strike   |        | 2.0 mm  |   |
| 6.4    | Overturned bedding—Showing strike and dip   |        | 1.0 mm<br>65 HI-6<br>.625 mm radius   |   |
| 6.5    | Bedding overturned more than 180 degrees—Showing strike and dip   |        | .7 mm<br>20 HI-6<br>.375 mm radius  |   |
| 6.6    | Inclined (dip direction to right) bedding, for multiple observations at one locality—Showing strike and dip   |        | 5.5 mm<br>40 HI-6<br>1.0 mm<br>1.325 mm                                     |   |
| 6.7    | Inclined (dip direction to left) bedding, for multiple observations at one locality—Showing strike and dip  |        | 40  |   |
| 6.8    | Vertical bedding, for multiple observations at one locality—Showing strike  |        | 2.0 mm  |   |
| 6.9    | Overturned (dip direction to right) bedding, for multiple observations at one locality—Showing strike and dip   |        | .625 mm radius<br>65 HI-6<br>1.0 mm   |   |
| 6.10   | Overturned (dip direction to left) bedding, for multiple observations at one locality—Showing strike and dip  |        | 65  |   |
| 6.11   | Bedding overturned more than 180 degrees (dip direction to right), for multiple observations at one locality—Showing strike and dip   |        | 20 HI-6<br>.7 mm<br>.375 mm radius  |   |
| 6.12   | Bedding overturned more than 180 degrees (dip direction to left), for multiple observations at one locality—Showing strike and dip  |        | 20  |   |
| 6.13   | Inclined bedding, where top direction of beds is known from local features—Showing strike and dip   |        | 1.0 mm<br>30 HI-6<br>5.0 mm<br>all lineweights .2 mm<br>dot diameter .75 mm | Symbols that have a ball may be used to indicate a greater level of certainty in the determination of top direction.  |
| 6.14   | Vertical bedding, where top direction of beds is known from local features—Showing strike. Ball shows top direction   |        | 2.0 mm  | On maps where determination of top direction is "known" at some places and "unknown" at others, symbols that have a ball also may be used to indicate where top direction is "known" (compare with ref. nos. 6.1-13).   |
| 6.15   | Overturned bedding, where top direction of beds is known from local features—Showing strike and dip   |        | 1.0 mm<br>85 HI-6<br>.625 mm radius   |   |
| 6.16   | Bedding overturned more than 180 degrees, where top direction of beds is known from local features—Showing strike and dip   |        | 10 HI-6<br>.7 mm<br>.375 mm radius  |   |
| 6.17   | Inclined (dip direction to right) bedding, where top direction of beds is known from local features, for multiple observations at one locality—Showing strike and dip                         |        | 5.5 mm<br>30 HI-6<br>1.0 mm<br>1.325 mm                                     |   |
| 6.18   | Inclined (dip direction to left) bedding, where top direction of beds is known from local features, for multiple observations at one locality—Showing strike and dip                          |        | 30  |   |
| 6.19   | Vertical (top direction to right) bedding, where top direction of beds is known from local features, for multiple observations at one locality—Showing strike. Ball shows top direction       |        | 2.0 mm  |   |
| 6.20   | Vertical (top direction to left) bedding, where top direction of beds is known from local features, for multiple observations at one locality—Showing strike. Ball shows top direction        |        |   |   |
| 6.21   | Overturned (dip direction to right) bedding, where top direction of beds is known from local features, for multiple observations at one locality—Showing strike and dip                       |        | .625 mm radius<br>85 HI-6<br>1.0 mm<br>1.7 mm                               |   |
| 6.22   | Overturned (dip direction to left) bedding, where top direction of beds is known from local features, for multiple observations at one locality—Showing strike and dip                        |        | 85  |   |
| 6.23   | Bedding overturned more than 180 degrees (dip direction to right), where top direction of beds is known from local features, for multiple observations at one locality—Showing strike and dip |        | 10 HI-6<br>.7 mm<br>.375 mm radius<br>1.325 mm                              |   |
| 6.24   | Bedding overturned more than 180 degrees (dip direction to left), where top direction of beds is known from local features, for multiple observations at one locality—Showing strike and dip  |        | 10  |   |

\*For more information, see general guidelines on pages A-1 to A-4.

**6—BEDDING (continued)**

| REF NO | DESCRIPTION  | SYMBOL | CARTOGRAPHIC SPECIFICATIONS* | NOTES ON USAGE*  |  |
|--------|--|--------|------------------------------|--|--|
| 6.25   | Inclined crenulated, warped, undulatory, or contorted bedding—Showing approximate strike and dip   |        |                              | Symbols may be used without a dip value to indicate the generalized strike and direction of dip of beds. |  |
| 6.26   | Vertical or near-vertical crenulated, warped, undulatory, or contorted bedding—Showing approximate strike  |        |                              |  |  |
| 6.27   | Inclined graded bedding—Showing strike and dip   |        |                              |  |  |
| 6.28   | Vertical or near-vertical graded bedding—Showing strike  |        |                              |  |  |
| 6.29   | Overtuned graded bedding—Showing strike and dip  |        |                              |  |  |
| 6.30   | Inclined bedding in crossbedded rocks—Showing approximate strike and dip   |        |                              |  |  |
| 6.31   | Vertical or near-vertical bedding in crossbedded rocks—Showing approximate strike  |        |                              |  |  |
| 6.32   | Overtuned bedding in crossbedded rocks—Showing approximate strike and dip  |        |                              |  |  |
| 6.33   | Approximate orientation of inclined bedding—Showing approximate strike and dip   |        |                              |  | Use when the measurement of strike and (or) dip value is approximate but the location of observation is accurate. Symbols that have a ball may be used to indicate a greater level of certainty in the determination of top direction. On maps where determination of top direction is "known" at some places and "unknown" at others, symbols that have a ball also may be used to indicate where top direction is "known". |
| 6.34   | Approximate orientation of vertical or near-vertical bedding—Showing approximate strike  |        |                              |  |  |
| 6.35   | Approximate orientation of overturned bedding—Showing approximate strike and dip   |        |                              |  |  |
| 6.36   | Approximate orientation of inclined bedding, where top direction of beds is known from local features—Showing approximate strike and dip               |        |                              |  |  |
| 6.37   | Approximate orientation of vertical or near-vertical bedding, where top direction of beds is known from local features—Showing approximate strike      |        |                              |  |  |
| 6.38   | Approximate orientation of overturned bedding, where top direction of beds is known from local features—Showing approximate strike and dip             |        |                              |  |  |
| 6.39   | Horizontal bedding, as determined remotely or from aerial photographs  |        |                              |  |  |
| 6.40   | Gently inclined (between 0° and 30°) bedding, as determined remotely or from aerial photographs—Showing approximate strike and direction of dip        |        |                              |  |  |
| 6.41   | Moderately inclined (between 30° and 60°) bedding, as determined remotely or from aerial photographs—Showing approximate strike and direction of dip   |        |                              |  |  |
| 6.42   | Steeply inclined (between 60° and 90°) bedding, as determined remotely or from aerial photographs—Showing approximate strike and direction of dip      |        |                              |  |  |
| 6.43   | Vertical or near-vertical bedding, as determined remotely or from aerial photographs—Showing approximate strike  |        |                              |  |  |
| 6.44   | Gently overturned (between 0° and 30°) bedding, as determined remotely or from aerial photographs—Showing approximate strike and direction of dip      |        |                              |  |  |
| 6.45   | Moderately overturned (between 30° and 60°) bedding, as determined remotely or from aerial photographs—Showing approximate strike and direction of dip |        |                              |  |  |
| 6.46   | Steeply overturned (between 60° and 90°) bedding, as determined remotely or from aerial photographs—Showing approximate strike and direction of dip    |        |                              |  |  |

\*For more information, see general guidelines on pages A-1 to A-9.

**7—CLEAVAGE**

| REF NO | DESCRIPTION   | SYMBOL | CARTOGRAPHIC SPECIFICATIONS* | NOTES ON USAGE*  |
|--------|---|--------|------------------------------|--|
| 7.1    | Horizontal cleavage (generic or type unspecified)   |        | all lineweights .2 mm<br>    | For symbols representing a single observation at one locality, point of observation is the mid-point of the strike line.<br>For multiple observations at one locality, join symbols at the "tail" ends of the strike lines (opposite the ornamentation); the junction point is at point of observation. To obey the right-hand rule, use the "dip direction to right" symbols (use "dip direction to left" symbols only when necessary to prevent overcrowding). |
| 7.2    | Inclined cleavage (generic or type unspecified)—Showing strike and dip  |        | HI-6<br>                     |  |
| 7.3    | Vertical cleavage (generic or type unspecified)—Showing strike  |        |                              |  |
| 7.4    | Inclined (dip direction to right) cleavage (generic or type unspecified), for multiple observations at one locality—Showing strike and dip      |        | HI-6<br>                     |  |
| 7.5    | Inclined (dip direction to left) cleavage (generic or type unspecified), for multiple observations at one locality—Showing strike and dip       |        |                              |  |
| 7.6    | Vertical cleavage (generic or type unspecified), for multiple observations at one locality—Showing strike                                       |        |                              |  |
| 7.7    | Horizontal continuous slaty cleavage  |        | all lineweights .2 mm<br>    |  |
| 7.8    | Inclined continuous slaty cleavage—Showing strike and dip   |        | HI-6<br>                     |  |
| 7.9    | Vertical continuous slaty cleavage—Showing strike   |        |                              |  |
| 7.10   | Inclined (dip direction to right) continuous slaty cleavage, for multiple observations at one locality—Showing strike and dip                   |        | HI-6<br>                     |  |
| 7.11   | Inclined (dip direction to left) continuous slaty cleavage, for multiple observations at one locality—Showing strike and dip                    |        |                              |  |
| 7.12   | Vertical continuous slaty cleavage, for multiple observations at one locality—Showing strike  |        |                              |  |
| 7.13   | Horizontal disjunctive spaced cleavage  |        | all lineweights .2 mm<br>    |  |
| 7.14   | Inclined disjunctive spaced cleavage—Showing strike and dip   |        | HI-6<br>                     |  |
| 7.15   | Vertical disjunctive spaced cleavage—Showing strike   |        |                              |  |
| 7.16   | Inclined (dip direction to right) disjunctive spaced cleavage, for multiple observations at one locality—Showing strike and dip                 |        | HI-6<br>                     |  |
| 7.17   | Inclined (dip direction to left) disjunctive spaced cleavage, for multiple observations at one locality—Showing strike and dip                  |        |                              |  |
| 7.18   | Vertical disjunctive spaced cleavage, for multiple observations at one locality—Showing strike  |        |                              |  |
| 7.19   | Horizontal disjunctive, symmetric crenulation cleavage  |        | all lineweights .2 mm<br>    |  |
| 7.20   | Inclined disjunctive, symmetric crenulation cleavage—Showing strike and dip   |        | HI-6<br>                     |  |
| 7.21   | Vertical or near-vertical disjunctive, symmetric crenulation cleavage—Showing strike  |        |                              |  |
| 7.22   | Inclined (dip direction to right) disjunctive, symmetric crenulation cleavage, for multiple observations at one locality—Showing strike and dip |        | HI-6<br>                     |  |
| 7.23   | Inclined (dip direction to left) disjunctive, symmetric crenulation cleavage, for multiple observations at one locality—Showing strike and dip  |        |                              |  |
| 7.24   | Vertical or near-vertical disjunctive, symmetric crenulation cleavage, for multiple observations at one locality—Showing strike                 |        |                              |  |

\*For more information, see general guidelines on pages A-i to A-v.

**7—CLEAVAGE (continued)**

| REF NO | DESCRIPTION  | SYMBOL | CARTOGRAPHIC SPECIFICATIONS*  | NOTES ON USAGE*  |
|--------|--|--------|---|--|
| 7.25   | Horizontal disjunctive, asymmetric (S-shaped, counterclockwise sense of shear) crenulation cleavage  |        | all lineweights .2 mm<br><br>4.0 mm<br>4.0 mm<br>long dash length 1.0 mm; short dash .5 mm; spacing .5 mm<br>draft as shown | For symbols representing a single observation at one locality, point of observation is the mid-point of the strike line.<br>For multiple observations at one locality, join symbols at the "tail" ends of the strike lines (opposite the ornamentation); the junction point is at point of observation. To obey the right-hand rule, use the "dip direction to right" symbols (use "dip direction to left" symbols only when necessary to prevent overcrowding). |
| 7.26   | Inclined disjunctive, asymmetric (S-shaped, counterclockwise sense of shear) crenulation cleavage—Showing strike and dip   |        | HI-6<br><br>1.0 mm<br>4.0 mm<br>5.0 mm<br>draft as shown  |  |
| 7.27   | Vertical or near-vertical disjunctive, asymmetric (S-shaped, counterclockwise sense of shear) crenulation cleavage—Showing strike  |        | <br>1.5 mm  |  |
| 7.28   | Inclined (dip direction to right) disjunctive, asymmetric (S-shaped, counterclockwise sense of shear) crenulation cleavage, for multiple observations at one locality—Showing strike and dip |        | 5.5 mm<br><br>1.0 mm<br>4.0 mm<br>HI-6<br>draft as shown  |  |
| 7.29   | Inclined (dip direction to left) disjunctive, asymmetric (S-shaped, counterclockwise sense of shear) crenulation cleavage, for multiple observations at one locality—Showing strike and dip  |        | <br>4.0 mm  |  |
| 7.30   | Vertical or near-vertical disjunctive, asymmetric (S-shaped, counterclockwise sense of shear) crenulation cleavage, for multiple observations at one locality—Showing strike                 |        | <br>1.5 mm  |  |
| 7.31   | Horizontal disjunctive, asymmetric (Z-shaped, clockwise sense of shear) crenulation cleavage   |        | all lineweights .2 mm<br><br>4.0 mm<br>4.0 mm<br>long dash length 1.0 mm; short dash .5 mm; spacing .5 mm<br>draft as shown |  |
| 7.32   | Inclined disjunctive, asymmetric (Z-shaped, clockwise sense of shear) crenulation cleavage—Showing strike and dip  |        | HI-6<br><br>1.0 mm<br>4.5 mm<br>5.0 mm<br>draft as shown  |  |
| 7.33   | Vertical or near-vertical disjunctive, asymmetric (Z-shaped, clockwise sense of shear) crenulation cleavage—Showing strike   |        | <br>1.5 mm  |  |
| 7.34   | Inclined (dip direction to right) disjunctive, asymmetric (Z-shaped, clockwise sense of shear) crenulation cleavage, for multiple observations at one locality—Showing strike and dip        |        | 5.5 mm<br><br>1.0 mm<br>4.5 mm<br>HI-6<br>draft as shown  |  |
| 7.35   | Inclined (dip direction to left) disjunctive, asymmetric (Z-shaped, clockwise sense of shear) crenulation cleavage, for multiple observations at one locality—Showing strike and dip         |        | <br>4.5 mm  |  |
| 7.36   | Vertical or near-vertical disjunctive, asymmetric (Z-shaped, clockwise sense of shear) crenulation cleavage, for multiple observations at one locality—Showing strike                        |        | <br>1.5 mm  |  |

\*For more information, see general guidelines on pages A-i to A-v.

**8—FOLIATION**

| REF NO   | DESCRIPTION  | SYMBOL | CARTOGRAPHIC SPECIFICATIONS*   | NOTES ON USAGE*   |
|--|--|--------|--|---|
| <b>8.1—Generic foliation (origin not known or not specified)</b> |  |        |  |   |
| 8.1.1  | Horizontal generic (origin not known or not specified) foliation   |        | all lineweights .2 mm<br>90°<br>1.5 mm<br>circle diameter 2.5 mm                         | For symbols representing a single observation at one locality, point of observation is the midpoint of the strike line.<br><br>For multiple observations at one locality, join symbols at the "tail" ends of the strike lines (opposite the ornamentation); the junction point is at point of observation. To obey the right-hand rule, use the "dip direction to right" symbols (use "dip direction to left" symbols only when necessary to prevent overcrowding).           |
| 8.1.2  | Inclined generic (origin not known or not specified) foliation—Showing strike and dip  |        | 1.0 mm<br>90°<br>55° HI-6<br>5.0 mm<br>all lineweights .2 mm                             |   |
| 8.1.3  | Vertical generic (origin not known or not specified) foliation—Showing strike  |        | 2.0 mm   |   |
| 8.1.4  | Inclined (dip direction to right) generic (origin not known or not specified) foliation, for multiple observations at one locality—Showing strike and dip  |        | 5.5 mm<br>55° HI-6<br>1.0 mm<br>90°  |   |
| 8.1.5  | Inclined (dip direction to left) generic (origin not known or not specified) foliation, for multiple observations at one locality—Showing strike and dip   |        | 55°  |   |
| 8.1.6  | Vertical generic (origin not known or not specified) foliation or foliation, for multiple observations at one locality—Showing strike                      |        | 2.0 mm   |   |
| <b>8.2—Primary foliation or layering (in igneous rocks)</b>      |  |        |  |   |
| 8.2.1  | Massive igneous rock   |        | dot diameter .35 mm<br>2.0 mm<br>90°   | May be used at locality where foliation and lineation are absent.   |
| 8.2.2  | Horizontal flow banding, lamination, or foliation in igneous rock  |        | all lineweights .2 mm<br>60°<br>circle diameter 2.5 mm                                   | For symbols representing a single observation at one locality, point of observation is the midpoint of the strike line.<br><br>For multiple observations at one locality, join symbols at the "tail" ends of the strike lines (opposite the ornamentation); the junction point is at point of observation. To obey the right-hand rule, use the "dip direction to right" symbols (use "dip direction to left" symbols only when necessary to prevent overcrowding).           |
| 8.2.3  | Inclined flow banding, lamination, or foliation in igneous rock—Showing strike and dip   |        | 1.0 mm<br>60°<br>10° HI-6<br>5.0 mm<br>all lineweights .2 mm                             |   |
| 8.2.4  | Vertical flow banding, lamination, or foliation in igneous rock—Showing strike   |        | 2.0 mm   |   |
| 8.2.5  | Inclined (dip direction to right) flow banding, lamination, or foliation in igneous rock, for multiple observations at one locality—Showing strike and dip |        | 5.5 mm<br>10° HI-6<br>1.0 mm<br>60°  |   |
| 8.2.6  | Inclined (dip direction to left) flow banding, lamination, or foliation in igneous rock, for multiple observations at one locality—Showing strike and dip  |        | 10°  |   |
| 8.2.7  | Vertical flow banding, lamination, or foliation in igneous rock, for multiple observations at one locality—Showing strike                                  |        | 2.0 mm   |   |
| 8.2.8  | Inclined crinkled or deformed flow banding, lamination, or foliation in igneous rock—Showing approximate strike and dip                                    |        | 1.0 mm<br>60°<br>20° HI-6<br>all lineweights .2 mm<br>3.75 mm<br>5.0 mm<br>.75 mm radius | Inclined (upright) and overturned cumulate foliation symbols are used when the top direction of layers is known to a reasonable degree of certainty.<br><br>Symbols that have a ball may be used to indicate a greater level of certainty in the determination of top direction.<br><br>On maps where determination of top direction is "known" at some places and "unknown" at others, symbols that have a ball also may be used to indicate where top direction is "known". |
| 8.2.9  | Vertical or near-vertical crinkled or deformed flow banding, lamination, or foliation in igneous rock—Showing approximate strike                           |        | 2.0 mm   |   |
| 8.2.10   | Horizontal cumulate foliation  |        | all lineweights .2 mm<br>circle diameter 2.5 mm<br>5.5 mm                                |   |
| 8.2.11   | Inclined cumulate foliation—Showing strike and dip   |        | all lineweights .2 mm<br>1.0 mm<br>45° HI-6<br>5.5 mm                                    |   |
| 8.2.12   | Vertical cumulate foliation—Showing strike   |        | 2.5 mm   |   |
| 8.2.13   | Overturned cumulate foliation—Showing strike and dip   |        | 1.0 mm<br>70° HI-6<br>.625 mm radius   |   |
| 8.2.14   | Inclined cumulate foliation, where top direction of layers is known from local features—Showing strike and dip   |        | all lineweights .2 mm<br>.5 mm<br>30° HI-6<br>1.0 mm<br>5.0 mm<br>dot diameter .75 mm    |   |
| 8.2.15   | Vertical cumulate foliation, where top direction of layers is known from local features—Showing strike. Ball shows top direction                           |        | 2.5 mm   |   |
| 8.2.16   | Overturned cumulate foliation, where top direction of layers is known from local features—Showing strike and dip   |        | 1.0 mm<br>80° HI-6<br>.625 mm radius   |   |

\*For more information, see general guidelines on pages A-i to A-v.

**8—FOLIATION (continued)**

| REF NO  | DESCRIPTION   | SYMBOL | CARTOGRAPHIC SPECIFICATIONS* | NOTES ON USAGE*  |
|---|---|--------|------------------------------|--|
| <b>8.2—Primary foliation or layering (in igneous rocks) (continued)</b> |   |        |                              |  |
| 8.2.17  | Inclined crinkled or deformed cumulate foliation—<br>Showing approximate strike and dip                                 |        |                              | For symbols representing a single observation at one locality, point of observation is the mid-point of the strike line.<br><br>For multiple observations at one locality, join symbols at the "tail" ends of the strike lines (opposite the ornamentation); the junction point is at point of observation. To obey the right-hand rule, use the "dip direction to right" symbols (use "dip direction to left" symbols only when necessary to prevent overcrowding). |
| 8.2.18  | Vertical or near-vertical crinkled or deformed cumulate foliation—Showing approximate strike                            |        |                              |  |
| 8.2.19  | Horizontal eutaxitic foliation  |        |                              |  |
| 8.2.20  | Inclined eutaxitic foliation—Showing strike and dip   |        |                              |  |
| 8.2.21  | Vertical or near-vertical eutaxitic foliation—Showing strike  |        |                              |  |
| 8.2.22  | Inclined (dip direction to right) eutaxitic foliation, for multiple observations at one locality—Showing strike and dip |        |                              |  |
| 8.2.23  | Inclined (dip direction to left) eutaxitic foliation, for multiple observations at one locality—Showing strike and dip  |        |                              |  |
| 8.2.24  | Vertical or near-vertical eutaxitic foliation, for multiple observations at one locality—Showing strike                 |        |                              |  |
| 8.2.25  | Inclined crinkled or deformed eutaxitic foliation—<br>Showing approximate strike and dip                                |        |                              |  |
| 8.2.26  | Vertical or near-vertical crinkled or deformed eutaxitic foliation—Showing approximate strike                           |        |                              |  |

\*For more information, see general guidelines on pages A-i to A-v.

**8—FOLIATION (continued)**

| REF NO   | DESCRIPTION   | SYMBOL | CARTOGRAPHIC SPECIFICATIONS*  | NOTES ON USAGE*  |
|--|---|--------|---|--|
| <b>8.3—Secondary foliation (caused by metamorphism or tectonism)</b> |   |        |   |  |
| 8.3.1  | Horizontal metamorphic or tectonic foliation  |        | circle diameter 2.5 mm<br>line weight .2 mm<br>60°                                      | For symbols representing a single observation at one locality, point of observation is the mid-point of the strike line.   |
| 8.3.2  | Inclined metamorphic or tectonic foliation—Showing strike and dip   |        | 1.0 mm<br>35° HI-6<br>5.0 mm<br>line weight .2 mm                                       |  |
| 8.3.3  | Vertical metamorphic or tectonic foliation—Showing strike   |        | 2.0 mm  | For multiple observations at one locality, join symbols at the "tail" ends of the strike lines (opposite the ornamentation); the junction point is at point of observation. To obey the right-hand rule, use the "dip direction to right" symbols (use "dip direction to left" symbols only when necessary to prevent overcrowding). |
| 8.3.4  | Inclined (dip direction to right) metamorphic or tectonic foliation, for multiple observations at one locality—Showing strike and dip                             |        | 5.5 mm<br>35° HI-6<br>1.0 mm<br>60°   |  |
| 8.3.5  | Inclined (dip direction to left) metamorphic or tectonic foliation, for multiple observations at one locality—Showing strike and dip                              |        | 35°   | Symbols that have a ball may be used to indicate a greater level of certainty in the determination of top direction. On maps where determination of top direction is "known" at some places and "unknown" at others, symbols that have a ball also may be used to indicate where top direction is "known".                           |
| 8.3.6  | Vertical metamorphic or tectonic foliation, for multiple observations at one locality—Showing strike  |        | 2.0 mm  |  |
| 8.3.7  | Horizontal metamorphic or tectonic foliation parallel to bedding  |        | circle diameter 2.5 mm<br>all line weights .2 mm  | Inclined (upright) and overturned foliation symbols are used when the top direction of bedding is known to a reasonable degree of certainty.   |
| 8.3.8  | Inclined metamorphic or tectonic foliation parallel to bedding—Showing strike and dip   |        | 1.0 mm<br>10° HI-6<br>1.0 mm<br>5.0 mm<br>all line weights .2 mm                        |  |
| 8.3.9  | Vertical metamorphic or tectonic foliation parallel to bedding—Showing strike   |        | 4.0 mm<br>2.0 mm  | Symbols that have a ball may be used to indicate a greater level of certainty in the determination of top direction. On maps where determination of top direction is "known" at some places and "unknown" at others, symbols that have a ball also may be used to indicate where top direction is "known".                           |
| 8.3.10   | Inclined metamorphic or tectonic foliation parallel to overturned bedding—Showing strike and dip  |        | 75° HI-6<br>.625 mm radius  |  |
| 8.3.11   | Inclined metamorphic or tectonic foliation parallel to upright bedding, where top direction of beds is known from local features—Showing strike and dip           |        | 1.0 mm<br>15° HI-6<br>1.0 mm<br>5.0 mm<br>dot diameter .75 mm<br>all line weights .2 mm | Symbols that have a ball may be used to indicate a greater level of certainty in the determination of top direction. On maps where determination of top direction is "known" at some places and "unknown" at others, symbols that have a ball also may be used to indicate where top direction is "known".                           |
| 8.3.12   | Vertical metamorphic or tectonic foliation parallel to bedding, where top direction of beds is known from local features—Showing strike. Ball shows top direction |        | 4.0 mm<br>2.0 mm  |  |
| 8.3.13   | Inclined metamorphic or tectonic foliation parallel to overturned bedding, where top direction of beds is known from local features—Showing strike and dip        |        | 85° HI-6<br>.625 mm radius  | For symbols representing a single observation at one locality, point of observation is the mid-point of the strike line.   |
| 8.3.14   | Inclined crinkled or deformed metamorphic or tectonic foliation—Showing approximate strike and dip  |        | 30° HI-6<br>1.0 mm<br>line weight .2 mm<br>5.0 mm<br>.375 mm<br>.75 mm radius           |  |
| 8.3.15   | Vertical or near-vertical crinkled or deformed metamorphic or tectonic foliation—Showing approximate strike   |        | 2.0 mm  | For multiple observations at one locality, join symbols at the "tail" ends of the strike lines (opposite the ornamentation); the junction point is at point of observation. To obey the right-hand rule, use the "dip direction to right" symbols (use "dip direction to left" symbols only when necessary to prevent overcrowding). |
| 8.3.16   | Horizontal continuous, penetrative foliation  |        | 1.0 mm<br>circle diameter 2.5 mm<br>5 mm<br>all line weights .2 mm<br>4.25 mm           |  |
| 8.3.17   | Inclined continuous, penetrative foliation—Showing strike and dip   |        | 1.0 mm<br>25° HI-6<br>1.0 mm<br>5.0 mm<br>all line weights .2 mm                        | For multiple observations at one locality, join symbols at the "tail" ends of the strike lines (opposite the ornamentation); the junction point is at point of observation. To obey the right-hand rule, use the "dip direction to right" symbols (use "dip direction to left" symbols only when necessary to prevent overcrowding). |
| 8.3.18   | Vertical continuous, penetrative foliation—Showing strike   |        | 2.0 mm  |  |
| 8.3.19   | Inclined (dip direction to right) continuous, penetrative foliation, for multiple observations at one locality—Showing strike and dip                             |        | 5.5 mm<br>25° HI-6<br>1.0 mm<br>5 mm<br>1.0 mm<br>60°                                   | Symbols that have a ball may be used to indicate a greater level of certainty in the determination of top direction. On maps where determination of top direction is "known" at some places and "unknown" at others, symbols that have a ball also may be used to indicate where top direction is "known".                           |
| 8.3.20   | Inclined (dip direction to left) continuous, penetrative foliation, for multiple observations at one locality—Showing strike and dip                              |        | 25°   |  |
| 8.3.21   | Vertical continuous, penetrative foliation, for multiple observations at one locality—Showing strike  |        | 2.0 mm  |  |

\*For more information, see general guidelines on pages A-1 to A-9.

**8—FOLIATION (continued)**

| REF NO   | DESCRIPTION   | SYMBOL | CARTOGRAPHIC SPECIFICATIONS*  | NOTES ON USAGE*  |
|--|---|--------|---|--|
| <b>8.3—Secondary foliation (caused by metamorphism or tectonism) (continued)</b> |   |        |   |  |
| 8.3.22   | Horizontal disjunctive, spaced foliation  |        | circle diameter 2.5 mm<br>all lineweights .2 mm<br>                   | For symbols representing a single observation at one locality, point of observation is the mid-point of the strike line.<br>For multiple observations at one locality, join symbols at the "tail" ends of the strike lines (opposite the ornamentation); the junction point is at point of observation. To obey the right-hand rule, use the "dip direction to right" symbols (use "dip direction to left" symbols only when necessary to prevent overcrowding). |
| 8.3.23   | Inclined disjunctive, spaced foliation—Showing strike and dip   |        |   |  |
| 8.3.24   | Vertical disjunctive, spaced foliation—Showing strike   |        |   |  |
| 8.3.25   | Inclined (dip direction to right) disjunctive, spaced foliation, for multiple observations at one locality—Showing strike and dip   |        |   |  |
| 8.3.26   | Inclined (dip direction to left) disjunctive, spaced foliation, for multiple observations at one locality—Showing strike and dip  |        |   |  |
| 8.3.27   | Vertical disjunctive, spaced foliation, for multiple observations at one locality—Showing strike  |        |   |  |
| 8.3.28   | Horizontal disjunctive, symmetric crenulation foliation   |        | circle diameter 2.5 mm<br>draft as shown<br>all lineweights .2 mm<br> |  |
| 8.3.29   | Inclined disjunctive, symmetric crenulation foliation—Showing strike and dip  |        |   |  |
| 8.3.30   | Vertical or near-vertical disjunctive, symmetric crenulation foliation—Showing strike   |        |   |  |
| 8.3.31   | Inclined (dip direction to right) disjunctive, symmetric crenulation foliation, for multiple observations at one locality—Showing strike and dip  |        |   |  |
| 8.3.32   | Inclined (dip direction to left) disjunctive, symmetric crenulation foliation, for multiple observations at one locality—Showing strike and dip   |        |   |  |
| 8.3.33   | Vertical or near-vertical disjunctive, symmetric crenulation foliation, for multiple observations at one locality—Showing strike  |        |   |  |
| 8.3.34   | Horizontal disjunctive, asymmetric (S-shaped, counterclockwise sense of shear) crenulation foliation  |        | circle diameter 2.5 mm<br>draft as shown<br>all lineweights .2 mm<br> |  |
| 8.3.35   | Inclined disjunctive, asymmetric (S-shaped, counterclockwise sense of shear) crenulation foliation—Showing strike and dip   |        |   |  |
| 8.3.36   | Vertical or near-vertical disjunctive, asymmetric (S-shaped, counterclockwise sense of shear) crenulation foliation—Showing strike  |        |   |  |
| 8.3.37   | Inclined (dip direction to right) disjunctive, asymmetric (S-shaped, counterclockwise sense of shear) crenulation foliation, for multiple observations at one locality—Showing strike and dip |        |   |  |
| 8.3.38   | Inclined (dip direction to left) disjunctive, asymmetric (S-shaped, counterclockwise sense of shear) crenulation foliation, for multiple observations at one locality—Showing strike and dip  |        |   |  |
| 8.3.39   | Vertical or near-vertical disjunctive, asymmetric (S-shaped, counterclockwise sense of shear) crenulation foliation, for multiple observations at one locality—Showing strike                 |        |   |  |
| 8.3.40   | Horizontal disjunctive, asymmetric (Z-shaped, clockwise sense of shear) crenulation foliation   |        | circle diameter 2.5 mm<br>draft as shown<br>all lineweights .2 mm<br> |  |
| 8.3.41   | Inclined disjunctive, asymmetric (Z-shaped, clockwise sense of shear) crenulation foliation—Showing strike and dip  |        |   |  |
| 8.3.42   | Vertical or near-vertical disjunctive, asymmetric (Z-shaped, clockwise sense of shear) crenulation foliation—Showing strike   |        |   |  |
| 8.3.43   | Inclined (dip direction to right) disjunctive, asymmetric (Z-shaped, clockwise sense of shear) crenulation foliation, for multiple observations at one locality—Showing strike and dip        |        |   |  |
| 8.3.44   | Inclined (dip direction to left) disjunctive, asymmetric (Z-shaped, clockwise sense of shear) crenulation foliation, for multiple observations at one locality—Showing strike and dip         |        |   |  |
| 8.3.45   | Vertical or near-vertical disjunctive, asymmetric (Z-shaped, clockwise sense of shear) crenulation foliation, for multiple observations at one locality—Showing strike                        |        |   |  |

**8—FOLIATION (continued)**

| REF NO   | DESCRIPTION   | SYMBOL | CARTOGRAPHIC SPECIFICATIONS*                        | NOTES ON USAGE*  |
|--|---|--------|---|--|
| <b>8.3—Secondary foliation (caused by metamorphism or tectonism) (continued)</b> |   |        |   |  |
| 8.3.46   | Horizontal gneissic layering  |        | circle diameter 2.5 mm<br>all lineweights .2 mm<br> | For symbols representing a single observation at one locality, point of observation is the mid-point of the strike line.<br>For multiple observations at one locality, join symbols at the "tail" ends of the strike lines (opposite the ornamentation); the junction point is at point of observation. To obey the right-hand rule, use the "dip direction to right" symbols (use "dip direction to left" symbols only when necessary to prevent overcrowding). |
| 8.3.47   | Inclined gneissic layering—Showing strike and dip   |        |   |  |
| 8.3.48   | Vertical or near-vertical gneissic layering—Showing strike  |        |   |  |
| 8.3.49   | Inclined (dip direction to right) gneissic layering, for multiple observations at one locality—Showing strike and dip   |        |   |  |
| 8.3.50   | Inclined (dip direction to left) gneissic layering, for multiple observations at one locality—Showing strike and dip    |        |   |  |
| 8.3.51   | Vertical or near-vertical gneissic layering, for multiple observations at one locality—Showing strike                   |        |   |  |
| 8.3.52   | Horizontal undulatory gneissic layering   |        | circle diameter 2.5 mm<br>all lineweights .2 mm<br> |  |
| 8.3.53   | Inclined undulatory gneissic layering—Showing strike and dip  |        |   |  |
| 8.3.54   | Vertical or near-vertical undulatory gneissic layering—Showing strike   |        |   |  |
| 8.3.55   | Horizontal mylonitic foliation  |        | circle diameter 2.5 mm<br>all lineweights .2 mm<br> |  |
| 8.3.56   | Inclined mylonitic foliation—Showing strike and dip   |        |   |  |
| 8.3.57   | Vertical or near-vertical mylonitic foliation—Showing strike  |        |   |  |
| 8.3.58   | Inclined (dip direction to right) mylonitic foliation, for multiple observations at one locality—Showing strike and dip |        |   |  |
| 8.3.59   | Inclined (dip direction to left) mylonitic foliation, for multiple observations at one locality—Showing strike and dip  |        |   |  |
| 8.3.60   | Vertical or near-vertical mylonitic foliation, for multiple observations at one locality—Showing strike                 |        |   |  |

\*For more information, see general guidelines on pages A-i to A-v.

**9—LINEATION**

| REF NO | DESCRIPTION  | SYMBOL | CARTOGRAPHIC SPECIFICATIONS*     | NOTES ON USAGE*  |
|--------|--|--------|----------------------------------|--|
| 9.1    | Approximate plunge direction of inclined generic (origin or type not known or not specified) lineation or linear structure (1st option)      |        | <i>lineweight</i> .2 mm<br>      | Open-arrowed ("2nd option") symbols may be used to show a second generation or another instance of a particular lineation.   |
| 9.2    | Approximate plunge direction of inclined generic (origin or type not known or not specified) lineation or linear structure (2nd option)      |        | <i>all lineweights</i> .2 mm<br> |  |
| 9.3    | Inclined generic (origin or type not known or not specified) lineation or linear structure (1st option) — Showing bearing and plunge         |        |                                  | Lineation symbols may be used separately or combined with other symbols.   |
| 9.4    | Inclined generic (origin or type not known or not specified) lineation or linear structure (2nd option) — Showing bearing and plunge         |        |                                  |  |
| 9.5    | Horizontal generic (origin or type not known or not specified) lineation or linear structure (1st option) — Showing bearing                  |        | <i>lineweight</i> .2 mm<br>      | For lineation symbols representing a single observation at one locality, the point of observation is at one of the following two places: for inclined lineations, at the "tail" end (opposite the arrow-head); for horizontal lineations, at the "tail" end (opposite the arrow-head); for horizontal lineations, at the midpoint of the bearing line. |
| 9.6    | Horizontal generic (origin or type not known or not specified) lineation or linear structure (2nd option) — Showing bearing                  |        | <i>all lineweights</i> .2 mm<br> |  |
| 9.7    | Vertical or near-vertical generic (origin or type not known or not specified) lineation or linear structure (1st option)                     |        | <i>all lineweights</i> .2 mm<br> | For a single lineation symbol combined with a single planar-feature (for example, bedding or foliation) symbol, join the "tail" end of the lineation arrow to the midpoint of the strike line of the planar-feature symbol; the junction point is at the point of observation.   |
| 9.8    | Vertical or near-vertical generic (origin or type not known or not specified) lineation or linear structure (2nd option)                     |        |                                  |  |
| 9.9    | Inclined parting lineation in sedimentary materials (1st option) — Showing bearing and plunge  |        | <i>all lineweights</i> .2 mm<br> | For multiple observations at one locality, join all symbols at their "tail" ends (opposite the arrowheads or other ornamentations); the junction point is at the point of observation.   |
| 9.10   | Inclined parting lineation in sedimentary materials (2nd option) — Showing bearing and plunge  |        |                                  |  |
| 9.11   | Horizontal parting lineation in sedimentary materials (1st option) — Showing bearing   |        | <i>all lineweights</i> .2 mm<br> |  |
| 9.12   | Horizontal parting lineation in sedimentary materials (2nd option) — Showing bearing   |        |                                  |  |
| 9.13   | Inclined sole mark, tool mark, scour mark, flute mark, groove, or channel in sedimentary materials (1st option) — Showing bearing and plunge |        | <i>lineweight</i> .2 mm<br>      |  |
| 9.14   | Inclined sole mark, tool mark, scour mark, flute mark, groove, or channel in sedimentary materials (2nd option) — Showing bearing and plunge |        | <i>all lineweights</i> .2 mm<br> |  |
| 9.15   | Horizontal sole mark, tool mark, scour mark, flute mark, groove, or channel in sedimentary materials (1st option) — Showing bearing          |        | <i>lineweight</i> .2 mm<br>      |  |
| 9.16   | Horizontal sole mark, tool mark, scour mark, flute mark, groove, or channel in sedimentary materials (2nd option) — Showing bearing          |        | <i>all lineweights</i> .2 mm<br> |  |
| 9.17   | Inclined slickenline, groove, or striation on fault surface (1st option) — Showing bearing and plunge  |        | <i>lineweight</i> .2 mm<br>      |  |
| 9.18   | Inclined slickenline, groove, or striation on fault surface (2nd option) — Showing bearing and plunge  |        | <i>all lineweights</i> .2 mm<br> |  |
| 9.19   | Horizontal slickenline, groove, or striation on fault surface (1st option) — Showing bearing   |        | <i>lineweight</i> .2 mm<br>      |  |
| 9.20   | Horizontal slickenline, groove, or striation on fault surface (2nd option) — Showing bearing   |        | <i>all lineweights</i> .2 mm<br> |  |
| 9.21   | Inclined surface groove or striation (origin not known or not specified) (1st option) — Showing bearing and plunge                           |        | <i>all lineweights</i> .2 mm<br> |  |
| 9.22   | Inclined surface groove or striation (origin not known or not specified) (2nd option) — Showing bearing and plunge                           |        |                                  |  |
| 9.23   | Horizontal surface groove or striation (origin not known or not specified) (1st option) — Showing bearing                                    |        | <i>all lineweights</i> .2 mm<br> |  |
| 9.24   | Horizontal surface groove or striation (origin not known or not specified) (2nd option) — Showing bearing                                    |        |                                  |  |

\*For more information, see general guidelines on pages A-i to A-v.

**9—LINEATION (continued)**

| REF NO | DESCRIPTION  | SYMBOL | CARTOGRAPHIC SPECIFICATIONS*   | NOTES ON USAGE*  |
|--------|--|--------|--|--|
| 9.25   | Inclined aligned-object lineation (1st option)—Showing bearing and plunge  |        | dot diameter 1.0 mm<br>6.0 mm<br>25°<br>2.5 mm<br>1.25 mm<br>HI-6<br>20<br>line weight .2 mm | Open-arrowed ("2nd option") symbols may be used to show a second generation or another instance of a particular lineation.   |
| 9.26   | Inclined aligned-object lineation (2nd option)—Showing bearing and plunge  |        | all line weights .2 mm   |  |
| 9.27   | Horizontal aligned-object lineation (1st option)—Showing bearing   |        | dot diameter 1.0 mm<br>6.0 mm<br>25°<br>2.5 mm<br>1.25 mm<br>line weight .2 mm               | Lineation symbols may be used separately or combined with other symbols.   |
| 9.28   | Horizontal aligned-object lineation (2nd option)—Showing bearing   |        | all line weights .2 mm   |  |
| 9.29   | Inclined aligned-clast or aligned-grain lineation (in sedimentary materials) (1st option)—Showing bearing and plunge |        | 2.425 mm<br>30°<br>20<br>line weight .2 mm<br>.675 mm<br>2.0 mm                              | For lineation symbols representing a single observation at one locality, the point of observation is at one of the following two places: for inclined lineations, at the "tail" end (opposite the arrow-head); for horizontal lineations, at the midpoint of the bearing line. |
| 9.30   | Inclined aligned-clast or aligned-grain lineation (in sedimentary materials) (2nd option)—Showing bearing and plunge |        | all line weights .2 mm   |  |
| 9.31   | Horizontal aligned-clast or aligned-grain lineation (in sedimentary materials) (1st option)—Showing bearing          |        | 2.425 mm<br>30°<br>line weight .2 mm<br>.675 mm<br>2.0 mm                                    | For a single lineation symbol combined with a single planar-feature (for example, bedding or foliation) symbol, join the "tail" end of the lineation arrow to the midpoint of the strike line of the planar-feature symbol; the junction point is at the point of observation. |
| 9.32   | Horizontal aligned-clast or aligned-grain lineation (in sedimentary materials) (2nd option)—Showing bearing          |        | all line weights .2 mm   |  |
| 9.33   | Inclined aligned-inclusion lineation (in igneous rocks) (1st option)—Showing bearing and plunge                      |        | circle diameter 1.0 mm<br>20<br>2.5 mm<br>all line weights .2 mm                             | For multiple observations at one locality, join all symbols at their "tail" ends (opposite the arrowheads or other ornamentations); the junction point is at the point of observation.   |
| 9.34   | Inclined aligned-inclusion lineation (in igneous rocks) (2nd option)—Showing bearing and plunge                      |        | all line weights .2 mm   |  |
| 9.35   | Horizontal aligned-inclusion lineation (in igneous rocks) (1st option)—Showing bearing                               |        | circle diameter 1.0 mm<br>2.5 mm<br>all line weights .2 mm                                   |  |
| 9.36   | Horizontal aligned-inclusion lineation (in igneous rocks) (2nd option)—Showing bearing                               |        | all line weights .2 mm   |  |
| 9.37   | Inclined aligned-mineral lineation (1st option)—Showing bearing and plunge   |        | 1.0 mm<br>20<br>2.5 mm<br>line weight .2 mm  |  |
| 9.38   | Inclined aligned-mineral lineation (2nd option)—Showing bearing and plunge   |        | all line weights .2 mm   |  |
| 9.39   | Horizontal aligned-mineral lineation (1st option)—Showing bearing  |        | 1.0 mm<br>20<br>2.5 mm<br>line weight .2 mm  |  |
| 9.40   | Horizontal aligned-mineral lineation (2nd option)—Showing bearing  |        | all line weights .2 mm   |  |
| 9.41   | Inclined aligned mineral-aggregate lineation (1st option)—Showing bearing and plunge                                 |        | .75 mm<br>20<br>2.0 mm<br>line weight .2 mm<br>.5 mm<br>.75 mm<br>1.75 mm                    |  |
| 9.42   | Inclined aligned mineral-aggregate lineation (2nd option)—Showing bearing and plunge                                 |        | all line weights .2 mm   |  |
| 9.43   | Horizontal aligned mineral-aggregate lineation (1st option)—Showing bearing  |        | .75 mm<br>20<br>2.0 mm<br>line weight .2 mm<br>.5 mm<br>.75 mm<br>1.75 mm                    |  |
| 9.44   | Horizontal aligned mineral-aggregate lineation (2nd option)—Showing bearing  |        | all line weights .2 mm   |  |
| 9.45   | Inclined aligned deformed-mineral lineation (1st option)—Showing bearing and plunge                                  |        | 2.75 mm<br>20<br>30°<br>line weight .2 mm<br>.5 mm<br>1.0 mm                                 |  |
| 9.46   | Inclined aligned deformed-mineral lineation (2nd option)—Showing bearing and plunge                                  |        | all line weights .2 mm   |  |
| 9.47   | Horizontal aligned deformed-mineral lineation (1st option)—Showing bearing   |        | 2.75 mm<br>20<br>30°<br>line weight .2 mm<br>.5 mm<br>1.0 mm                                 |  |
| 9.48   | Horizontal aligned deformed-mineral lineation (2nd option)—Showing bearing   |        | all line weights .2 mm   |  |

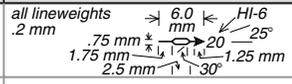
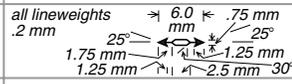
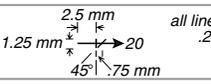
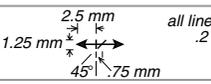
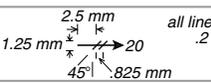
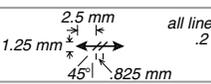
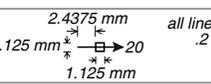
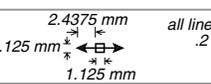
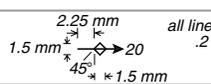
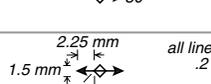
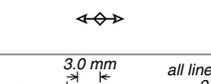
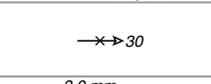
\*For more information, see general guidelines on pages A-i to A-v.

**9—LINEATION (continued)**

| REF NO | DESCRIPTION   | SYMBOL | CARTOGRAPHIC SPECIFICATIONS* | NOTES ON USAGE*  |
|--------|---|--------|------------------------------|--|
| 9.49   | Inclined aligned stretched-object lineation (1st option)—Showing bearing and plunge |        |                              | Open-arrowed ("2nd option") symbols may be used to show a second generation or another instance of a particular lineation.   |
| 9.50   | Inclined aligned stretched-object lineation (2nd option)—Showing bearing and plunge |        |                              |  |
| 9.51   | Horizontal aligned stretched-object lineation (1st option)—Showing bearing          |        |                              | Lineation symbols may be used separately or combined with other symbols.   |
| 9.52   | Horizontal aligned stretched-object lineation (2nd option)—Showing bearing          |        |                              |  |
| 9.53   | Inclined aligned stretched-pebble lineation (1st option)—Showing bearing and plunge |        |                              | For lineation symbols representing a single observation at one locality, the point of observation is at one of the following two places: for inclined lineations, at the "tail" end (opposite the arrow-head); for horizontal lineations, at the midpoint of the bearing line. |
| 9.54   | Inclined aligned stretched-pebble lineation (2nd option)—Showing bearing and plunge |        |                              |  |
| 9.55   | Horizontal aligned stretched-pebble lineation (1st option)—Showing bearing          |        |                              | For a single lineation symbol combined with a single planar-feature (for example, bedding or foliation) symbol, join the "tail" end of the lineation arrow to the midpoint of the strike line of the planar-feature symbol; the junction point is at the point of observation. |
| 9.56   | Horizontal aligned stretched-pebble lineation (2nd option)—Showing bearing          |        |                              |  |
| 9.57   | Inclined aligned stretched-oid lineation (1st option)—Showing bearing and plunge    |        |                              | For multiple observations at one locality, join all symbols at their "tail" ends (opposite the arrowheads or other ornamentations); the junction point is at the point of observation.   |
| 9.58   | Inclined aligned stretched-oid lineation (2nd option)—Showing bearing and plunge    |        |                              |  |
| 9.59   | Horizontal aligned stretched-oid lineation (1st option)—Showing bearing             |        |                              |  |
| 9.60   | Horizontal aligned stretched-oid lineation (2nd option)—Showing bearing             |        |                              |  |
| 9.61   | Inclined rodding (1st option)—Showing bearing and plunge                            |        |                              |  |
| 9.62   | Inclined rodding (2nd option)—Showing bearing and plunge                            |        |                              |  |
| 9.63   | Horizontal rodding (1st option)—Showing bearing                                     |        |                              |  |
| 9.64   | Horizontal rodding (2nd option)—Showing bearing                                     |        |                              |  |
| 9.65   | Inclined mullions (1st option)—Showing bearing and plunge                           |        |                              |  |
| 9.66   | Inclined mullions (2nd option)—Showing bearing and plunge                           |        |                              |  |
| 9.67   | Horizontal mullions (1st option)—Showing bearing                                    |        |                              |  |
| 9.68   | Horizontal mullions (2nd option)—Showing bearing                                    |        |                              |  |
| 9.69   | Inclined boudins (1st option)—Showing bearing and plunge                            |        |                              |  |
| 9.70   | Inclined boudins (2nd option)—Showing bearing and plunge                            |        |                              |  |
| 9.71   | Horizontal boudins (1st option)—Showing bearing                                     |        |                              |  |
| 9.72   | Horizontal boudins (2nd option)—Showing bearing                                     |        |                              |  |

\*For more information, see general guidelines on pages A-i to A-v.

**9—LINEATION (continued)**

| REF NO | DESCRIPTION   | SYMBOL  | CARTOGRAPHIC SPECIFICATIONS*  | NOTES ON USAGE*  |
|--------|---|---|---|--|
| 9.73   | Inclined pencil structure (1st option)—Showing bearing and plunge   |    |     | Open-arrowed ("2nd option") symbols may be used to show a second generation or another instance of a particular lineation.   |
| 9.74   | Inclined pencil structure (2nd option)—Showing bearing and plunge   |    |    |  |
| 9.75   | Horizontal pencil structure (1st option)—Showing bearing  |    |     | Lineation symbols may be used separately or combined with other symbols.   |
| 9.76   | Horizontal pencil structure (2nd option)—Showing bearing  |    |    |  |
| 9.77   | Inclined lineation at intersection of bedding and cleavage (1st option)—Showing bearing and plunge                      |    |     | For lineation symbols representing a single observation at one locality, the point of observation is at one of the following two places: for inclined lineations, at the "tail" end (opposite the arrow-head); for horizontal lineations, at the midpoint of the bearing line. |
| 9.78   | Inclined lineation at intersection of bedding and cleavage (2nd option)—Showing bearing and plunge                      |    |    |  |
| 9.79   | Horizontal lineation at intersection of bedding and cleavage (1st option)—Showing bearing                               |    |     | For a single lineation symbol combined with a single planar-feature (for example, bedding or foliation) symbol, join the "tail" end of the lineation arrow to the midpoint of the strike line of the planar-feature symbol; the junction point is at the point of observation. |
| 9.80   | Horizontal lineation at intersection of bedding and cleavage (2nd option)—Showing bearing                               |    |    |  |
| 9.81   | Inclined lineation at intersection of two cleavages (1st option)—Showing bearing and plunge                             |    |     | For multiple observations at one locality, join all symbols at their "tail" ends (opposite the arrowheads or other ornamentations); the junction point is at the point of observation.   |
| 9.82   | Inclined lineation at intersection of two cleavages (2nd option)—Showing bearing and plunge                             |    |    |  |
| 9.83   | Horizontal lineation at intersection of two cleavages (1st option)—Showing bearing                                      |    |    |  |
| 9.84   | Horizontal lineation at intersection of two cleavages (2nd option)—Showing bearing                                      |  |  |  |
| 9.85   | Inclined lineation at intersection of two fractures or joints (1st option)—Showing bearing and plunge                   |  |   |  |
| 9.86   | Inclined lineation at intersection of two fractures or joints (2nd option)—Showing bearing and plunge                   |  |  |  |
| 9.87   | Horizontal lineation at intersection of two fractures or joints (1st option)—Showing bearing                            |  |   |  |
| 9.88   | Horizontal lineation at intersection of two fractures or joints (2nd option)—Showing bearing                            |  |  |  |
| 9.89   | Inclined lineation at intersection of two foliations (1st option)—Showing bearing and plunge                            |  |   |  |
| 9.90   | Inclined lineation at intersection of two foliations (2nd option)—Showing bearing and plunge                            |  |  |  |
| 9.91   | Horizontal lineation at intersection of two foliations (1st option)—Showing bearing                                     |  |   |  |
| 9.92   | Horizontal lineation at intersection of two foliations (2nd option)—Showing bearing                                     |  |  |  |
| 9.93   | Inclined lineation at intersection of two surfaces (origin or type unspecified) (1st option)—Showing bearing and plunge |  |   |  |
| 9.94   | Inclined lineation at intersection of two surfaces (origin or type unspecified) (2nd option)—Showing bearing and plunge |  |  |  |
| 9.95   | Horizontal lineation at intersection of two surfaces (origin or type unspecified) (1st option)—Showing bearing          |  |   |  |
| 9.96   | Horizontal lineation at intersection of two surfaces (origin or type unspecified) (2nd option)—Showing bearing          |  |  |  |

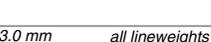
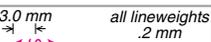
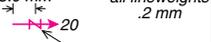
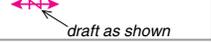
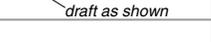
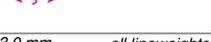
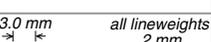
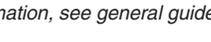
\*For more information, see general guidelines on pages A-i to A-v.

9—LINEATION (continued)

| REF NO | DESCRIPTION  | SYMBOL  | CARTOGRAPHIC SPECIFICATIONS*  | NOTES ON USAGE*   |
|--------|--|---|---|---|
| 9.97   | Inclined fold hinge of generic (type or orientation unspecified) small, minor fold (1st option)—Showing bearing and plunge |    | dot diameter .5 mm<br>color 100% magenta<br>2.75 mm<br>6.0 mm<br>HI-6 (100% black)<br>20<br>25°<br>1.25 mm<br>line weight .2 mm | Open-armed ("2nd option") symbols may be used to show a second generation or another instance of a particular lineation.<br><br>Lineation symbols may be used separately or combined with other symbols.<br><br>For lineation symbols representing a single observation at one locality, the point of observation is at one of the following two places: for inclined lineations, at the "tail" end (opposite the arrow-head); for horizontal lineations, at the midpoint of the bearing line.<br><br>For a single lineation symbol combined with a single planar-feature (for example, bedding or foliation) symbol, join the "tail" end of the lineation arrow to the midpoint of the strike line of the planar-feature symbol; the junction point is at the point of observation.<br><br>For multiple observations at one locality, join all symbols at their "tail" ends (opposite the arrowheads or other ornamentations); the junction point is at the point of observation.<br><br>May also be shown in black or other colors. |
| 9.98   | Inclined fold hinge of generic (type or orientation unspecified) small, minor fold (2nd option)—Showing bearing and plunge |    | all line weights .2 mm  |   |
| 9.99   | Horizontal fold hinge of generic (type or orientation unspecified) small, minor fold (1st option)—Showing bearing          |    | dot diameter .5 mm<br>2.75 mm<br>6.0 mm<br>25°<br>1.25 mm<br>line weight .2 mm<br>color 100% magenta                            |   |
| 9.100  | Horizontal fold hinge of generic (type or orientation unspecified) small, minor fold (2nd option)—Showing bearing          |    | all line weights .2 mm  |   |
| 9.101  | Inclined fold hinge of small, minor penecontemporaneous soft-sediment fold (1st option)—Showing bearing and plunge         |    | color 100% magenta<br>3.0 mm<br>20<br>draft as shown  |   |
| 9.102  | Inclined fold hinge of small, minor penecontemporaneous soft-sediment fold (2nd option)—Showing bearing and plunge         |    |   |   |
| 9.103  | Horizontal fold hinge of small, minor penecontemporaneous soft-sediment fold (1st option)—Showing bearing                  |    | color 100% magenta<br>3.0 mm<br>draft as shown  |   |
| 9.104  | Horizontal fold hinge of small, minor penecontemporaneous soft-sediment fold (2nd option)—Showing bearing                  |    | all line weights .2 mm  |   |
| 9.105  | Inclined fold hinge of small, minor anticline (1st option)—Showing bearing and plunge                                      |    | color 100% magenta<br>3.5 mm<br>20<br>draft as shown  |   |
| 9.106  | Inclined fold hinge of small, minor anticline (2nd option)—Showing bearing and plunge                                      |    |   |   |
| 9.107  | Horizontal fold hinge of small, minor anticline (1st option)—Showing bearing. Ball on topographically higher side of fold  |  | dot diameter .5 mm<br>3.5 mm<br>draft as shown<br>all line weights .2 mm<br>color 100% magenta<br>.4 mm                         |   |
| 9.108  | Horizontal fold hinge of small, minor anticline (2nd option)—Showing bearing. Ball on topographically higher side of fold  |  |   |   |
| 9.109  | Inclined fold hinge of small, minor antiform (1st option)—Showing bearing and plunge                                       |  | color 100% magenta<br>3.3 mm<br>20<br>draft as shown  |   |
| 9.110  | Inclined fold hinge of small, minor antiform (2nd option)—Showing bearing and plunge                                       |  |   |   |
| 9.111  | Horizontal fold hinge of small, minor antiform (1st option)—Showing bearing. Ball on topographically higher side of fold   |  | dot diameter .5 mm<br>3.5 mm<br>draft as shown<br>all line weights .2 mm<br>color 100% magenta<br>.4 mm                         |   |
| 9.112  | Horizontal fold hinge of small, minor antiform (2nd option)—Showing bearing. Ball on topographically higher side of fold   |  |   |   |
| 9.113  | Inclined fold hinge of small, minor syncline (1st option)—Showing bearing and plunge                                       |  | color 100% magenta<br>2.45 mm<br>20<br>draft as shown   |   |
| 9.114  | Inclined fold hinge of small, minor syncline (2nd option)—Showing bearing and plunge                                       |  |   |   |
| 9.115  | Horizontal fold hinge of small, minor syncline (1st option)—Showing bearing. Ball on topographically higher side of fold   |  | dot diameter .5 mm<br>2.45 mm<br>draft as shown<br>all line weights .2 mm<br>color 100% magenta<br>1.3 mm                       |   |
| 9.116  | Horizontal fold hinge of small, minor syncline (2nd option)—Showing bearing. Ball on topographically higher side of fold   |  |   |   |
| 9.117  | Inclined fold hinge of small, minor synform (1st option)—Showing bearing and plunge  |  | color 100% magenta<br>3.3 mm<br>20<br>draft as shown  |   |
| 9.118  | Inclined fold hinge of small, minor synform (2nd option)—Showing bearing and plunge  |  |   |   |
| 9.119  | Horizontal fold hinge of small, minor synform (1st option)—Showing bearing. Ball on topographically higher side of fold    |  | dot diameter .5 mm<br>3.3 mm<br>draft as shown<br>all line weights .2 mm<br>color 100% magenta<br>.8 mm                         |   |
| 9.120  | Horizontal fold hinge of small, minor synform (2nd option)—Showing bearing. Ball on topographically higher side of fold    |  |   |   |

\*For more information, see general guidelines on pages A-i to A-v.

9—LINEATION (continued)

| REF NO | DESCRIPTION   | SYMBOL  | CARTOGRAPHIC SPECIFICATIONS*  | NOTES ON USAGE*  |
|--------|---|---|---|--|
| 9.121  | Inclined symmetric minor fold hinge (1st option)—<br>Showing bearing and plunge   |    | color 100% magenta<br>draft as shown<br>6.0 mm<br>HI-6 (100% black)<br>25°<br>all lineweights .2 mm<br>2.75 mm<br>1.25 mm | Open-armed ("2nd option") symbols may be used to show a second generation or another instance of a particular lineation.   |
| 9.122  | Inclined symmetric minor fold hinge (2nd option)—<br>Showing bearing and plunge   |    |                                        |  |
| 9.123  | Horizontal symmetric minor fold hinge (1st option)—<br>Showing bearing  |    | color 100% magenta<br>draft as shown<br>6.0 mm<br>25°<br>all lineweights .2 mm<br>1.25 mm<br>2.5 mm                       | Lineation symbols may be used separately or combined with other symbols.   |
| 9.124  | Horizontal symmetric minor fold hinge (2nd option)—<br>Showing bearing  |    |                                        |  |
| 9.125  | Inclined asymmetric (S-shaped, counterclockwise sense of shear) minor fold hinge (1st option)—<br>Showing bearing and plunge                |    | color 100% magenta<br>draft as shown<br>3.0 mm<br>all lineweights .2 mm   | For lineation symbols representing a single observation at one locality, the point of observation is at one of the following two places: for inclined lineations, at the "tail" end (opposite the arrow-head); for horizontal lineations, at the midpoint of the bearing line. |
| 9.126  | Inclined asymmetric (S-shaped, counterclockwise sense of shear) minor fold hinge (2nd option)—<br>Showing bearing and plunge                |    |                                        |  |
| 9.127  | Horizontal asymmetric (S-shaped, counterclockwise sense of shear) minor fold hinge (1st option)—<br>Showing bearing                         |    | color 100% magenta<br>draft as shown<br>3.0 mm<br>all lineweights .2 mm   | For a single lineation symbol combined with a single planar-feature (for example, bedding or foliation) symbol, join the "tail" end of the lineation arrow to the midpoint of the strike line of the planar-feature symbol; the junction point is at the point of observation. |
| 9.128  | Horizontal asymmetric (S-shaped, counterclockwise sense of shear) minor fold hinge (2nd option)—<br>Showing bearing                         |    |                                        |  |
| 9.129  | Inclined asymmetric (Z-shaped, clockwise sense of shear) minor fold hinge (1st option)—<br>Showing bearing and plunge                       |    | color 100% magenta<br>draft as shown<br>3.0 mm<br>all lineweights .2 mm   | For multiple observations at one locality, join all symbols at their "tail" ends (opposite the arrowheads or other ornamentations); the junction point is at the point of observation.   |
| 9.130  | Inclined asymmetric (Z-shaped, clockwise sense of shear) minor fold hinge (2nd option)—<br>Showing bearing and plunge                       |   |                                       |  |
| 9.131  | Horizontal asymmetric (Z-shaped, clockwise sense of shear) minor fold hinge (1st option)—<br>Showing bearing                                |  | color 100% magenta<br>draft as shown<br>3.0 mm<br>all lineweights .2 mm   | May also be shown in black or other colors.  |
| 9.132  | Horizontal asymmetric (Z-shaped, clockwise sense of shear) minor fold hinge (2nd option)—<br>Showing bearing                                |  |                                      |  |
| 9.133  | Inclined crenulation lineation (1st option)—<br>Showing bearing and plunge  |  | color 100% magenta<br>draft as shown<br>3.0 mm<br>all lineweights .2 mm   |  |
| 9.134  | Inclined crenulation lineation (2nd option)—<br>Showing bearing and plunge  |  |                                      |  |
| 9.135  | Horizontal crenulation lineation (1st option)—<br>Showing bearing   |  | color 100% magenta<br>draft as shown<br>3.0 mm<br>all lineweights .2 mm   |  |
| 9.136  | Horizontal crenulation lineation (2nd option)—<br>Showing bearing   |  |                                      |  |
| 9.137  | Inclined asymmetric (S-shaped, counterclockwise sense of shear) kink-band crenulation lineation (1st option)—<br>Showing bearing and plunge |  | color 100% magenta<br>draft as shown<br>3.0 mm<br>all lineweights .2 mm   |  |
| 9.138  | Inclined asymmetric (S-shaped, counterclockwise sense of shear) kink-band crenulation lineation (2nd option)—<br>Showing bearing and plunge |  |                                      |  |
| 9.139  | Horizontal asymmetric (S-shaped, counterclockwise sense of shear) kink-band crenulation lineation (1st option)—<br>Showing bearing          |  | color 100% magenta<br>draft as shown<br>3.0 mm<br>all lineweights .2 mm   |  |
| 9.140  | Horizontal asymmetric (S-shaped, counterclockwise sense of shear) kink-band crenulation lineation (2nd option)—<br>Showing bearing          |  |                                      |  |
| 9.141  | Inclined asymmetric (Z-shaped, clockwise sense of shear) kink-band crenulation lineation (1st option)—<br>Showing bearing and plunge        |  | color 100% magenta<br>draft as shown<br>3.0 mm<br>all lineweights .2 mm   |  |
| 9.142  | Inclined asymmetric (Z-shaped, clockwise sense of shear) kink-band crenulation lineation (2nd option)—<br>Showing bearing and plunge        |  |                                      |  |
| 9.143  | Horizontal asymmetric (Z-shaped, clockwise sense of shear) kink-band crenulation lineation (1st option)—<br>Showing bearing                 |  | color 100% magenta<br>draft as shown<br>3.0 mm<br>all lineweights .2 mm   |  |
| 9.144  | Horizontal asymmetric (Z-shaped, clockwise sense of shear) kink-band crenulation lineation (2nd option)—<br>Showing bearing                 |  |                                      |  |

\*For more information, see general guidelines on pages A-i to A-v.

**10—PALEONTOLOGICAL FEATURES**

| REF NO                      | DESCRIPTION                               | SYMBOL  | CARTOGRAPHIC SPECIFICATIONS* | NOTES ON USAGE*                      |
|-----------------------------|---|---------|------------------------------|--------------------------------------|
| <b>10.1—Fossil locality</b> |   |         |                              |                                      |
| 10.1.1                      | Fossil locality—Showing collection number | ◇ D4426 |                              | May be shown in red or other colors. |

| REF NO                     | DESCRIPTION     | SYMBOL | REF NO                                 | DESCRIPTION      | SYMBOL | REF NO   | DESCRIPTION                        | SYMBOL                   |
|----------------------------|-----------------|--------|--|------------------|--------|--|------------------------------------|--------------------------|
| <b>10.2—Fossil symbols</b> |                 |        | <b>10.2—Fossil symbols (continued)</b> |                  |        | <b>10.2—Fossil symbols (continued)</b>   |                                    |                          |
| 10.2.1                     | Macrofossils    |        | 10.2.23                                | Gastropods       |        | 10.2.45  | Microfossils                       |                          |
| 10.2.2                     | Invertebrates   |        | 10.2.24                                | Pelecypods       |        | 10.2.46  | Conodonts                          |                          |
| 10.2.3                     | Annelids        |        | 10.2.25                                | Sponges          |        | 10.2.47  | Diatoms                            |                          |
| 10.2.4                     | Arthropods      |        | 10.2.26                                | Vertebrates      |        | 10.2.48  | Foraminifera                       |                          |
| 10.2.5                     | Arachnids       |        | 10.2.27                                | Amphibians       |        | 10.2.49  | Larger foraminifera, or fusulinids |                          |
| 10.2.6                     | Crustaceans     |        | 10.2.28                                | Fish             |        | 10.2.50  | Smaller, benthonic foraminifera    |                          |
| 10.2.7                     | Insects         |        | 10.2.29                                | Mammals          |        | 10.2.51  | Smaller, planktonic foraminifera   |                          |
| 10.2.8                     | Trilobites      |        | 10.2.30                                | Reptiles         |        | 10.2.52  | Nannofossils                       |                          |
| 10.2.9                     | Brachiopods     |        | 10.2.31                                | Plants           |        | 10.2.53  | Ostracodes                         |                          |
| 10.2.10                    | Bryozoans       |        | 10.2.32                                | Leaves           |        | 10.2.54  | Palynomorphs                       |                          |
| 10.2.11                    | Cnidarians      |        | 10.2.33                                | Roots            |        | 10.2.55  | Acritarchs                         |                          |
| 10.2.12                    | Corals          |        | 10.2.34                                | Wood             |        | 10.2.56  | Chitinozoans                       |                          |
| 10.2.13                    | Stromatoporoids |        | 10.2.35                                | Algae            |        | 10.2.57  | Dinoflagellates                    |                          |
| 10.2.14                    | Echinoderms     |        | 10.2.36                                | Conifers         |        | 10.2.58  | Pollen and (or) spores             |                          |
| 10.2.15                    | Crinoids        |        | 10.2.37                                | Ferns            |        | 10.2.59  | Radiolarians                       |                          |
| 10.2.16                    | Echinoids       |        | 10.2.38                                | Flowering plants |        | 10.2.60  | Silicoflagellates                  |                          |
| 10.2.17                    | Graptolites     |        | 10.2.39                                | Stromatolites    |        | 10.2.61  | Spicules                           |                          |
| 10.2.18                    | Mollusks        |        | 10.2.40                                | Fungi            |        | <b>CARTOGRAPHIC SPECIFICATIONS*</b>  |                                    |                          |
| 10.2.19                    | Cephalopods     |        | 10.2.41                                | Trace fossils    |        | all lineweights .125 mm<br>draft as shown<br>size may vary   | fill color<br>100% white           | fill color<br>100% black |
| 10.2.20                    | Ammonoids       |        | 10.2.42                                | Burrows          |        | <b>NOTES ON USAGE*</b>   |                                    |                          |
| 10.2.21                    | Belemnoids      |        | 10.2.43                                | Coprolites       |        | Fossil symbols are usually reserved for use on stratigraphic columns, sections, or charts. Cartographic specifications (shown for two examples above) pertain to all fossil symbols. Fossil symbols may be reduced in size, and line-weights reduced accordingly; however, note that lineweights below .125 mm may not plot correctly if output at higher resolutions (1800 dpi or higher). May also be shown in other colors. |                                    |                          |
| 10.2.22                    | Nautiloids      |        | 10.2.44                                | Tracks           |        |  |                                    |                          |

**11 – GEOPHYSICAL AND STRUCTURE CONTOURS**

| REF NO | DESCRIPTION   | SYMBOL | CARTOGRAPHIC SPECIFICATIONS*  | NOTES ON USAGE*  |
|--------|---|--------|---|--|
| 11.1   | Geophysical contour (index)—Accurately located  |        | lineweight .325 mm<br><br>line and text color 100% red                                  | On most maps, every fourth or fifth contour should be an index contour.  |
| 11.2   | Geophysical contour (index)—Showing datum (in parentheses): SL, sea level   |        |   | Only index contours are labeled. Negative values must be preceded by a minus (-) sign.   |
| 11.3   | Geophysical contour (index)—Accurately located. Hachures point into closed areas of lower values  |        | hachure lineweight .2 mm<br><br>5.0 mm<br>1.0 mm  | Add hachures to indicate closed areas of low values or if it is unclear that contour values are decreasing (hachures point into areas of low value). |
| 11.4   | Geophysical contour (index)—Approximately located where data are incomplete   |        | <br>.5 mm<br>4.5 mm   | May be shown in black or other colors.   |
| 11.5   | Geophysical contour (index)—Approximately located where data are incomplete. Hachures point into closed areas of lower values               |        | hachure lineweight .2 mm<br><br>5.0 mm<br>1.0 mm  |  |
| 11.6   | Geophysical contour (intermediate)—Accurately located   |        | lineweight .2 mm<br><br>line color 100% red   |  |
| 11.7   | Geophysical contour (intermediate)—Accurately located. Hachures point into closed areas of lower values                                     |        | all lineweights .2 mm<br><br>5.0 mm<br>1.0 mm   |  |
| 11.8   | Geophysical contour (intermediate)—Approximately located where data are incomplete  |        | <br>.5 mm<br>4.5 mm   |  |
| 11.9   | Geophysical contour (intermediate)—Approximately located where data are incomplete. Hachures point into closed areas of lower values        |        | <br>5.0 mm<br>1.0 mm  |  |
| 11.10  | Geophysical data collection locality  |        | 2.0 mm<br><br>90°<br>line color 100% red<br>lineweight .25 mm                           | May be shown in black or other colors.   |
| 11.11  | Geophysical data collection locality—Showing value where known  |        | 752<br><br>line and text color 100% red<br>HI-7   |  |
| 11.12  | Maximum or minimum intensity value within closed high or closed low   |        | 2864<br><br>lineweights .15 mm<br>30°<br>2.0 mm<br>line and text color 100% red<br>HI-7 |  |
| 11.13  | Structure contour, 1st surface (index)—Accurately located   |        | lineweight .4 mm<br><br>line and text color 100% red<br>HI-9                            | On most maps, every fourth or fifth contour should be an index contour.  |
| 11.14  | Structure contour, 1st surface (index)—Showing datum (in parentheses): SL, sea level  |        |   | Only index contours are labeled. Negative values must be preceded by a minus (-) sign.   |
| 11.15  | Structure contour, 1st surface (index)—Accurately located. Hachures point into closed areas of lower values                                 |        | hachure lineweight .2 mm<br><br>5.5 mm<br>1.0 mm  | Add hachures to indicate closed areas of low values or if it is unclear that contour values are decreasing (hachures point into areas of low value). |
| 11.16  | Structure contour, 1st surface (index)—Approximately located where control is poor  |        | <br>.5 mm<br>5.0 mm   | May be shown in black or other colors.   |
| 11.17  | Structure contour, 1st surface (index)—Approximately located where control is poor. Hachures point into closed areas of lower values        |        | <br>5.5 mm<br>1.0 mm  |  |
| 11.18  | Structure contour, 1st surface (intermediate)—Accurately located  |        | lineweight .275 mm<br>  |  |
| 11.19  | Structure contour, 1st surface (intermediate)—Accurately located. Hachures point into closed areas of lower values                          |        | hachure lineweight .2 mm<br><br>5.5 mm<br>1.0 mm  |  |
| 11.20  | Structure contour, 1st surface (intermediate)—Approximately located where control is poor   |        | <br>.5 mm<br>5.0 mm   |  |
| 11.21  | Structure contour, 1st surface (intermediate)—Approximately located where control is poor. Hachures point into closed areas of lower values |        | <br>5.5 mm<br>1.0 mm  |  |
| 11.22  | Outcrop point as structural control point (1st surface)   |        | 1520<br><br>line and text color 100% red<br>90°<br>2.0 mm<br>lineweight .275 mm<br>HI-7 | May be shown in black or other colors.   |

\*For more information, see general guidelines on pages A-i to A-v.

**11—GEOPHYSICAL AND STRUCTURE CONTOURS (continued)**

| REF NO | DESCRIPTION   | SYMBOL | CARTOGRAPHIC SPECIFICATIONS*   | NOTES ON USAGE*  |
|--------|---|--------|--|--|
| 11.23  | Structure contour, 2nd surface (index)—Accurately located   |        | lineweight .4 mm<br>HI-9<br>line and text color 100% violet                    | On most maps, every fourth or fifth contour should be an index contour.  |
| 11.24  | Structure contour, 2nd surface (index)—Showing datum (in parentheses): SL, sea level  |        |  | Only index contours are labeled. Negative values must be preceded by a minus (-) sign.   |
| 11.25  | Structure contour, 2nd surface (index)—Accurately located. Hachures point into closed areas of lower values                                 |        | hachure lineweight .2 mm<br>5.5 mm<br>1.0 mm                                   | Add hachures to indicate closed areas of low values or if it is unclear that contour values are decreasing (hachures point into areas of low value). |
| 11.26  | Structure contour, 2nd surface (index)—Approximately located where control is poor  |        | .5 mm<br>5.0 mm  | May be shown in black or other colors.   |
| 11.27  | Structure contour, 2nd surface (index)—Approximately located where control is poor. Hachures point into closed areas of lower values        |        | 5.5 mm<br>1.0 mm   |  |
| 11.28  | Structure contour, 2nd surface (intermediate)—Accurately located  |        | lineweight .275 mm   |  |
| 11.29  | Structure contour, 2nd surface (intermediate)—Accurately located. Hachures point into closed areas of lower values                          |        | hachure lineweight .2 mm<br>5.5 mm<br>1.0 mm                                   |  |
| 11.30  | Structure contour, 2nd surface (intermediate)—Approximately located where control is poor   |        | .5 mm<br>5.0 mm  |  |
| 11.31  | Structure contour, 2nd surface (intermediate)—Approximately located where control is poor. Hachures point into closed areas of lower values |        | 5.5 mm<br>1.0 mm   |  |
| 11.32  | Outcrop point as structural control point (2nd surface)   |        | line and text color 100% violet<br>90°<br>HI-7<br>lineweight .275 mm<br>2.0 mm | May be shown in black or other colors.   |
| 11.33  | Structure contour, 3rd surface (index)—Accurately located   |        | lineweight .4 mm<br>HI-9<br>line and text color 100% green                     | On most maps, every fourth or fifth contour should be an index contour.  |
| 11.34  | Structure contour, 3rd surface (index)—Showing datum (in parentheses): SL, sea level  |        |  | Only index contours are labeled. Negative values must be preceded by a minus (-) sign.   |
| 11.35  | Structure contour, 3rd surface (index)—Accurately located. Hachures point into closed areas of lower values                                 |        | hachure lineweight .2 mm<br>5.5 mm<br>1.0 mm                                   | Add hachures to indicate closed areas of low values or if it is unclear that contour values are decreasing (hachures point into areas of low value). |
| 11.36  | Structure contour, 3rd surface (index)—Approximately located where control is poor  |        | .5 mm<br>5.0 mm  | May be shown in black or other colors.   |
| 11.37  | Structure contour, 3rd surface (index)—Approximately located where control is poor. Hachures point into closed areas of lower values        |        | 5.5 mm<br>1.0 mm   |  |
| 11.38  | Structure contour, 3rd surface (intermediate)—Accurately located  |        | lineweight .275 mm   |  |
| 11.39  | Structure contour, 3rd surface (intermediate)—Accurately located. Hachures point into closed areas of lower values                          |        | hachure lineweight .2 mm<br>5.5 mm<br>1.0 mm                                   |  |
| 11.40  | Structure contour, 3rd surface (intermediate)—Approximately located where control is poor   |        | .5 mm<br>5.0 mm  |  |
| 11.41  | Structure contour, 3rd surface (intermediate)—Approximately located where control is poor. Hachures point into closed areas of lower values |        | 5.5 mm<br>1.0 mm   |  |
| 11.42  | Outcrop point as structural control point (3rd surface)   |        | line and text color 100% green<br>90°<br>HI-7<br>lineweight .275 mm<br>2.0 mm  | May be shown in black or other colors.   |

\*For more information, see general guidelines on pages A-i to A-v.

**12—FLUVIAL AND ALLUVIAL FEATURES**

| REF NO | DESCRIPTION  | SYMBOL | CARTOGRAPHIC SPECIFICATIONS*   | NOTES ON USAGE*                             |
|--------|--|--------|--|---|
| 12.1   | Fluvial terrace scarp—Identity and existence certain, location accurate. Hachures point downscarp        |        | <p>all lineweights .2 mm</p> <p>color 100% cyan</p>  | May also be shown in black or other colors. |
| 12.2   | Fluvial terrace scarp—Identity or existence questionable, location accurate. Hachures point downscarp    |        |  |   |
| 12.3   | Fluvial terrace scarp—Identity and existence certain, location approximate. Hachures point downscarp     |        | <p>3.5 mm</p> <p>.75 mm .75 mm</p>   |   |
| 12.4   | Fluvial terrace scarp—Identity or existence questionable, location approximate. Hachures point downscarp |        |  |   |
| 12.5   | Fluvial transport direction  |        | <p>lineweight .2 mm</p> <p>color 100% cyan</p>   |   |
| 12.6   | Sediment transport direction determined from imbrication   |        | <p>circle diameters .75 mm</p> <p>all lineweights .2 mm</p> <p>color 100% cyan</p>                         |   |
| 12.7   | Sediment transport direction determined from crossbeds   |        | <p>1.25 mm</p> <p>90°</p> <p>5.5 mm</p> <p>color 100% cyan</p> <p>all lineweights .2 mm</p>                |   |
| 12.8   | Sediment transport direction determined from flute casts   |        | <p>1.375 mm</p> <p>90°</p> <p>5.5 mm</p> <p>.75 mm</p> <p>all lineweights .2 mm</p> <p>color 100% cyan</p> |   |

\*For more information, see general guidelines on pages A-i to A-v.

**13—GLACIAL AND GLACIOFLUVIAL FEATURES**

| REF NO | DESCRIPTION   | SYMBOL | CARTOGRAPHIC SPECIFICATIONS*  | NOTES ON USAGE*  |
|--------|---|--------|---|--|
| 13.1   | Crevasse on glacier   |        | lineweights .2 mm<br>color 100% cyan<br>lengths may vary  |  |
| 13.2   | Ice-flow direction  |        | lineweight .25 mm<br>color 100% cyan<br>length may vary<br>60°<br>1.5 mm  |  |
| 13.3   | Glacial-lake spillway—Arrow shows direction of flow   |        | color 100% cyan<br>1.25 mm<br>lineweight .2 mm<br>length may vary<br>25°<br>60°<br>2.0 mm                                   |  |
| 13.4   | Glacial-lake spillway—Showing elevation. Arrow shows direction of flow  |        | 785'<br>HI-6 (100% black)   |  |
| 13.5   | Inferred glacial-lake spillway—Arrow shows direction of flow  |        | all lineweights .2 mm   |  |
| 13.6   | Inferred glacial-lake spillway—Showing estimated elevation. Arrow shows direction of flow                     |        | 785'  |  |
| 13.7   | Glacial meltwater stream—Barbs show direction of flow   |        | all lineweights .2 mm<br>color 100% cyan<br>7.5 mm<br>3.0 mm<br>stem lengths may vary<br>spacing may vary<br>20°<br>2.25 mm |  |
| 13.8   | Cutbanks of glacial meltwater stream channel (mapped to scale)—Hachures point into channel                    |        | spacing may vary<br>all lineweights .25 mm<br>1.125 mm<br>3.0 mm<br>color 100% cyan   |  |
| 13.9   | Flow direction of glacial meltwater in stream channel   |        | color 100% cyan<br>all lineweights .2 mm<br>stem lengths may vary<br>2.0 mm<br>25°  |  |
| 13.10  | Crest line of moraine, sense of symmetry unspecified (1st option)   |        | color 100% cyan<br>lineweight .2 mm<br>circle diameter .75 mm; spacing .625 mm  |  |
| 13.11  | Crest line of moraine, sense of symmetry unspecified (2nd option)   |        | color 100% cyan<br>dot diameter .825 mm; spacing .625 mm  |  |
| 13.12  | Crest line of symmetrical moraine   |        | color 100% cyan<br>3.0 mm .5 mm all lineweights .2 mm<br>circle diameter .675 mm; hachure height 1.5 mm                     |  |
| 13.13  | Crest line of asymmetrical moraine—Ticks point down steeper slope   |        | hachure height .75 mm   |  |
| 13.14  | Ridges on moraine   |        | color 100% cyan<br>lineweight .25 mm<br>lengths and spacing may vary  |  |
| 13.15  | Scarp at top of ice-contact slope—Hachures point downscarp  |        | .5 mm<br>1.375 mm<br>12°<br>color 100% cyan   |  |
| 13.16  | Ice-contact slope   |        | pattern 521-C in 50% cyan   |  |
| 13.17  | Esker or ice-channel deposit, transport direction unknown   |        | 1.25 mm .375 mm .625 mm<br>color 100% cyan<br>lineweight .2 mm<br>70°   |  |
| 13.18  | Esker or ice-channel deposit, transport direction known (1st option)—Chevrons point in direction of transport |        | color 100% cyan<br>70°<br>1.25 mm<br>1.0 mm<br>lineweight .2 mm   |  |
| 13.19  | Esker or ice-channel deposit, transport direction known (2nd option)—Chevrons point in direction of transport |        | color 100% cyan<br>70°<br>5.0 mm 1.25 mm<br>lineweight .375 mm lineweight .2 mm   |  |
| 13.20  | Drumlin—Showing bearing and direction of flow   |        | 2.25 mm 1.25 mm 1.25 mm<br>all lineweights .2 mm<br>color 100% cyan<br>25°<br>1.875 mm 6.0 mm                               | Point of observation is at the midpoint of the bearing line.         |
| 13.21  | Drumlin, flow direction unknown (1st option)—Showing bearing  |        | 1.875 mm<br>6.0 mm  | May also be shown in black or other colors.                          |
| 13.22  | Drumlin, flow direction unknown (2nd option)—Showing bearing  |        | 1.75 mm<br>1.0 mm<br>lineweight .2 mm<br>color 100% cyan<br>3.5 mm  |  |
| 13.23  | Drumlin (length mapped to scale)—Showing bearing and direction of flow  |        | color 100% cyan<br>1.25 mm<br>draw length to scale<br>1.25 mm<br>all lineweights .2 mm<br>25°                               | Use when map scale is large enough to show actual length of drumlin. |
| 13.24  | Drumlin (length mapped to scale), flow direction unknown—Showing bearing                                      |        | draw length to scale  | May also be shown in black or other colors.                          |

\*For more information, see general guidelines on pages A-i to A-v.

**13—GLACIAL AND GLACIOFLUVIAL FEATURES (continued)**

| REF NO | DESCRIPTION   | SYMBOL | CARTOGRAPHIC SPECIFICATIONS*   | NOTES ON USAGE*  |
|--------|---|--------|--|--|
| 13.25  | Kettle  |        | color 100% cyan<br>all lineweights .2 mm<br>45°<br>3.0 mm<br>1.75 mm                             | May also be shown in black or other colors.                                      |
| 13.26  | Hummocky topography (1st option)  |        | pattern 523-K in 50% black   |  |
| 13.27  | Hummocky topography (2nd option)  |        | pattern 523-DO in 50% black  |  |
| 13.28  | Hummocky topography (3rd option)  |        | pattern 524-K in 50% black   |  |
| 13.29  | Younger glacial striation or groove—Showing general bearing and direction of flow   |        | lineweight .2 mm<br>6.0 mm<br>25°<br>1.25 mm<br>color 100% cyan                                  | Point of observation is at the midpoint of the bearing line.                     |
| 13.30  | Younger glacial striation or groove—Showing measured bearing and direction of flow. Dot indicates location of observation point         |        | 2.625 mm<br>dot diameter .75 mm  | May also be shown in black or other colors.                                      |
| 13.31  | Older glacial striation or groove—Showing general bearing and direction of flow   |        | 2.625 mm<br>all lineweights .2 mm<br>.75 mm  |  |
| 13.32  | Older glacial striation or groove—Showing measured bearing and direction of flow. Open circle indicates location of observation point   |        | 2.625 mm<br>all lineweights .2 mm<br>circle diameter .75 mm                                      |  |
| 13.33  | Younger glacial striation or groove, flow direction unknown—Showing general bearing   |        | lineweight .2 mm<br>6.0 mm<br>color 100% cyan  |  |
| 13.34  | Younger glacial striation or groove, flow direction unknown—Showing measured bearing. Dot indicates location of observation point       |        | 2.625 mm<br>dot diameter .75 mm  |  |
| 13.35  | Older glacial striation or groove, flow direction unknown—Showing general bearing   |        | 2.625 mm<br>all lineweights .2 mm<br>.75 mm  |  |
| 13.36  | Older glacial striation or groove, flow direction unknown—Showing measured bearing. Open circle indicates location of observation point |        | 2.625 mm<br>all lineweights .2 mm<br>circle diameter .75 mm                                      |  |
| 13.37  | Younger glacial striation or groove (length mapped to scale)—Arrow shows direction of flow  |        | lineweight .2 mm<br>length may vary<br>25°<br>1.5 mm<br>color 100% cyan                          | Use when map scale is large enough to show actual length of striation or groove. |
| 13.38  | Younger glacial striation or groove (length mapped to scale), flow direction unknown  |        | length may vary  | May also be shown in black or other colors.                                      |
| 13.39  | Older glacial striation or groove (length mapped to scale)—Arrow shows direction of flow  |        | lineweight .2 mm<br>2.125 mm<br>length may vary<br>color 100% cyan<br>.75 mm                     |  |
| 13.40  | Older glacial striation or groove (length mapped to scale), flow direction unknown  |        | length may vary  |  |
| 13.41  | Cirque headwall—Hachures point into cirque  |        | lineweight .2 mm<br>color 100% cyan<br>hachure height 1.0 mm; spacing 1.0 mm<br>lineweight .3 mm | May also be shown in black or other colors.                                      |
| 13.42  | Arête or headwall of adjoining cirques  |        | lineweight .2 mm<br>color 100% cyan<br>hachure height 2.0 mm; spacing 1.0 mm<br>lineweight .3 mm |  |
| 13.43  | Margin of glacially scoured basin—Identity and existence certain, location accurate. Hachures point into basin                          |        | all lineweights .225 mm<br>color 100% cyan<br>H-8<br>1.0 mm<br>.75 mm<br>2.0 mm                  |  |
| 13.44  | Margin of glacially scoured basin—Identity or existence questionable, location accurate. Hachures point into basin                      |        |  |  |
| 13.45  | Margin of glacially scoured basin—Identity and existence certain, location approximate. Hachures point into basin                       |        | 3.5 mm<br>2.0 mm<br>.75 mm .75 mm  |  |
| 13.46  | Margin of glacially scoured basin—Identity or existence questionable, location approximate. Hachures point into basin                   |        |  |  |
| 13.47  | Margin of glacially scoured basin—Identity and existence certain, location concealed. Hachures point into basin                         |        | 1.25 mm  |  |
| 13.48  | Margin of glacially scoured basin—Identity or existence questionable, location concealed. Hachures point into basin                     |        | .75 mm .75 mm  |  |

\*For more information, see general guidelines on pages A-i to A-v.

**13—GLACIAL AND GLACIOFLUVIAL FEATURES (continued)**

| REF NO | DESCRIPTION  | SYMBOL | CARTOGRAPHIC SPECIFICATIONS*      | NOTES ON USAGE*                             |
|--------|--|--------|-----------------------------------|---|
| 13.49  | Glacial limit or terminus—Identity and existence certain, location accurate  |        | lineweight .45 mm color 100% cyan | May also be shown in black or other colors. |
| 13.50  | Glacial limit or terminus—Identity or existence questionable, location accurate  |        |                                   |   |
| 13.51  | Glacial limit or terminus—Identity and existence certain, location approximate   |        |                                   |   |
| 13.52  | Glacial limit or terminus—Identity or existence questionable, location approximate   |        |                                   |   |
| 13.53  | Glacial limit or terminus—Identity and existence certain, location inferred  |        |                                   |   |
| 13.54  | Glacial limit or terminus—Identity or existence questionable, location inferred  |        |                                   |   |
| 13.55  | Glacial limit or terminus—Identity and existence certain, location concealed   |        |                                   |   |
| 13.56  | Glacial limit or terminus—Identity or existence questionable, location concealed   |        |                                   |   |
| 13.57  | Glacial limit or terminus—Showing name of glaciation (BL, Bull Lake)   |        |                                   |   |
| 13.58  | Limit of significant glacial advance—Identity and existence certain, location accurate. Hachures on side of advancing ice        |        | lineweight .3 mm color 100% cyan  |   |
| 13.59  | Limit of significant glacial advance—Identity or existence questionable, location accurate. Hachures on side of advancing ice    |        |                                   |   |
| 13.60  | Limit of significant glacial advance—Identity and existence certain, location approximate. Hachures on side of advancing ice     |        |                                   |   |
| 13.61  | Limit of significant glacial advance—Identity or existence questionable, location approximate. Hachures on side of advancing ice |        |                                   |   |
| 13.62  | Limit of significant glacial advance—Identity and existence certain, location concealed. Hachures on side of advancing ice       |        |                                   |   |
| 13.63  | Limit of significant glacial advance—Identity or existence questionable, location concealed. Hachures on side of advancing ice   |        |                                   |   |
| 13.64  | Retreatal position of stagnant ice margin—Identity and existence certain, location accurate                                      |        | lineweight .3 mm color 100% cyan  |   |
| 13.65  | Retreatal position of stagnant ice margin—Identity or existence questionable, location accurate                                  |        |                                   |   |
| 13.66  | Retreatal position of stagnant ice margin—Identity and existence certain, location approximate                                   |        |                                   |   |
| 13.67  | Retreatal position of stagnant ice margin—Identity or existence questionable, location approximate                               |        |                                   |   |
| 13.68  | Retreatal position of stagnant ice margin—Identity and existence certain, location inferred                                      |        |                                   |   |
| 13.69  | Retreatal position of stagnant ice margin—Identity or existence questionable, location inferred                                  |        |                                   |   |
| 13.70  | Retreatal position of stagnant ice margin—Identity and existence certain, location concealed                                     |        |                                   |   |
| 13.71  | Retreatal position of stagnant ice margin—Identity or existence questionable, location concealed                                 |        |                                   |   |
| 13.72  | Retreatal position of stagnant ice margin—Showing name of depositional unit  |        |                                   |   |

\*For more information, see general guidelines on pages A-i to A-v.

**14—PERIGLACIAL FEATURES**

| REF NO | DESCRIPTION                  | SYMBOL | CARTOGRAPHIC SPECIFICATIONS*   | NOTES ON USAGE*                             |
|--------|------------------------------|--------|--|---|
| 14.1   | Pingo                        |        | all lineweights<br>.2 mm<br>60°<br>.875 mm<br>color 100% cyan<br>dot diameter .325 mm circle diameter 1.5 mm | May also be shown in black or other colors. |
| 14.2   | Periglacial patterned ground |        |  |   |
| 14.3   | Polygonal patterned ground   |        |  |   |
| 14.4   | Sorted circles               |        | diameter .9 mm<br>color 100% cyan<br>lineweight .2 mm  |   |
| 14.5   | Stone stripe, fine debris    |        | circle diameter .9 mm; spacing .45 mm  |   |
| 14.6   | Stone stripe, coarse debris  |        | circle lineweight .2 mm<br>color 100% cyan<br>dot diameter .5 mm; spacing 1.25 mm                            |   |
| 14.7   | Solifluction lobes           |        |  |   |
| 14.8   | Ice-wedge polygon            |        | 2.25 mm<br>color 100% cyan   |   |
| 14.9   | Ice-wedge polygons           |        |  |   |
| 14.10  | Felsenmeer                   |        |  |   |
| 14.11  | Thermokarst depression       |        | color 100% cyan<br>all lineweights .2 mm<br>hachure height 1.0 mm; spacing 1.75 mm                           |   |

\*For more information, see general guidelines on pages A-i to A-v.

**15—LACUSTRINE AND MARINE FEATURES**

| REF NO | DESCRIPTION  | SYMBOL | CARTOGRAPHIC SPECIFICATIONS*                                       | NOTES ON USAGE*                             |
|--------|--|--------|--|---|
| 15.1   | Beach  |        | color 100% cyan<br>dot diameter .75 mm; spacing .75 mm             | May also be shown in black or other colors. |
| 15.2   | Beach ridges   |        | color 100% cyan<br>lineweight .2 mm<br>length and spacing may vary |   |
| 15.3   | Marine-abrasion platform (1st option)  |        | pattern 201-C (at 45°)   |   |
| 15.4   | Marine-abrasion platform (2nd option)  |        | pattern 522-C  |   |
| 15.5   | Aggradational shoreline—Identity and existence certain, location accurate. Triangles point offshore        |        | color 100% cyan<br>lineweight .2 mm<br>H-8                         |   |
| 15.6   | Aggradational shoreline—Identity or existence questionable, location accurate. Triangles point offshore    |        | 1.5 mm<br>H-8<br>22°<br>.75 mm<br>2.0 mm                           |   |
| 15.7   | Aggradational shoreline—Identity and existence certain, location approximate. Triangles point offshore     |        | 3.5 mm<br>H-8  |   |
| 15.8   | Aggradational shoreline—Identity or existence questionable, location approximate. Triangles point offshore |        | .75 mm .75 mm  |   |
| 15.9   | Erosional shoreline—Identity and existence certain, location accurate. Triangles point onshore             |        | color 100% cyan<br>lineweight .2 mm<br>H-8                         |   |
| 15.10  | Erosional shoreline—Identity or existence questionable, location accurate. Triangles point onshore         |        | 1.5 mm<br>H-8<br>22°<br>.75 mm<br>2.0 mm                           |   |
| 15.11  | Erosional shoreline—Identity and existence certain, location approximate. Triangles point onshore          |        | 3.5 mm<br>H-8  |   |
| 15.12  | Erosional shoreline—Identity or existence questionable, location approximate. Triangles point onshore      |        | .75 mm .75 mm  |   |
| 15.13  | Former shoreline or marine limit—Identity and existence certain, location accurate                         |        | lineweight .25 mm<br>color 100% cyan<br>H-8                        |   |
| 15.14  | Former shoreline or marine limit—Identity or existence questionable, location accurate                     |        | .75 mm<br>12.0 mm  |   |
| 15.15  | Former shoreline or marine limit—Identity and existence certain, location approximate                      |        | 3.5 mm<br>H-8  |   |
| 15.16  | Former shoreline or marine limit—Identity or existence questionable, location approximate                  |        | .75 mm .75 mm  |   |
| 15.17  | Former shoreline or marine limit—Identity and existence certain, location inferred                         |        | 1.5 mm<br>H-8  |   |
| 15.18  | Former shoreline or marine limit—Identity or existence questionable, location inferred                     |        | .75 mm .75 mm  |   |
| 15.19  | Former shoreline or marine limit—Identity and existence certain, location concealed                        |        | .5 mm<br>H-8   |   |
| 15.20  | Former shoreline or marine limit—Identity or existence questionable, location concealed                    |        | .75 mm .75 mm  |   |
| 15.21  | Former shoreline or marine limit—Showing name (B, Bonneville)  |        | H-8 (100% black)   |   |

\*For more information, see general guidelines on pages A-i to A-v.

**15—LACUSTRINE AND MARINE FEATURES (continued)**

| REF NO | DESCRIPTION   | SYMBOL | CARTOGRAPHIC SPECIFICATIONS*                   | NOTES ON USAGE*                             |
|--------|---|--------|--|---|
| 15.22  | Shoreline cliff—Identity and existence certain, location accurate. Hachures point down cliff        |        | color 100% cyan      all lineweights .2 mm<br> | May also be shown in black or other colors. |
| 15.23  | Shoreline cliff—Identity or existence questionable, location accurate. Hachures point down cliff    |        |  |   |
| 15.24  | Shoreline cliff—Identity and existence certain, location approximate. Hachures point down cliff     |        | 3.5 mm<br>                                     |   |
| 15.25  | Shoreline cliff—Identity or existence questionable, location approximate. Hachures point down cliff |        |  |   |
| 15.26  | Spit or bar—Identity and existence certain, location accurate                                       |        | color 100% cyan      all lineweights .2 mm<br> |   |
| 15.27  | Spit or bar—Identity or existence questionable, location accurate                                   |        |  |   |
| 15.28  | Spit or bar—Identity and existence certain, location approximate                                    |        | 3.5 mm<br>                                     |   |
| 15.29  | Spit or bar—Identity or existence questionable, location approximate                                |        |  |   |

\*For more information, see general guidelines on pages A-i to A-v.

**16—EOLIAN FEATURES**

| REF NO | DESCRIPTION   | SYMBOL | CARTOGRAPHIC SPECIFICATIONS*  | NOTES ON USAGE*  |
|--------|---|--------|---|--|
| 16.1   | Dune crest  |        | lineweight .25 mm<br>dash .375 mm;<br>space .3 mm   | Dune forms shown by traces of dune crests.                   |
| 16.2   | Scarp on dune crest, caused by slip—Hachures point down slip face of dune   |        | hachure lineweight .2 mm;<br>height 1.0 mm; spacing 4.75 mm   |  |
| 16.3   | Blowout rim around closed depression of eolian origin in dune field—Hachures point into closed depression                     |        | all lineweights .15 mm<br>hachure height .875 mm; spacing 3.5 mm<br>long dash 1.4 mm;<br>short dash .5 mm;<br>space .375 mm |  |
| 16.4   | Blowout rim around closed depression of eolian origin in bedrock—Accurately located. Hachures point into closed depression    |        | all lineweights .2 mm<br>hachure height .875 mm; spacing 2.5 mm   |  |
| 16.5   | Blowout rim around closed depression of eolian origin in bedrock—Approximately located. Hachures point into closed depression |        | 2.5 mm<br>5 mm  |  |
| 16.6   | Edge of dry lakebed within closed depression of eolian origin in bedrock  |        | lineweight .15 mm;<br>dash length 1.5 mm;<br>space .375 mm  |  |
| 16.7   | Sediment transport direction determined from dune forms   |        | all lineweights .15 mm<br>1.5 mm<br>.875 mm<br>5.0 mm<br>.875 mm radius<br>20°<br>1.0 mm<br>1.25 mm                         | Point of observation is at the midpoint of the bearing line. |
| 16.8   | Sediment transport direction determined from dune bedding in horizontal section   |        | 1.25 mm<br>.875 mm radius<br>1.5 mm<br>1.0 mm<br>all lineweights .15 mm   |  |
| 16.9   | Sediment transport direction determined from eolian crossbedding in vertical or near-vertical section                         |        | .5 mm<br>2.5 mm<br>1.0 mm<br>dot diameter .3 mm;<br>spacing .225 mm<br>40°  |  |

\*For more information, see general guidelines on pages A-i to A-v.

**17—LANDSLIDE AND MASS-WASTING FEATURES**

| REF NO | DESCRIPTION  | SYMBOL | CARTOGRAPHIC SPECIFICATIONS*   | NOTES ON USAGE*  |
|--------|--|--------|--|--|
| 17.1   | Outline of slip surface of landslide—Identity and existence certain, location accurate             |        | linecolor 60% black<br>lineweight .2 mm<br>H-8 (60% black)   | May be used to outline area of slip surface of landslide if desired. Do not use to outline landslide deposits (use a map-unit-boundary contact instead). |
| 17.2   | Outline of slip surface of landslide—Identity or existence questionable, location accurate         |        | 12.0 mm<br>.75 mm  |  |
| 17.3   | Outline of slip surface of landslide—Identity and existence certain, location approximate          |        | 3.5 mm   |  |
| 17.4   | Outline of slip surface of landslide—Identity or existence questionable, location approximate      |        | .75 mm .75 mm  |  |
| 17.5   | Outline of slip surface of landslide—Identity and existence certain, location inferred             |        | 1.5 mm   |  |
| 17.6   | Outline of slip surface of landslide—Identity or existence questionable, location inferred         |        | .75 mm .75 mm  |  |
| 17.7   | Outline of slip surface of landslide—Identity and existence certain, location concealed            |        | .5 mm  |  |
| 17.8   | Outline of slip surface of landslide—Identity or existence questionable, location concealed        |        | .75 mm .75 mm  |  |
| 17.9   | Area of slip surface of landslide  |        | pattern 431-K in 50% black (rotated so lines parallel slip direction)<br>outline of slip surface [lineweight .2 mm, in 60% black]<br>contact [lineweight .15 mm]<br>50°/ 2.0 mm<br>arrow lineweight .175 mm length and curve of arrow may vary | Downslope edge of slip surface is usually concealed by landslide deposits or debris materials. Landslide arrows may be shown singly or in pairs.         |
| 17.10  | Direction of downslope movement of landslide   |        |  |  |
| 17.11  | Landslide deposits—Arrows show direction of downslope movement                                     |        |  |  |
| 17.12  | Head or main scarp of landslide—Active, sharp, distinct, and accurately located                    |        | all lineweights .25 mm<br>hachure height 1.0 mm; spacing 1.75 mm   | Place line along crown of scarp; hachures point downscarp. May be shown in red or other colors.  |
| 17.13  | Head or main scarp of landslide—Inactive, subdued, indistinct, and (or) approximately located      |        | .5 mm<br>3.0 mm  |  |
| 17.14  | Head or main scarp of landslide—Showing height (in meters)   |        | 0.8 HI-7   |  |
| 17.15  | Head or main scarp of rotated block in landslide—Arrow shows direction of oblique slip             |        | 5.0 mm<br>2.5 mm<br>15°<br>arrow lineweight .175 mm  |  |
| 17.16  | Internal or minor scarp in landslide—Active, sharp, distinct, and accurately located               |        | all lineweights .25 mm<br>hachure height .75 mm; spacing 1.25 mm   |  |
| 17.17  | Internal or minor scarp in landslide—Inactive, subdued, indistinct, and (or) approximately located |        | .5 mm<br>2.0 mm  |  |
| 17.18  | Internal or minor scarp in landslide—Showing height (in meters)                                    |        | 0.3 HI-6   |  |
| 17.19  | Internal or minor scarp of rotated block in landslide—Arrow shows direction of oblique slip        |        | 4.5 mm<br>15°<br>2.0 mm<br>arrow lineweight .175 mm  |  |

\*For more information, see general guidelines on pages A-i to A-v.

**17—LANDSLIDE AND MASS-WASTING FEATURES (continued)**

| REF NO | DESCRIPTION  | SYMBOL | CARTOGRAPHIC SPECIFICATIONS*   | NOTES ON USAGE*   |
|--------|--|--------|--|---|
| 17.20  | Main toe of landslide—Active, sharp, distinct, and accurately located  |        | 3.0 mm  60°<br>lineweight .25 mm  1.0 mm   | Place line along base of toe; sawteeth on over-riding block.  |
| 17.21  | Main toe of landslide—Inactive, subdued, indistinct, and (or) approximately located  |        | .5 mm  3.0 mm  | May be shown in red or other colors.  |
| 17.22  | Minor toe, internal thrust fault, or pressure ridge in landslide—Active, sharp, distinct, and accurately located   |        | 2.5 mm  60°<br>lineweight .25 mm  .85 mm   |   |
| 17.23  | Minor toe, internal thrust fault, or pressure ridge in landslide—Inactive, subdued, indistinct, and (or) approximately located                             |        | .5 mm  2.0 mm  |   |
| 17.24  | Minor toe, internal thrust fault, or pressure ridge in landslide, showing transport reversal—Active, sharp, distinct, and accurately located               |        | lineweight .25 mm  60°<br>.85 mm  5.0 mm  60°  |   |
| 17.25  | Minor toe, internal thrust fault, or pressure ridge in landslide, showing transport reversal—Inactive, subdued, indistinct, and (or) approximately located |        | .5 mm  2.0 mm  |   |
| 17.26  | Right flank of landslide or right-lateral shear feature—Active, sharp, distinct, and accurately located  |        | 15°  2.5 mm  arrow<br>lineweight .25 mm  5.0 mm  .175 mm                                 | Arrow shows sense of lateral movement.<br>Place arrow on side of moving ground or on displaced earth materials. |
| 17.27  | Right flank of landslide or right-lateral shear feature—Inactive, subdued, indistinct, and (or) approximately located                                      |        | .5 mm  3.0 mm  |   |
| 17.28  | Right flank of landslide or right-lateral shear feature—Concealed by landslide deposits or debris materials  |        | .5 mm  .5 mm   | In cross section, can also be used to show plane of slope failure.<br>May be shown in red or other colors.      |
| 17.29  | Right flank of landslide or right-lateral shear feature—Showing amount of offset (in meters)   |        | 2.3  HI-7  |   |
| 17.30  | Left flank of landslide or left-lateral shear feature—Active, sharp, distinct, and accurately located  |        | 2.5 mm  15°  arrow<br>lineweight .25 mm  5.0 mm  .175 mm                                 |   |
| 17.31  | Left flank of landslide or left-lateral shear feature—Inactive, subdued, indistinct, and (or) approximately located  |        | .5 mm  3.0 mm  |   |
| 17.32  | Left flank of landslide or left-lateral shear feature—Concealed by landslide deposits or debris materials  |        | .5 mm  .5 mm   |   |
| 17.33  | Left flank of landslide or left-lateral shear feature—Showing amount of offset (in meters)   |        | 2.3  HI-7  |   |
| 17.34  | Open tension crack or fracture on landslide  |        | hachure height .5 mm  all lineweights .2 mm  1.5 mm                                      | Hachures point into crack.  |
| 17.35  | Tension crack or fracture on landslide (1st option)  |        | all lineweights .2 mm  1.0 mm  | May be shown in red or other colors.  |
| 17.36  | Tension crack or fracture on landslide (2nd option)  |        | 1.2 mm  all lineweights .2 mm<br>dash .375 mm; space .325 mm                             |   |
| 17.37  | Tension crack or fracture on landslide (3rd option)  |        | lineweight .2 mm   |   |
| 17.38  | En echelon cracks or fractures on landslide, indicating right-lateral shear  |        | 15°  2.5 mm  arrow<br>crack lineweights .2 mm  5.0 mm  .175 mm  .175 mm                  | Arrow shows sense of lateral movement.<br>May be shown in red or other colors.                                  |
| 17.39  | En echelon cracks or fractures on landslide, indicating left-lateral shear   |        | 2.5 mm  15°  arrow<br>crack lineweights .2 mm  5.0 mm  .175 mm  .175 mm                  |   |
| 17.40  | Anticlinal soft-sediment fold, buckle fold, bulge, or linear ridge on landslide  |        | line length can vary  60°<br>2.0 mm  1.0 mm  arrow lineweight .175 mm                    | May be shown in red or other colors.  |
| 17.41  | Dome structure or bulge on landslide   |        | line length can vary  60°<br>1.0 mm  1.0 mm  |   |
| 17.42  | Synclinal soft-sediment fold or linear depression on landslide   |        | line length can vary  60°<br>lineweight .25 mm  1.0 mm  1.0 mm  arrow lineweight .175 mm |   |
| 17.43  | Basin structure or depression on landslide   |        | 1.0 mm  line lengths can vary  60°<br>.75 mm  .75 mm                                     |   |

\*For more information, see general guidelines on pages A-i to A-v.

**17—LANDSLIDE AND MASS-WASTING FEATURES (continued)**

| REF NO | DESCRIPTION  | SYMBOL | CARTOGRAPHIC SPECIFICATIONS*   | NOTES ON USAGE*   |
|--------|--|--------|--|---|
| 17.44  | Crest line of lateral levee on landslide (1st option)  |        | lineweights .175 mm<br>1.0 mm<br>1.5 mm<br>0.65 mm<br>< 60°          |   |
| 17.45  | Crest line of lateral levee on landslide (2nd option)  |        | 1.0 mm<br>1.5 mm<br>0.65 mm<br>< 60°                                 |   |
| 17.46  | Path of gully on landslide   |        | all lineweights .2 mm<br>25°<br>1.375 mm<br>4.5 mm<br>1.575 mm       |   |
| 17.47  | Soil creep or incipient sliding on landslide   |        | lineweight .2 mm<br>1.0 mm<br>6.75 mm<br>20°<br>1.5 mm               | Arrow points downhill.<br>May be shown in red or other colors.                          |
| 17.48  | Spring, seep, or drainage (runoff) on landslide  |        | lineweight .2 mm<br>circle diameter 1.5 mm; tail length 3.0 mm       | Tail points downhill.<br>May be shown in red or other colors.                           |
| 17.49  | Sag pond or closed depression on landslide (mapped to scale)   |        | all lineweights .175 mm<br>hachure height .875 mm; spacing 1.25 mm   | Hachures point into depression.   |
| 17.50  | Hummock on landslide (mapped to scale)   |        | all lineweights .175 mm<br>hachure height .875 mm; spacing 1.25 mm   | Hachures point away from hummock.   |
| 17.51  | Hummock on landslide (shown as point symbol when too small to outline at map scale)  |        | all lineweights .175 mm<br>60°<br>0.875 mm<br>circle diameter 1.5 mm |   |
| 17.52  | Tilt direction of surface of landslide   |        | 4.0 mm<br>1.125 mm<br>2.0 mm<br>30°<br>lineweight .2 mm<br>2.0 mm    | Usually shown on special-purpose landslide activity maps.                               |
| 17.53  | Tilt direction of surface of landslide—Showing angle of tilt   |        | 14<br>HI-6   | May also be shown in red or other colors.   |
| 17.54  | Displacement vector—Showing bearing  |        | lineweight .2 mm<br>1.75 mm<br>6.75 mm<br>25°                        |   |
| 17.55  | Displacement vector—Showing bearing and distance   |        | 1.3<br>HI-7  |   |
| 17.56  | Active, reactivated, or historically active debris flow, showing a sharply defined morphology  |        | 4.0 mm<br>1.5 mm<br>20°<br>color 100% magenta                        | Usually shown on special-purpose landslide activity maps.                               |
| 17.57  | Dormant-young debris flow, showing a fresh and uneroded morphology but having no evidence of historic activity   |        | color 50% magenta  | If necessary, alphanumeric characters may be added to help distinguish landslide areas. |
| 17.58  | Active, reactivated, or historically active landslide (mapped to scale), showing a sharply defined morphology  |        | fill color 60% magenta   | May also be shown in red or other colors.   |
| 17.59  | Dormant-young landslide (mapped to scale), showing a fresh and uneroded morphology but having no evidence of historic activity                             |        | fill color 40% magenta   |   |
| 17.60  | Dormant-mature landslide (mapped to scale), showing a smoothed and eroded morphology   |        | fill color 20% magenta   |   |
| 17.61  | Dormant-old or relict landslide (mapped to scale), showing a weak morphology   |        | fill color 8% magenta  |   |
| 17.62  | Rock slide, slump, block-glide landslide, rotational landslide, or Toreva block, consisting of a relatively intact mass of displaced materials             |        | draft as shown<br>0.5 mm<br>90°<br>all lineweights .3 mm             | Usually shown on special-purpose landslide activity maps.                               |
| 17.63  | Earth flow, consisting of a relatively thick and jumbled mixture of displaced materials  |        | 4.5 mm<br>1.0 mm<br>90°<br>all lineweights .3 mm                     | May also be shown in red or other colors.   |
| 17.64  | Debris slide, consisting of a loose and relatively shallow veneer of displaced materials   |        | draft as shown<br>90°<br>all lineweights .3 mm                       | If necessary, symbols may be enlarged or reduced.                                       |
| 17.65  | Debris-slide slope (mapped to scale), consisting of coalesced scars of landslides and debris flows that are too small or numerous to be shown at map scale |        | fill color 20% black   | Usually shown on special-purpose landslide activity maps.                               |

\*For more information, see general guidelines on pages A-1 to A-v.

**18—VOLCANIC FEATURES**

| REF NO | DESCRIPTION  | SYMBOL | CARTOGRAPHIC SPECIFICATIONS* | NOTES ON USAGE*   |
|--------|--|--------|------------------------------|---|
| 18.1   | Rim of volcanic crater—Identity and existence certain, location accurate. Hachures point into crater           |        |                              | Use to show outline of topographic wall. Rim may not outline crater completely. May also be shown in red, magenta, or other colors. |
| 18.2   | Rim of volcanic crater—Identity or existence questionable, location accurate. Hachures point into crater       |        |                              |   |
| 18.3   | Rim of volcanic crater—Identity or existence certain, location approximate. Hachures point into crater         |        |                              |   |
| 18.4   | Rim of volcanic crater—Identity or existence questionable, location approximate. Hachures point into crater    |        |                              |   |
| 18.5   | Rim of volcanic crater—Identity and existence certain, location concealed. Hachures point into crater          |        |                              |   |
| 18.6   | Rim of volcanic crater—Identity or existence questionable, location concealed. Hachures point into crater      |        |                              |   |
| 18.7   | Rim of volcanic crater—Showing low point of crater (dot)   |        |                              |   |
| 18.8   | Caldera margin (1st option)—Identity and existence certain, location accurate. Ticks point into caldera        |        |                              | May also be shown in red, magenta, or other colors.   |
| 18.9   | Caldera margin (1st option)—Identity or existence questionable, location accurate. Ticks point into caldera    |        |                              |   |
| 18.10  | Caldera margin (1st option)—Identity and existence certain, location approximate. Ticks point into caldera     |        |                              |   |
| 18.11  | Caldera margin (1st option)—Identity or existence questionable, location approximate. Ticks point into caldera |        |                              |   |
| 18.12  | Caldera margin (1st option)—Identity and existence certain, location inferred. Ticks point into caldera        |        |                              |   |
| 18.13  | Caldera margin (1st option)—Identity or existence questionable, location inferred. Ticks point into caldera    |        |                              |   |
| 18.14  | Caldera margin (1st option)—Identity and existence certain, location concealed. Ticks point into caldera       |        |                              |   |
| 18.15  | Caldera margin (1st option)—Identity or existence questionable, location concealed. Ticks point into caldera   |        |                              |   |
| 18.16  | Caldera margin (2nd option)—Identity and existence certain, location accurate. Ticks point into caldera        |        |                              |   |
| 18.17  | Caldera margin (2nd option)—Identity or existence questionable, location accurate. Ticks point into caldera    |        |                              |   |
| 18.18  | Caldera margin (2nd option)—Identity and existence certain, location approximate. Ticks point into caldera     |        |                              |   |
| 18.19  | Caldera margin (2nd option)—Identity or existence questionable, location approximate. Ticks point into caldera |        |                              |   |
| 18.20  | Caldera margin (2nd option)—Identity and existence certain, location inferred. Ticks point into caldera        |        |                              |   |
| 18.21  | Caldera margin (2nd option)—Identity or existence questionable, location inferred. Ticks point into caldera    |        |                              |   |
| 18.22  | Caldera margin (2nd option)—Identity and existence certain, location concealed. Ticks point into caldera       |        |                              |   |
| 18.23  | Caldera margin (2nd option)—Identity or existence questionable, location concealed. Ticks point into caldera   |        |                              |   |

\*For more information, see general guidelines on pages A-i to A-v.

**18—VOLCANIC FEATURES (continued)**

| REF NO | DESCRIPTION   | SYMBOL | CARTOGRAPHIC SPECIFICATIONS*   | NOTES ON USAGE*                                       |
|--------|---|--------|--|---|
| 18.24  | Contact separating individual lava flows within same map unit—Identity and existence certain, location accurate                   |        | lineweight .2 mm<br>color 100% red   | May also be shown in magenta, black, or other colors. |
| 18.25  | Contact separating individual lava flows within same map unit—Identity or existence questionable, location accurate               |        |  |   |
| 18.26  | Contact separating individual lava flows within same map unit—Identity and existence certain, location approximate                |        | 3.5 mm<br>   |   |
| 18.27  | Contact separating individual lava flows within same map unit—Identity or existence questionable, location approximate            |        |  |   |
| 18.28  | Contact separating individual lava flows within same map unit—Identity and existence certain, location inferred                   |        | 1.5 mm<br>   |   |
| 18.29  | Contact separating individual lava flows within same map unit—Identity or existence questionable, location inferred               |        |  |   |
| 18.30  | Contact separating individual lava flows within same map unit—Identity and existence certain, location concealed                  |        | .5 mm<br>  |   |
| 18.31  | Contact separating individual lava flows within same map unit—Identity or existence questionable, location concealed              |        |  |   |
| 18.32  | Flow lobe or lava-flow front—Identity and existence certain, location accurate. Hachures on side of overlying younger flow        |        | all lineweights .2 mm<br>color 100% red<br>  |   |
| 18.33  | Flow lobe or lava-flow front—Identity or existence questionable, location accurate. Hachures on side of overlying younger flow    |        |  |   |
| 18.34  | Flow lobe or lava-flow front—Identity and existence certain, location approximate. Hachures on side of overlying younger flow     |        | 3.5 mm<br>   |   |
| 18.35  | Flow lobe or lava-flow front—Identity or existence questionable, location approximate. Hachures on side of overlying younger flow |        |  |   |
| 18.36  | Flow lobe or lava-flow front—Identity and existence certain, location concealed. Hachures on side of overlying younger flow       |        | .5 mm<br>  |   |
| 18.37  | Flow lobe or lava-flow front—Identity or existence questionable, location concealed. Hachures on side of overlying younger flow   |        |  |   |
| 18.38  | Form line on lava flow  |        | lineweight .2 mm<br>color 100% red<br>length and spacing may vary                                |   |
| 18.39  | Flow lines on lava flow   |        | color 100% red<br>stem lineweight .175 mm<br>25°<br>2.0 mm<br>stem length and spacing may vary   |   |
| 18.40  | Cracks on surface of lava flow  |        | lineweight .25 mm<br>color 100% red<br>length and spacing may vary                               |   |
| 18.41  | Volcanic fissure  |        | lineweight .25 mm<br>color 100% red  |   |
| 18.42  | Buried volcanic fissure   |        | 1.25 mm<br>hachure lineweight .15 mm<br>color 100% red   |   |
| 18.43  | Volcanic fissure where lava has been emitted  |        | lineweight .25 mm<br>hachure lineweight .15 mm<br>color 100% red                                 |   |
| 18.44  | Lava tube—Red circles indicate presence of skylights (not mapped to scale) along lava tube  |        | circle lineweight .2 mm; diameter .75 mm; color 100% red<br>lineweight .15 mm<br>1.375 mm<br>25° |   |
| 18.45  | Lava tube—Red circles outline collapses (mapped to scale) along lava tube   |        | lineweight .2 mm; color 100% red   |   |
| 18.46  | Crest line of pressure ridge or tumulus on lava flow  |        | lineweight .2 mm<br>color 100% red<br>60°<br>5.5 mm<br>1.0 mm                                    |   |
| 18.47  | Pressure ridge on lava flow   |        | lineweight .2 mm<br>color 100% red<br>60°<br>5.5 mm<br>1.0 mm                                    |   |

\*For more information, see general guidelines on pages A-i to A-v.

**18—VOLCANIC FEATURES (continued)**

| REF NO | DESCRIPTION  | SYMBOL | CARTOGRAPHIC SPECIFICATIONS*  | NOTES ON USAGE*   |
|--------|--|--------|---|---|
| 18.48  | Ice-contact lava-flow margin— Identity and existence certain, location accurate. Rectangles on side of overlying younger flow        |        | lineweight .2 mm<br>color 100% red  | May also be shown in magenta, black, or other colors.                     |
| 18.49  | Ice-contact lava-flow margin— Identity or existence questionable, location accurate. Rectangles on side of overlying younger flow    |        | lineweight .2 mm<br>color 100% red<br>H-8<br>tick spacing 2.0 mm (at base)<br>12.0 mm<br>2.0 mm<br>.75 mm<br>.5 mm                              |   |
| 18.50  | Ice-contact lava-flow margin— Identity and existence certain, location approximate. Rectangles on side of overlying younger flow     |        | 3.5 mm<br>lineweight .2 mm<br>color 100% red  |   |
| 18.51  | Ice-contact lava-flow margin— Identity or existence questionable, location approximate. Rectangles on side of overlying younger flow |        | .75 mm .75 mm   |   |
| 18.52  | Ice-contact lava-flow margin— Identity and existence certain, location concealed. Rectangles on side of overlying younger flow       |        | .5 mm 2.5 mm  |   |
| 18.53  | Ice-contact lava-flow margin— Identity or existence questionable, location concealed. Rectangles on side of overlying younger flow   |        | .75 mm .75 mm   |   |
| 18.54  | Outline of basalt-filled lava pond   |        | all lineweights .2 mm<br>tick spacing 2.0 mm (at base)<br>color 100% red<br>1.0 mm<br>.875 mm   | May also be shown in magenta, black, or other colors.                     |
| 18.55  | Small cone, vent, cinder cone, or spatter cone   |        | lineweight .2 mm<br>color 100% red<br>60°<br>2.0 mm   | May also be shown in magenta, black, or other colors.                     |
| 18.56  | Large cone, vent, cinder cone, or spatter cone   |        | lineweight .2 mm<br>color 100% red<br>2.625 mm<br>2.625 mm<br>60°   |   |
| 18.57  | Small hornito  |        | lineweight .2 mm<br>color 100% red<br>45°<br>2.0 mm<br>2.0 mm   |   |
| 18.58  | Large hornito  |        | lineweight .2 mm<br>color 100% red<br>45°<br>2.625 mm<br>2.625 mm   |   |
| 18.59  | Spatter rampart  |        | lineweight .2 mm<br>color 100% red<br>1.5 mm<br>5 mm<br>90°   |   |
| 18.60  | Rootless vent area on lava flow  |        | lineweight .2 mm<br>line color 100% red<br>pattern 327-R  |   |
| 18.61  | Thermal area   |        | lineweight .2 mm<br>line color 100% red<br>pattern 121-R in 50% red   |   |
| 18.62  | Thermal spring   |        | color 100% red<br>dot diameter 1.5 mm<br>H-7<br>radius .5 mm<br>lineweight .15 mm<br>2.0 mm   | Rotate tail to downhill.<br>May also be shown in magenta or other colors. |
| 18.63  | Geyser   |        | lineweight .2 mm<br>lineweight .375 mm<br>lineweight .2 mm<br>color 100% red<br>radius .5 mm<br>2.75 mm<br>ellipse height 1.25 mm; width 2.5 mm | May also be shown in magenta, black, or other colors.                     |
| 18.64  | Fumarole or steam vent   |        | draft as shown<br>2.5 mm<br>color 100% red<br>ellipse height 1.25 mm; width 2.5 mm<br>all lineweights .2 mm                                     |   |
| 18.65  | Recent volcano on small-scale maps   |        | 22.5°<br>outer diameter 3.0 mm; inner diameter 1.375 mm<br>all lineweights .2 mm  |   |
| 18.66  | Active volcano on small-scale maps   |        | lineweight .3 mm<br>color 100% red<br>2.625 mm<br>60°   | Usually reserved for maps at scales of 1:250,000 or smaller.              |
| 18.67  | Inactive volcano on small-scale maps   |        | 90°<br>color 100% red<br>lineweight .3 mm<br>2.5 mm   | May also be shown in magenta, black, or other colors.                     |
| 18.68  | Cinder cone on small-scale maps  |        | circle diameter 1.375 mm<br>lineweight .2 mm<br>color 100% red  |   |
| 18.69  | Diatreme   |        | dot diameter 1.375 mm<br>color 100% red<br>H-7  |   |
| 18.70  | Breccia pipe   |        | dot diameter 1.375 mm<br>color 100% red<br>H-7  |   |
| 18.71  | Collapse structure—Indicating breccia pipe at depth  |        | lineweight .2 mm<br>circle diameter 1.375 mm<br>color 100% red<br>H-7   |   |

\*For more information, see general guidelines on pages A-i to A-v.

**19—NATURAL RESOURCES**

| REF NO   | DESCRIPTION   | SYMBOL | CARTOGRAPHIC SPECIFICATIONS*  | NOTES ON USAGE*   |
|--|---|--------|---|---|
| <b>19.1—Veins and mineralized areas; mineral resource areas; metamorphic facies boundary</b> |   |        |   |   |
| 19.1.1   | Vein, veinlet, or mineralized stringer—Identity and existence certain, location accurate                |        | lineweight .25 mm color 100% red<br>→8.0 mm←<br>H-8   | May also be shown in black or other colors.   |
| 19.1.2   | Vein, veinlet, or mineralized stringer—Identity or existence questionable, location accurate            |        | dot diameter .75 mm; spacing 4.5 mm   |   |
| 19.1.3   | Vein, veinlet, or mineralized stringer—Identity and existence certain, location approximate             |        | 3.625 mm  |   |
| 19.1.4   | Vein, veinlet, or mineralized stringer—Identity or existence questionable, location approximate         |        | .75 mm .75 mm   |   |
| 19.1.5   | Vein, veinlet, or mineralized stringer—Identity and existence certain, location concealed               |        | .5 mm .75 mm  |   |
| 19.1.6   | Vein, veinlet, or mineralized stringer—Identity or existence questionable, location concealed           |        | .75 mm .75 mm   |   |
| 19.1.7   | Vein, veinlet, or mineralized stringer—Showing type of mineral occurrence                               |        | Cu ←H-8 (100% black)  |   |
| 19.1.8   | Inclined vein, veinlet, or mineralized stringer (1st option)—Showing dip value and direction            |        | tick length 1.75 mm; lineweight .2 mm tick color 100% black<br>35 ←HI-6 (100% black)          | Place tick, arrow, or other line-symbol decoration where observation was made.<br>Add arrowhead or '90' to ticks showing dip if necessary for clarity.          |
| 19.1.9   | Inclined vein, veinlet, or mineralized stringer (2nd option)—Showing dip value and direction            |        | tick length 1.375 mm; lineweight .2 mm<br>15 ←.875 mm<br>30°                                  |   |
| 19.1.10  | Vertical or near-vertical vein, veinlet, or mineralized stringer (1st option)                           |        | tick length 2.5 mm; lineweight .2 mm  |   |
| 19.1.11  | Vertical or near-vertical vein, veinlet, or mineralized stringer (2nd option)                           |        | 90 ←HI-6 (100% black)   |   |
| 19.1.12  | Small, minor inclined vein, veinlet, or mineralized stringer—Showing strike and dip                     |        | HI-6 (100% black) 70 lineweight .25 mm; line color 100% red<br>1.25 mm 5.5 mm                 | May also be shown in black or other colors.   |
| 19.1.13  | Small, minor vertical or near-vertical vein, veinlet, or mineralized stringer—Showing strike            |        | 2.5 mm  |   |
| 19.1.14  | Zone of mineralized or altered rock (1st option)  |        | pattern 405-R (at 45°)  | Add labels to show specific types of alteration. May be used alone or may overprint other mapped units. May also be shown in black or other colors.             |
| 19.1.15  | Zone of mineralized or altered rock (2nd option)  |        | pattern 405-R in 50% red (at 45°)   |   |
| 19.1.16  | Zone of mineralized or altered rock, showing high level of mineralization                               |        | pattern 119-R   |   |
| 19.1.17  | Zone of mineralized or altered rock, showing low level of mineralization                                |        | pattern 117-R   |   |
| 19.1.18  | Area of identified resources  |        | lineweight .5 mm color 100% red   | Usually reserved for use on special-purpose maps, not on general-purpose geologic maps. Generally shown in red, but may also be shown in black or other colors. |
| 19.1.19  | Area of high mineral resource potential   |        | lineweight .3 mm line and text color 100% red<br>H-12 pattern 427-R in 50% red                |   |
| 19.1.20  | Area of moderate mineral resource potential   |        | lineweight .3 mm H-12 pattern 229-R (at 45°) in 50% red                                       |   |
| 19.1.21  | Area of low mineral resource potential  |        | lineweight .2 mm H-10   |   |
| 19.1.22  | Area considered to have mineral resource potential but not evaluated, mostly because of inadequate data |        | lineweight .2 mm H-10 dash 1.75 mm; space .5 mm   |   |
| 19.1.23  | Metamorphic facies boundary—Showing approximate boundary between diagnostic mineral assemblages         |        | H-8 Greenschist Amphibolite dot diameter .5 mm; spacing .5 mm<br>line and text color 100% red | May also be shown in black or other colors.   |

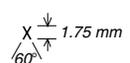
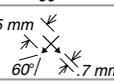
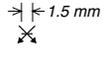
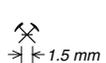
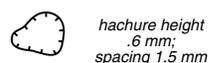
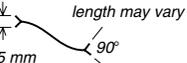
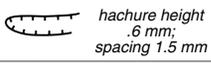
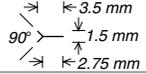
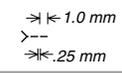
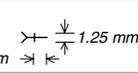
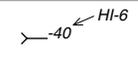
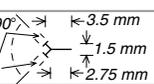
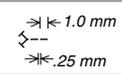
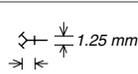
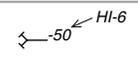
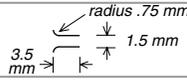
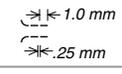
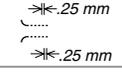
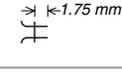
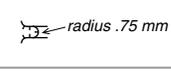
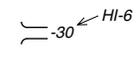
\*For more information, see general guidelines on pages A-i to A-v.

**19—NATURAL RESOURCES (continued)**

| REF NO  | DESCRIPTION   | SYMBOL | CARTOGRAPHIC SPECIFICATIONS*  | NOTES ON USAGE*  |
|---|---|--------|---|--|
| <b>19.2—Areas of extensively disturbed ground; surface workings; subsurface workings projected to surface</b> |   |        |   |  |
| 19.2.1  | Graded area—Extensive amount of mapped geologic unit has been removed |        | lineweight .2 mm<br>line color 100% red<br>pattern 226-R (at 45°)             | Patterns should overlay other mapped units. Generally shown in black or red, but may also be shown in brown or other colors.   |
| 19.2.2  | Strip mine (1st option)   |        | lineweight .15 mm<br>lineweight .3 mm<br>pattern 226-K (at 45°)               |  |
| 19.2.3  | Strip mine (2nd option)   |        | pattern 419-R in 50% red  |  |
| 19.2.4  | Artificial fill—Earth materials                                       |        | lineweight .15 mm<br>H-8<br>20% black   | Show as separately mapped units. Generally shown in black or red, but may also be shown in other colors.   |
| 19.2.5  | Artificial fill—Human-generated refuse (landfill)                     |        | lineweight .15 mm<br>H-8<br>pattern 226-R (at 45°)                            |  |
| 19.2.6  | Tailings  |        | lineweights .125 mm<br>draft as shown   | Symbols should overlay other mapped units. Generally shown in red or black, but may also be shown in brown or other colors.  |
| 19.2.7  | Mine dump (1st option)  |        | all lineweights .125 mm<br>dash length and spacing may vary<br>draft as shown |  |
| 19.2.8  | Mine dump (2nd option)  |        | all lineweights .125 mm<br>dash length and spacing may vary<br>draft as shown |  |
| 19.2.9  | Mine dump bench   |        | .75 mm<br>2.5 mm<br>all lineweights .125 mm                                   |  |
| 19.2.10   | Subsurface workings, projected to surface (1st option)                |        | color 100% red<br>lineweights .2 mm<br>spacing may vary                       | Different symbols may be used to show different levels of workings. Symbols should overlay other mapped units. Generally shown in red, but may also be shown in black or other colors. |
| 19.2.11   | Subsurface workings, projected to surface (2nd option)                |        | dash 3.0 mm;<br>spacing .5 mm   |  |
| 19.2.12   | Subsurface workings, projected to surface (3rd option)                |        | dash 1.5 mm;<br>spacing .5 mm   |  |
| 19.2.13   | Subsurface workings, projected to surface (4th option)                |        | dash .5 mm;<br>spacing .5 mm  |  |
| 19.2.14   | Subsurface workings, projected to surface (5th option)                |        | long dash 2.5 mm; short dashes .5 mm;<br>spacing .5 mm                        |  |
| 19.2.15   | Subsurface workings, projected to surface (6th option)                |        | long dash 4.0 mm; short dash .5 mm;<br>spacing .5 mm                          |  |

\*For more information, see general guidelines on pages A-i to A-v.

**19—NATURAL RESOURCES (continued)**

| REF NO  | DESCRIPTION   | SYMBOL  | CARTOGRAPHIC SPECIFICATIONS*  | NOTES ON USAGE*   |
|---|---|---|---|---|
| <b>19.3—Mining and mineral exploration (at surface)</b> |   |   |   |   |
| 19.3.1  | Prospect (pit or small open cut)  | X   | lineweight .2 mm<br>   |   |
| 19.3.2  | Sand, gravel, clay, or placer pit   | ⊗   | 3.125 mm<br>all lineweights .15 mm<br>60°<br>  |   |
| 19.3.3  | Abandoned sand, gravel, clay, or placer pit   | ⊗   | 1.5 mm<br>all lineweights .15 mm<br>   |   |
| 19.3.4  | Open pit, quarry, or glory hole   | ⊗   | pick thickness .25 mm; radius 1.625 mm<br>1.5 mm<br>1.5 mm<br>3.125 mm<br>lineweight .15 mm<br>hammerhead thickness .3 mm; radius 1.625 mm<br> |   |
| 19.3.5  | Abandoned open pit, quarry, or glory hole   | ⊗   | all lineweights .15 mm<br>   |   |
| 19.3.6  | Open pit or quarry (mapped to scale)  |  | all lineweights .25 mm<br><br>hachure height .6 mm; spacing 1.5 mm   |   |
| 19.3.7  | Trench (generalized trace)  |  | 1.5 mm<br>length may vary<br>90°<br>all lineweights .25 mm<br>   |   |
| 19.3.8  | Trench (drawn to scale)   |  | all lineweights .25 mm<br><br>hachure height .6 mm; spacing 1.5 mm   |   |
| 19.3.9  | Adit or tunnel entrance (1st option)  | └   | all lineweights .175 mm<br>90°<br>3.5 mm<br>1.5 mm<br>2.75 mm<br>  | Long line points in direction of adit or tunnel entrance at surface.  |
| 19.3.10   | Approximately located adit or tunnel entrance (1st option)  | └-  | 1.0 mm<br>25 mm<br>  | Map position of adit or tunnel entrance is at intersection of long line and two short lines.                                  |
| 19.3.11   | Destroyed adit or tunnel entrance (1st option)  | └...  | 25 mm<br>25 mm<br>  |   |
| 19.3.12   | Abandoned or inaccessible adit or tunnel entrance (1st option)  | └+  | all lineweights .175 mm<br>1.75 mm<br>1.25 mm<br>  |   |
| 19.3.13   | Adit or tunnel entrance (1st option)—Showing angle of inclination (negative value indicates downward slope) | └-40  | HI-6<br>-40<br>  | Angle of inclination may be added to any adit or tunnel entrance symbol.  |
| 19.3.14   | Adit or tunnel entrance (2nd option)  | └   | all lineweights .175 mm<br>90°<br>3.5 mm<br>1.5 mm<br>2.75 mm<br>1.0 mm<br>  | Long line points in direction of adit or tunnel entrance at surface.  |
| 19.3.15   | Approximately located adit or tunnel entrance (2nd option)  | └-  | 1.0 mm<br>25 mm<br>  | Map position of adit or tunnel entrance is at intersection of long line and two short lines.                                  |
| 19.3.16   | Destroyed adit or tunnel entrance (2nd option)  | └...  | 25 mm<br>25 mm<br>   |   |
| 19.3.17   | Abandoned or inaccessible adit or tunnel entrance (2nd option)  | └+  | all lineweights .175 mm<br>1.75 mm<br>1.25 mm<br>  |   |
| 19.3.18   | Adit or tunnel entrance (2nd option)—Showing angle of inclination (negative value indicates downward slope) | └-50  | HI-6<br>-50<br>  | Angle of inclination may be added to any adit or tunnel entrance symbol.  |
| 19.3.19   | Portal  |   | all lineweights .175 mm<br>radius .75 mm<br>3.5 mm<br>1.5 mm<br>   | Long lines point in direction of portal entry at surface.   |
| 19.3.20   | Approximately located portal  | -   | 1.0 mm<br>25 mm<br>  | Map position of portal entry is between the two lines, at the position where the short curved lines intersect the long lines. |
| 19.3.21   | Destroyed portal  | ...   | 25 mm<br>25 mm<br>   |   |
| 19.3.22   | Abandoned or inaccessible portal  | +   | all lineweights .175 mm<br>1.75 mm<br>   |   |
| 19.3.23   | Portal and open cut   |   | all lineweights .175 mm<br>tick length .5 mm<br>radius .75 mm<br>  | Open cut may be added to any portal symbol.   |
| 19.3.24   | Portal—Showing angle of inclination (negative value indicates downward slope)                               | -30   | HI-6<br>-30<br>  | Angle of inclination may be added to any portal symbol.   |

**19—NATURAL RESOURCES (continued)**

| REF NO  | DESCRIPTION  | SYMBOL                 | CARTOGRAPHIC SPECIFICATIONS*   | NOTES ON USAGE*   |
|---|--|------------------------|--|---|
| <b>19.3—Mining and mineral exploration (at surface) (continued)</b> |  |                        |  |   |
| 19.3.25   | Drill hole for mineral exploration   | ○                      | <i>lineweight</i><br>.175 mm <span style="margin-left: 100px;">○</span><br><i>diameter</i> 1.5 mm                                      |   |
| 19.3.26   | Drill hole for mineral exploration—No geologic data available  | ○ <sup>ND</sup>        | <span style="margin-left: 100px;">○<sup>ND</sup></span> ← H-6  |   |
| 19.3.27   | Drill hole for mineral exploration—Showing name and number   | ○ PAHUTE 2             | <span style="margin-left: 100px;">○ PAHUTE 2</span> ← H-7  |   |
| 19.3.28   | Drill hole for mineral exploration—Showing type (DDH, diamond drill hole)  | DDH ○                  | HI-6 → DDH ○   |   |
| 19.3.29   | Drill hole for exploration of low-grade ore  | φ                      | <i>all lineweights</i><br>.175 mm <span style="margin-left: 100px;">φ</span><br>↓ 4.0 mm<br>↑  |   |
| 19.3.30   | Drill hole for exploration of high-grade ore   | ●                      | <span style="margin-left: 100px;">●</span><br>↓ 4.0 mm<br>↑  |   |
| 19.3.31   | Inclined drill hole for mineral exploration—Showing location of collar (circle) and projected trace (dashed line) and bottom (T) of drill hole | ○-----┴                | <i>all lineweights</i><br>.175 mm <span style="margin-left: 100px;">○-----┴</span><br><i>length may vary</i> → 1.0 mm<br>↓ 1.5 mm<br>↑ | Projected trace of drill hole, angle of inclination, surface altitude, and total depth may be added to any drill hole symbol. |
| 19.3.32   | Inclined drill hole for mineral exploration—Showing angle of inclination (negative value indicates downward slope)                             | ○-----┴ <sup>-65</sup> | <span style="margin-left: 100px;">○-----┴<sup>-65</sup></span> ← HI-6  |   |
| 19.3.33   | Inclined drill hole for mineral exploration—Showing surface altitude of collar (in meters)   | 2500 ○-----┴           | HI-6 → 2500 ○-----┴  |   |
| 19.3.34   | Inclined drill hole for mineral exploration—Showing total depth of drill hole (in meters)  | ○-----┴ TD 1000        | <span style="margin-left: 100px;">○-----┴ TD 1000</span> ← HI-6  |   |
| 19.3.35   | Vertical mine shaft, as shown on smaller scale or general-purpose maps   | ■                      | <i>lineweight</i><br>.175 mm <span style="margin-left: 100px;">■</span><br>↓ 1.5 mm<br>↑   |   |
| 19.3.36   | Multiple vertical mine shafts, as shown on smaller scale or general-purpose maps   | ■■■                    | ■■■  |   |
| 19.3.37   | Abandoned or inaccessible vertical mine shaft, as shown on smaller scale or general-purpose maps   | ■ <sup>A</sup>         | <span style="margin-left: 100px;">■<sup>A</sup></span> ← H-7   |   |
| 19.3.38   | Inclined mine shaft, as shown on smaller scale or general-purpose maps—Showing direction of inclination  | ┴                      | <i>all lineweights</i><br>.175 mm <span style="margin-left: 100px;">┴</span><br>↓ 1.0 mm<br>↑  |   |
| 19.3.39   | Inclined mine shaft, as shown on smaller scale or general-purpose maps—Showing angle of inclination (negative value indicates downward slope)  | ┴ <sub>25</sub>        | <span style="margin-left: 100px;">┴<sub>25</sub></span> ← HI-6   |   |

\*For more information, see general guidelines on pages A-i to A-v.

**19—NATURAL RESOURCES (continued)**

| REF NO                                    | DESCRIPTION   | SYMBOL | CARTOGRAPHIC SPECIFICATIONS*   | NOTES ON USAGE*        |
|---|---|--------|--|------------------------|
| <b>19.4—Mines and subsurface workings</b> |   |        |  |                        |
| 19.4.1                                    | Vertical mine shaft at surface (drawn to scale), as shown on subsurface exploration maps  |        | size may vary<br>lineweight .175 mm  |                        |
| 19.4.2                                    | Inclined mine shaft at surface (drawn to scale), as shown on subsurface exploration maps—Showing direction of inclination                                       |        | all lineweights .175 mm<br>lengths may vary  |                        |
| 19.4.3                                    | Inclined mine shaft at surface (drawn to scale), as shown on subsurface exploration maps—Showing angle of inclination (negative value indicates downward slope) |        | -30 ← HI-6   |                        |
| 19.4.4                                    | Mine shaft, above and below level (drawn to scale), as shown on subsurface exploration maps   |        | size may vary<br>all lineweights .175 mm   |                        |
| 19.4.5                                    | Bottom of mine shaft (drawn to scale), as shown on subsurface exploration maps  |        | size may vary<br>all lineweights .175 mm   |                        |
| 19.4.6                                    | Winze or head of raise (drawn to scale), as shown on subsurface exploration maps  |        | size may vary<br>all lineweights .175 mm   |                        |
| 19.4.7                                    | Raise or winze extending through level (drawn to scale), as shown on subsurface exploration maps  |        | size may vary<br>all lineweights .175 mm   |                        |
| 19.4.8                                    | Raise or foot of winze (drawn to scale), as shown on subsurface exploration maps  |        | size may vary<br>all lineweights .175 mm   |                        |
| 19.4.9                                    | Crosscut tunnel or intersection of workings (drawn to scale), as shown on subsurface exploration maps   |        | radius 1.25 mm<br>lineweight .175 mm   | size may vary          |
| 19.4.10                                   | Workings (drawn to scale), as shown on subsurface exploration maps  |        | spacing may vary<br>lineweights .175 mm  |                        |
| 19.4.11                                   | Caved or otherwise inaccessible workings (drawn to scale), as shown on subsurface exploration maps  |        | all lineweights .175 mm<br>length of crossbar may vary<br>dash 1.5 mm; spacing .5 mm | spacing may vary       |
| 19.4.12                                   | Inclined workings, as shown on subsurface exploration maps (drawn to scale)—Chevrons point down-slope (multiple chevrons indicate steeper slope)                |        | all lineweights .175 mm<br>spacing may vary<br>90°                                   |                        |
| 19.4.13                                   | Ore chute (drawn to scale), as shown on subsurface exploration maps   |        | 1.5 mm<br>spacing may vary<br>all lineweights .15 mm                                 |                        |
| 19.4.14                                   | Lagging or cribbing along drift (drawn to scale), as shown on subsurface exploration maps   |        | all lineweights .15 mm<br>spacing may vary<br>circle diameter .75 mm; spacing .75 mm | .55 mm                 |
| 19.4.15                                   | Elevation of roof or back, as shown on subsurface exploration maps  |        | 1.0 mm<br>60°<br>2801' ← HI-6  | all lineweights .15 mm |
| 19.4.16                                   | Elevation of floor or sill, as shown on subsurface exploration maps   |        | 1.0 mm<br>HI-6 → 2809'<br>60°  |                        |
| 19.4.17                                   | Stoped area (drawn to scale), as shown on subsurface exploration maps (section view)  |        | all lineweights .15 mm<br>dash 1.5 mm; spacing .5 mm                                 |                        |
| 19.4.18                                   | Inferred stoped area (drawn to scale), as shown on subsurface exploration maps (section view)   |        | pattern 226-K (at 45°)<br>dash .3 mm; spacing .3 mm                                  |                        |

\*For more information, see general guidelines on pages A-i to A-v.

**19—NATURAL RESOURCES (continued)**

| REF NO  | DESCRIPTION  | SYMBOL | CARTOGRAPHIC SPECIFICATIONS*  | NOTES ON USAGE*   |
|---|--|--------|---|---|
| <b>19.5—Oil and gas fields; wells drilled for hydrocarbon exploration or exploitation</b> |  |        |   |   |
| 19.5.1  | Oil field—Extent defined   |        | lineweight .2 mm<br>fill color 50% green<br>                            | Patterned areas (extent defined) should be shown as separately mapped units. Outlined areas (extent not yet defined) should overlay other mapped units. Generally shown in red and (or) green, but may also be shown in other colors or patterns. |
| 19.5.2  | Oil field—Extent not yet defined   |        | lineweight .2 mm<br>dash .5 mm; spacing .5 mm<br>                       |   |
| 19.5.3  | Gas field—Extent defined   |        | lineweight .2 mm<br>fill color 50% red<br>                              |   |
| 19.5.4  | Gas field—Extent not yet defined   |        | lineweight .2 mm<br>dash 2.0 mm; spacing .5 mm<br>                      |   |
| 19.5.5  | Oil and gas field—Extent defined   |        | lineweight .2 mm<br>  |   |
| 19.5.6  | Oil and gas field—Extent not yet defined   |        | lineweight .2 mm<br>long dash 2.0 mm; short dash .5 mm; space .5 mm<br> |   |
| 19.5.7  | Core (nonspecific depth)   |        | lineweight .2 mm<br>dot diameter .5 mm<br>                              | May also be shown in other colors.  |
| 19.5.8  | Shallow core   |        |   | Use if both shallow and deep cores are shown on map.  |
| 19.5.9  | Deep core  |        | all lineweights .2 mm<br>circle diameter 2.75 mm<br>                    | May also be shown in other colors.  |
| 19.5.10   | Drilling well or well location for hydrocarbon exploration or exploitation   |        | lineweight .2 mm<br>diameter 1.5 mm<br>                                 | Name, number, and total depth may be added to any type of well symbol.  |
| 19.5.11   | Drill hole for hydrocarbon exploration or exploitation—No data available   |        |   | May also be shown in green (oil), red (gas), or other colors.   |
| 19.5.12   | Drill hole for hydrocarbon exploration or exploitation—Showing name and number   |        |   |   |
| 19.5.13   | Drill hole for hydrocarbon exploration or exploitation—Showing total depth (in meters)   |        |   |   |
| 19.5.14   | Inclined drill hole for hydrocarbon exploration or exploitation—Showing location of collar (circle) and projected trace (dashed line) and bottom (T) of drill hole |        | all lineweights .2 mm<br>length of trace may vary<br>                   | Projected trace of drill hole, angle of inclination, surface altitude, and total depth may be added to any type of well symbol.   |
| 19.5.15   | Inclined drill hole for hydrocarbon exploration or exploitation—Showing angle of inclination   |        |   |   |
| 19.5.16   | Inclined drill hole for hydrocarbon exploration or exploitation—Showing surface altitude of collar (in meters)   |        |   |   |
| 19.5.17   | Inclined drill hole for hydrocarbon exploration or exploitation—Showing total depth of drill hole (in meters)  |        |   | May also be shown in green (oil), red (gas), or other colors.   |
| 19.5.18   | Multiple wells drilled from single platform—Showing location of collar (open circle) on platform. Types of wells indicated at drill hole bottoms                   |        |   | Any type of well symbol may be shown at bottoms of drill holes.   |

\*For more information, see general guidelines on pages A-i to A-v.

**19—NATURAL RESOURCES (continued)**

| REF NO  | DESCRIPTION  | SYMBOL | CARTOGRAPHIC SPECIFICATIONS* | NOTES ON USAGE*  |
|---|--|--------|------------------------------|--|
| <b>19.5—Oil and gas fields; wells drilled for hydrocarbon exploration or exploitation (continued)</b> |  |        |                              |  |
| 19.5.19   | Dry hole (nonspecific depth)   |        | all lineweights .2 mm<br>    | May also be shown in other colors.                                       |
| 19.5.20   | Dry hole—Showing map unit at surface (Km) and at bottom of hole (Kd). Also showing altitude at surface and total depth of hole (in meters) |        | all lineweights .2 mm<br>    |  |
| 19.5.21   | Shallow dry hole   |        |                              | Use if both shallow and deep dry holes are shown on map.                 |
| 19.5.22   | Deep dry hole  |        | all lineweights .2 mm<br>    | May also be shown in other colors.                                       |
| 19.5.23   | Junked hole (nonspecific depth)  |        | all lineweights .2 mm<br>    | May also be shown in other colors.                                       |
| 19.5.24   | Shallow junked hole  |        |                              | Use if both shallow and deep junked holes are shown on map.              |
| 19.5.25   | Deep junked hole   |        | all lineweights .2 mm<br>    | May also be shown in other colors.                                       |
| 19.5.26   | Disposal well (nonspecific depth)  |        | 2.0 mm<br>                   | May also be shown in other colors.                                       |
| 19.5.27   | Plugged and abandoned disposal well (nonspecific depth)  |        | all lineweights .2 mm<br>    |  |
| 19.5.28   | Shallow disposal well  |        |                              | Use if both shallow and deep disposal wells are shown on map.            |
| 19.5.29   | Plugged and abandoned shallow disposal well  |        |                              | May also be shown in other colors.                                       |
| 19.5.30   | Deep disposal well   |        | all lineweights .2 mm<br>    |  |
| 19.5.31   | Plugged and abandoned deep disposal well   |        | all lineweights .2 mm<br>    |  |
| 19.5.32   | Salt-water disposal well (nonspecific depth)   |        | 2.0 mm<br>                   | May also be shown in other colors.                                       |
| 19.5.33   | Plugged and abandoned salt-water disposal well (nonspecific depth)   |        | all lineweights .2 mm<br>    |  |
| 19.5.34   | Shallow salt-water disposal well   |        |                              | Use if both shallow and deep salt-water disposal wells are shown on map. |
| 19.5.35   | Plugged and abandoned shallow salt-water disposal well   |        |                              | May also be shown in other colors.                                       |
| 19.5.36   | Deep salt-water disposal well  |        | all lineweights .2 mm<br>    |  |
| 19.5.37   | Plugged and abandoned deep salt-water disposal well  |        | all lineweights .2 mm<br>    |  |

\*For more information, see general guidelines on pages A-i to A-v.

**19—NATURAL RESOURCES (continued)**

| REF NO  | DESCRIPTION   | SYMBOL | CARTOGRAPHIC SPECIFICATIONS*  | NOTES ON USAGE*   |
|---|---|--------|---|---|
| <b>19.5—Oil and gas fields; wells drilled for hydrocarbon exploration or exploitation (continued)</b> |   |        |   |   |
| 19.5.38   | Oil seep  |        | lineweight .2 mm<br>diameter 1.5 mm   | May also be shown in green or other colors.   |
| 19.5.39   | Oil show  |        | lineweight .2 mm<br>diameter 1.5 mm   |   |
| 19.5.40   | Oil well (nonspecific depth)                          |        | diameter 1.5 mm   | Use if both shallow and deep oil wells are shown on map.<br>May also be shown in green or other colors. |
| 19.5.41   | Suspended oil well (nonspecific depth)                |        | lineweight .2 mm<br>4.0 mm  |   |
| 19.5.42   | Plugged and abandoned oil well (nonspecific depth)    |        | lineweight .2 mm<br>4.0 mm  |   |
| 19.5.43   | Shallow oil well                                      |        |   |   |
| 19.5.44   | Suspended shallow oil well                            |        |   |   |
| 19.5.45   | Plugged and abandoned shallow oil well                |        |   |   |
| 19.5.46   | Deep oil well   |        | lineweight .2 mm<br>inner dot diameter 1.5 mm<br>outer circle diameter 2.75 mm                          |   |
| 19.5.47   | Suspended deep oil well                               |        | all lineweights .2 mm<br>4.0 mm   |   |
| 19.5.48   | Plugged and abandoned deep oil well                   |        | all lineweights .2 mm<br>4.0 mm   |   |
| 19.5.49   | Gas seep  |        | all lineweights .2 mm<br>90° 90° 1.2 mm<br>diameter 1.5 mm  |   |
| 19.5.50   | Gas show  |        | all lineweights .2 mm<br>diameter 1.5 mm  |   |
| 19.5.51   | Gas well (nonspecific depth)                          |        | all lineweights .2 mm<br>diameter 1.5 mm  | Use if both shallow and deep gas wells are shown on map.<br>May also be shown in red or other colors.   |
| 19.5.52   | Suspended gas well (nonspecific depth)                |        | all lineweights .2 mm<br>4.0 mm   |   |
| 19.5.53   | Plugged and abandoned gas well (nonspecific depth)    |        | all lineweights .2 mm<br>4.0 mm   |   |
| 19.5.54   | Shallow gas well                                      |        |   |   |
| 19.5.55   | Suspended shallow gas well                            |        |   |   |
| 19.5.56   | Plugged and abandoned shallow gas well                |        |   |   |
| 19.5.57   | Deep gas well   |        | inner circle diameter 1.5 mm; outer circle diameter 2.75 mm<br>all lineweights .2 mm<br>diameter 1.5 mm |   |
| 19.5.58   | Suspended deep gas well                               |        | all lineweights .2 mm<br>4.0 mm   |   |
| 19.5.59   | Plugged and abandoned deep gas well                   |        | all lineweights .2 mm<br>4.0 mm   |   |
| 19.5.60   | Deep gas well, plugged back and producing shallow gas |        | all lineweights .2 mm<br>1.25 mm  | May also be shown in red or other colors.   |

\*For more information, see general guidelines on pages A-i to A-v.

**19—NATURAL RESOURCES (continued)**

| REF NO  | DESCRIPTION  | SYMBOL | CARTOGRAPHIC SPECIFICATIONS*   | NOTES ON USAGE*  |
|---|--|--------|--|--|
| <b>19.5—Oil and gas fields; wells drilled for hydrocarbon exploration or exploitation (continued)</b> |  |        |  |  |
| 19.5.61   | Oil and gas seep   |        | all lineweights .2 mm<br><br>90° 90°<br>1.2 mm diameter 1.5 mm<br>.625 mm  | May also be shown in other colors.                               |
| 19.5.62   | Oil and gas show   |        | all lineweights .2 mm<br><br>.625 mm diameter 1.5 mm   |  |
| 19.5.63   | Oil and gas well (nonspecific depth)                       |        | all lineweights .2 mm<br><br>.625 mm diameter 1.5 mm   | Use if both shallow and deep oil and gas wells are shown on map. |
| 19.5.64   | Suspended oil and gas well (nonspecific depth)             |        | all lineweights .2 mm<br><br>4.0 mm diameter 1.5 mm  |  |
| 19.5.65   | Plugged and abandoned oil and gas well (nonspecific depth) |        | all lineweights .2 mm<br><br>4.0 mm diameter 1.5 mm  | May also be shown in other colors.                               |
| 19.5.66   | Shallow oil and gas well                                   |        |  |  |
| 19.5.67   | Suspended shallow oil and gas well                         |        |  | Use if both shallow and deep oil and gas wells are shown on map. |
| 19.5.68   | Plugged and abandoned shallow oil and gas well             |        |  |  |
| 19.5.69   | Deep oil and gas well                                      |        | inner dot diameter 1.5 mm; outer circle diameter 2.75 mm<br><br>.625 mm<br>all lineweights .2 mm                         | May also be shown in other colors.                               |
| 19.5.70   | Suspended deep oil and gas well                            |        | all lineweights .2 mm<br><br>4.0 mm<br>inner dot diameter 1.5 mm; outer circle diameter 2.75 mm<br>all lineweights .2 mm |  |
| 19.5.71   | Plugged and abandoned deep oil and gas well                |        | all lineweights .2 mm<br><br>4.0 mm<br>inner dot diameter 1.5 mm; outer circle diameter 2.75 mm<br>all lineweights .2 mm | Use if both shallow and deep condensate wells are shown on map.  |
| 19.5.72   | Condensate show  |        | lineweight .2 mm<br><br>diameter 1.5 mm  |  |
| 19.5.73   | Condensate well (nonspecific depth)                        |        | lineweight .2 mm<br><br>diameter 1.5 mm  | May also be shown in other colors.                               |
| 19.5.74   | Suspended condensate well (nonspecific depth)              |        | lineweight .2 mm<br><br>4.0 mm<br>lineweight .2 mm<br>diameter 1.5 mm  |  |
| 19.5.75   | Plugged and abandoned condensate well (nonspecific depth)  |        | lineweight .2 mm<br><br>4.0 mm<br>lineweight .2 mm<br>diameter 1.5 mm  | Use if both shallow and deep condensate wells are shown on map.  |
| 19.5.76   | Shallow condensate well                                    |        |  |  |
| 19.5.77   | Suspended shallow condensate well                          |        |  | May also be shown in other colors.                               |
| 19.5.78   | Plugged and abandoned shallow condensate well              |        |  |  |
| 19.5.79   | Deep condensate well                                       |        | all lineweights .2 mm<br><br>inner dot diameter 1.5 mm<br>outer circle diameter 2.75 mm<br>all lineweights .2 mm         | May also be shown in other colors.                               |
| 19.5.80   | Suspended deep condensate well                             |        | all lineweights .2 mm<br><br>4.0 mm<br>inner dot diameter 1.5 mm; outer circle diameter 2.75 mm<br>all lineweights .2 mm |  |
| 19.5.81   | Plugged and abandoned deep condensate well                 |        | all lineweights .2 mm<br><br>4.0 mm<br>inner dot diameter 1.5 mm; outer circle diameter 2.75 mm<br>all lineweights .2 mm |  |

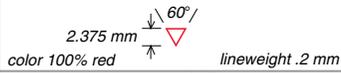
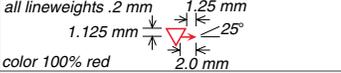
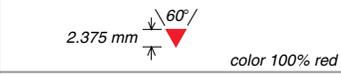
\*For more information, see general guidelines on pages A-i to A-v.

**19—NATURAL RESOURCES (continued)**

| REF NO  | DESCRIPTION  | SYMBOL | CARTOGRAPHIC SPECIFICATIONS*   | NOTES ON USAGE*   |
|---|--|--------|--|---|
| <b>19.5—Oil and gas fields; wells drilled for hydrocarbon exploration or exploitation (continued)</b> |  |        |  |   |
| 19.5.82   | Gas and condensate show  |        | all lineweights .2 mm<br>diameter 1.5 mm<br>   | May also be shown in other colors.  |
| 19.5.83   | Gas and condensate well (nonspecific depth)                                      |        | all lineweights .2 mm<br>diameter 1.5 mm<br>   |   |
| 19.5.84   | Suspended gas and condensate well (nonspecific depth)                            |        | all lineweights .2 mm<br>  |   |
| 19.5.85   | Plugged and abandoned gas and condensate well (nonspecific depth)                |        | all lineweights .2 mm<br>  |   |
| 19.5.86   | Shallow gas and condensate well  |        |  | Use if both shallow and deep gas and condensate wells are shown on map.<br>May also be shown in other colors. |
| 19.5.87   | Suspended shallow gas and condensate well  |        |  |   |
| 19.5.88   | Plugged and abandoned shallow gas and condensate well                            |        |  |   |
| 19.5.89   | Deep gas and condensate well   |        | inner circle diameter 1.5 mm; outer circle diameter 2.75 mm<br>all lineweights .2 mm<br> |   |
| 19.5.90   | Suspended deep gas and condensate well   |        | all lineweights .2 mm<br>  |   |
| 19.5.91   | Plugged and abandoned deep gas and condensate well                               |        | all lineweights .2 mm<br>  |   |
| 19.5.92   | Gas storage well (nonspecific depth)   |        | 1.75 mm<br>  | May also be shown in other colors.  |
| 19.5.93   | Plugged and abandoned gas storage well (nonspecific depth)                       |        | lineweight .2 mm<br>   |   |
| 19.5.94   | Shallow gas storage well   |        |  | Use if both shallow and deep gas storage wells are shown on map.<br>May also be shown in other colors.        |
| 19.5.95   | Plugged and abandoned shallow gas storage well                                   |        |  |   |
| 19.5.96   | Deep gas storage well  |        | lineweight .2 mm<br>outer circle diameter 2.75 mm<br>                                    |   |
| 19.5.97   | Plugged and abandoned deep gas storage well                                      |        | all lineweights .2 mm<br>  |   |
| 19.5.98   | Observation well for gas-storage field (nonspecific depth)                       |        | diameter 1.5 mm<br>all lineweights .2 mm<br>0.725 mm<br>                                 |   |
| 19.5.99   | Plugged and abandoned observation well for gas-storage field [nonspecific depth] |        | all lineweights .2 mm<br>  |   |
| 19.5.100  | Shallow observation well for gas-storage field                                   |        |  | Use if both shallow and deep observation wells are shown on map.<br>May also be shown in other colors.        |
| 19.5.101  | Plugged and abandoned shallow observation well for gas-storage field             |        |  |   |
| 19.5.102  | Deep observation well for gas-storage field                                      |        | all lineweights .2 mm<br>outer circle diameter 2.75 mm<br>                               |   |
| 19.5.103  | Plugged and abandoned deep observation well for gas-storage field                |        | all lineweights .2 mm<br>  |   |

\*For more information, see general guidelines on pages A-i to A-v.

**20—HAZARDOUS WASTE SITES**

| REF NO | DESCRIPTION   | SYMBOL  | CARTOGRAPHIC SPECIFICATIONS*   | NOTES ON USAGE*   |
|--------|---|---|--|---|
| 20.1   | Hazardous waste site  |  | <br>2.375 mm<br>color 100% red<br>linewidth .2 mm                                | Generally shown in red, but may also be shown in black or other colors. |
| 20.2   | Hazardous waste site—Showing direction of surface-leachate flow from site |  | <br>all lineweights .2 mm<br>1.125 mm<br>color 100% red<br>2.0 mm<br>25°         |   |
| 20.3   | Active (operating) hazardous waste site                                   |  | <br>2.375 mm<br>color 100% red<br>60°  |   |
| 20.4   | Inactive (closed) hazardous waste site                                    |  | <br>triangle linewidth .2 mm<br>bar linewidth .3 mm<br>color 100% red<br>3.75 mm |   |
| 20.5   | Hazardous waste site—Clean-up activities are in progress                  |  | <br>color 100% red<br>linewidth .25 mm   |   |
| 20.6   | Hazardous waste site—Clean-up activities have been completed              |  | <br>color 100% red<br>linewidth .25 mm   |   |
| 20.7   | Hazardous waste site, showing smaller restricted area (mapped to scale)   |  | <br>linewidth .25 mm<br>color 100% red<br>pattern 226-R (at 45°)                 |   |
| 20.8   | Hazardous waste site, showing larger restricted area (mapped to scale)    |  | <br>1.5 mm<br>color 100% red   |   |

\*For more information, see general guidelines on pages A-i to A-v.

**21 — NEOTECTONIC AND EARTHQUAKE-HAZARD FEATURES**

| REF NO | DESCRIPTION  | SYMBOL | CARTOGRAPHIC SPECIFICATIONS*  | NOTES ON USAGE*  |            |
|--------|--|--------|---|--|------------|
| 21.1   | Earthquake epicenter, magnitude 7.5 or larger  |        | color 100% violet<br>outer circle diameter 7.0 mm; inner circle diameter 5.75 mm; linewidth .25 mm<br>inner dot diameter 4.5 mm | The type of scale used for measuring earthquakes should be noted.<br>May also be shown in black or other colors.   |            |
| 21.2   | Earthquake epicenter, magnitude 7–7.49   |        | color 100% violet<br>dot diameter 4.25 mm   |  |            |
| 21.3   | Earthquake epicenter, magnitude 6.5–6.99   |        | color 100% violet<br>inner dot diameter 2.375 mm<br>circle diameter 4.0 mm; linewidth .25 mm                                    |  |            |
| 21.4   | Earthquake epicenter, magnitude 6–6.49   |        | color 100% violet<br>dot diameter 2.25 mm   |  |            |
| 21.5   | Earthquake epicenter, magnitude 5.5–5.99   |        | color 100% violet<br>circle diameter 2.25 mm; linewidth .25 mm  |  |            |
| 21.6   | Earthquake epicenter, magnitude 4–5.49   |        | color 100% violet<br>circle diameter 1.4 mm; linewidth .225 mm  |  |            |
| 21.7   | Earthquake epicenter, magnitude less than 4  |        | color 100% violet<br>circle diameter .875 mm; linewidth .2 mm   |  |            |
| 21.8   | Fault-plane or focal-mechanism diagram for vertical, down-to-the-left offset along north-striking, vertical fault—Black quadrant indicates region of compression                           |        | size may vary<br>   | Note that two types of fault motion and (or) two different fault-plane orientations could be represented by the same focal-mechanism diagram. For example, the focal-mechanism diagram that shows right-lateral strike-slip offset along a north-striking, vertical fault (ref. no. 21.9) could also show left-lateral strike-slip offset along an east-west-striking, vertical fault. |            |
| 21.9   | Fault-plane or focal-mechanism diagram for right-lateral strike-slip offset along north-striking, vertical fault —Black quadrants indicate regions of compression                          |        |   |  |            |
| 21.10  | Fault-plane or focal-mechanism diagram for left-lateral strike-slip offset along north-striking, vertical fault —Black quadrants indicate regions of compression                           |        |   |  |            |
| 21.11  | Fault-plane or focal-mechanism diagram for normal, down-to-the-left offset along north-striking, west-dipping (at 45°) fault—Black quadrants indicate regions of compression               |        |   |  |            |
| 21.12  | Fault-plane or focal-mechanism diagram for normal, down-to-the-left offset along northwest-striking, southwest-dipping (at 30°) fault—Black quadrants indicate regions of compression      |        |   |  |            |
| 21.13  | Fault-plane or focal-mechanism diagram for reverse, left-side-up offset along north-striking, west-dipping (at 45°) fault—Black quadrant indicates region of compression                   |        |   |  |            |
| 21.14  | Fault-plane or focal-mechanism diagram for reverse, left-side-up offset along northwest-striking, southwest-dipping (at 60°) fault—Black quadrant indicates region of compression          |        |   |  |            |
| 21.15  | Fault-plane or focal-mechanism diagram for oblique reverse, left-side-up offset along northwest-striking, southwest-dipping (at 60°) fault—Black quadrants indicate regions of compression |        |   |  |            |
| 21.16  | Outer limit of subsidence caused by shock— Identity and existence certain, location accurate. Hachures point into subsided area  |        | all linewidths .275 mm<br>  | May also be shown in purple or other colors.   |            |
| 21.17  | Outer limit of subsidence caused by shock— Identity or existence questionable, location accurate. Hachures point into subsided area  |        |   |  |            |
| 21.18  | Outer limit of subsidence caused by shock— Identity or existence certain, location approximate. Hachures point into subsided area  |        |   |  | 3.5 mm<br> |
| 21.19  | Outer limit of subsidence caused by shock— Identity or existence questionable, location approximate. Hachures point into subsided area   |        |   |  |            |
| 21.20  | Outer limit of subsidence caused by shock— Identity or existence certain, location inferred. Hachures point into subsided area   |        |   |  | 1.5 mm<br> |
| 21.21  | Outer limit of subsidence caused by shock— Identity or existence questionable, location inferred. Hachures point into subsided area  |        |   |  |            |
| 21.22  | Outer limit of subsidence caused by shock— Identity and existence certain, location concealed. Hachures point into subsided area   |        |   |  | .75 mm<br> |
| 21.23  | Outer limit of subsidence caused by shock— Identity or existence questionable, location concealed. Hachures point into subsided area   |        |   |  |            |

\*For more information, see general guidelines on pages A-i to A-v.

**21—NEOTECTONIC AND EARTHQUAKE-HAZARD FEATURES (continued)**

| REF NO | DESCRIPTION   | SYMBOL | CARTOGRAPHIC SPECIFICATIONS* | NOTES ON USAGE*                              |
|--------|---|--------|------------------------------|--|
| 21.24  | Rim crest or crater with rim, formed by shock or sand blowouts—Identity and existence certain, location accurate. Hachures point into crater        |        | all lineweights .2 mm<br>    | May also be shown in purple or other colors. |
| 21.25  | Rim crest or crater with rim, formed by shock or sand blowouts—Identity or existence questionable, location accurate. Hachures point into crater    |        |                              |  |
| 21.26  | Rim crest or crater with rim, formed by shock or sand blowouts—Identity or existence certain, location approximate. Hachures point into crater      |        | 3.5 mm<br>                   |  |
| 21.27  | Rim crest or crater with rim, formed by shock or sand blowouts—Identity or existence questionable, location approximate. Hachures point into crater |        |                              |  |
| 21.28  | Rim crest or crater with rim, formed by shock or sand blowouts—Identity and existence certain, location concealed. Hachures point into crater       |        | 1.25 mm<br>                  |  |
| 21.29  | Rim crest or crater with rim, formed by shock or sand blowouts—Identity or existence questionable, location concealed. Hachures point into crater   |        |                              |  |
| 21.30  | Sinkhole or crater without rim, formed by shock—Identity and existence certain, location accurate. Hachures point into sinkhole                     |        | all lineweights .2 mm<br>    |  |
| 21.31  | Sinkhole or crater without rim, formed by shock—Identity or existence questionable, location accurate. Hachures point into sinkhole                 |        |                              |  |
| 21.32  | Sinkhole or crater without rim, formed by shock—Identity or existence certain, location approximate. Hachures point into sinkhole                   |        | 3.5 mm<br>                   |  |
| 21.33  | Sinkhole or crater without rim, formed by shock—Identity or existence questionable, location approximate. Hachures point into sinkhole              |        |                              |  |
| 21.34  | Sinkhole or crater without rim, formed by shock—Identity or existence certain, location concealed. Hachures point into sinkhole                     |        | .5 mm<br>                    |  |
| 21.35  | Sinkhole or crater without rim, formed by shock—Identity or existence questionable, location concealed. Hachures point into sinkhole                |        |                              |  |
| 21.36  | Fissures or cracks, formed in ground by earthquake  |        | lineweights .2 mm<br>        |  |
| 21.37  | Fissures and sand and (or) other material ejected during earthquake   |        | lineweights .3 mm<br>        |  |

\*For more information, see general guidelines on pages A-i to A-v.

**22—PLATE-TECTONIC FEATURES**

| REF NO | DESCRIPTION  | SYMBOL | CARTOGRAPHIC SPECIFICATIONS*  | NOTES ON USAGE*                             |
|--------|--|--------|---|---|
| 22.1   | Active spreading axis or mid-oceanic ridge, with rift—Accurately located. Sawteeth point in direction of spreading       |        | color 100% red $\setminus 60^\circ$ linewidth .375 mm<br>1.25 mm spacing may vary<br>sawtooth linewidth .25 mm; spacing 12.5 mm | May also be shown in black or other colors. |
| 22.2   | Active spreading axis or mid-oceanic ridge, with rift—Approximately located. Sawteeth point in direction of spreading    |        | 10.0 mm<br>2.5 mm   |   |
| 22.3   | Active spreading axis or mid-oceanic ridge, without rift—Accurately located. Sawteeth point in direction of spreading    |        | color 100% red $\setminus 60^\circ$ linewidth .625 mm<br>1.25 mm spacing may vary<br>sawtooth linewidth .25 mm; spacing 12.5 mm |   |
| 22.4   | Active spreading axis or mid-oceanic ridge, without rift—Approximately located. Sawteeth point in direction of spreading |        | 10.0 mm<br>2.5 mm   |   |
| 22.5   | Ancient spreading axis or mid-oceanic ridge—Accurately located. Sawteeth point in direction of spreading                 |        | 1.25 mm all linewidths .25 mm<br>$\setminus 60^\circ$ sawtooth spacing 12.5 mm<br>7.5 mm  | May also be shown in other colors.          |
| 22.6   | Ancient spreading axis or mid-oceanic ridge—Approximately located. Sawteeth point in direction of spreading              |        | 10.0 mm<br>2.5 mm   |   |
| 22.7   | Surface trace of active deep-seisnofocal or subduction zone—Accurately located. Sawteeth on upper plate                  |        | linewidth .375 mm color 100% red<br>1.25 mm<br>6.25 mm<br>sawtooth radius 3.0 mm  | May also be shown in black or other colors. |
| 22.8   | Surface trace of active deep-seisnofocal or subduction zone—Approximately located. Sawteeth on upper plate               |        | 5.25 mm<br>1.0 mm   |   |
| 22.9   | Surface trace of active deep-seisnofocal or subduction zone—Showing fore-arc sediments. Sawteeth on upper plate          |        | pattern 427-R   |   |
| 22.10  | Active convergent plate boundary—Accurately located. Sawteeth on upper plate   |        | linewidth .375 mm<br>color 100% red<br>6.25 mm<br>$\setminus 60^\circ$<br>2.0 mm  |   |
| 22.11  | Active convergent plate boundary—Approximately located. Sawteeth on upper plate  |        | 5.25 mm<br>1.0 mm   |   |
| 22.12  | Active convergent plate boundary—Showing accretionary prism. Sawteeth on upper plate                                     |        | pattern 429-R   |   |
| 22.13  | Ancient convergent plate boundary—Accurately located. Sawteeth on upper plate  |        | linewidth .25 mm<br>6.25 mm<br>$\setminus 60^\circ$<br>1.75 mm  | May also be shown in other colors.          |
| 22.14  | Ancient convergent plate boundary—Approximately located. Sawteeth on upper plate   |        | 5.25 mm<br>1.0 mm   |   |
| 22.15  | Active transform fault, sense of offset unspecified—Accurately located   |        | color 100% red<br>linewidth .375 mm   | May also be shown in black or other colors. |
| 22.16  | Active transform fault, sense of offset unspecified—Approximately located  |        | 3.5 mm<br>1.0 mm  |   |
| 22.17  | Active transform fault, right-lateral offset—Accurately located. Arrows show relative motion                             |        | arrow linewidth .3 mm<br>25°<br>1.75 mm<br>color 100% red<br>5.0 mm<br>linewidth .375 mm  |   |
| 22.18  | Active transform fault, right-lateral offset—Approximately located. Arrows show relative motion                          |        | 3.5 mm<br>1.0 mm  |   |
| 22.19  | Active transform fault, left-lateral offset—Accurately located. Arrows show relative motion                              |        | arrow linewidth .3 mm<br>1.75 mm<br>25°<br>color 100% red<br>5.0 mm<br>linewidth .375 mm  |   |
| 22.20  | Active transform fault, left-lateral offset—Approximately located. Arrows show relative motion                           |        | 3.5 mm<br>1.0 mm  |   |
| 22.21  | Active transform fault, normal offset—Accurately located. Hachures on downthrown side                                    |        | color 100% red<br>linewidth .375 mm<br>1.0 mm<br>hachure linewidth .175 mm; spacing .375 mm                                     |   |
| 22.22  | Active transform fault, normal offset—Approximately located. Hachures on downthrown side                                 |        | 3.5 mm<br>1.0 mm  |   |
| 22.23  | Ancient transform fault, sense of offset unspecified—Accurately located  |        | linewidth .275 mm   | May also be shown in black or other colors. |
| 22.24  | Ancient transform fault, sense of offset unspecified—Approximately located   |        | 3.5 mm<br>1.0 mm  |   |

\*For more information, see general guidelines on pages A-i to A-v.

**22—PLATE-TECTONIC FEATURES (continued)**

| REF NO | DESCRIPTION   | SYMBOL | CARTOGRAPHIC SPECIFICATIONS*                                       | NOTES ON USAGE*                    |
|--------|---|--------|--|------------------------------------|
| 22.25  | Continental slope—Accurately located. Rectangles point downslope                            |        | lineweight 25 mm<br><br>tooth height .875 mm; width 1.5 mm         | May also be shown in other colors. |
| 22.26  | Continental slope—Approximately located. Rectangles point downslope                         |        | 5.25 mm<br><br>1.0 mm  |                                    |
| 22.27  | Continental slope—Showing margin filled by sedimentation. Rectangles point downslope        |        | pattern 119-K<br>  |                                    |
| 22.28  | Outline of basin—Accurately located. Sawteeth point into basin                              |        | all lineweights .2 mm<br><br>6.25 mm 90° .75 mm                    |                                    |
| 22.29  | Outline of basin—Approximately located. Sawteeth point into basin                           |        | 5.25 mm 1.0 mm<br><br>6.25 mm                                      |                                    |
| 22.30  | Deep-sea trench—Patterned where filled by sedimentation                                     |        | all lineweights .2 mm<br><br>pattern 119-K                         |                                    |
| 22.31  | Margin of oceanic rise—Accurately located. Hachures point downslope                         |        | all lineweights .2 mm<br><br>.625 mm 6.25 mm 1.0 mm                |                                    |
| 22.32  | Margin of oceanic rise—Approximately located. Hachures point downslope                      |        | 5.25 mm 1.0 mm<br><br>6.25 mm                                      |                                    |
| 22.33  | Volcanic ridge or edifice—Accurately located. Hachures point downslope                      |        | all lineweights .2 mm<br><br>.625 mm 3.125 mm                      |                                    |
| 22.34  | Volcanic ridge or edifice—Approximately located. Hachures point downslope                   |        | 5.25 mm 1.0 mm<br><br>6.25 mm                                      |                                    |
| 22.35  | Guyot—Hachures point downslope  |        | all lineweights .2 mm<br><br>hachure height .625 mm; spacing .5 mm |                                    |
| 22.36  | Seamount, nonvolcanic origin—Sawteeth point downslope                                       |        | sawtooth spacing 5.0 mm<br><br>60° 1.0 mm<br>all lineweights .2 mm |                                    |
| 22.37  | Seamount, volcanic origin—Sawteeth point downslope  |        |  |                                    |
| 22.38  | Seamount, nonvolcanic origin (shown as point symbol when too small to outline at map scale) |        | all lineweights .2 mm<br><br>.625 mm<br>circle diameter 1.375 mm   |                                    |
| 22.39  | Seamount, volcanic origin (shown as point symbol when too small to outline at map scale)    |        | lineweights .2 mm<br><br>dot diameter 1.375 mm                     |                                    |

\*For more information, see general guidelines on pages A-i to A-v.

**23— MISCELLANEOUS UPLIFT AND COLLAPSE FEATURES**

| REF NO | DESCRIPTION   | SYMBOL | CARTOGRAPHIC SPECIFICATIONS*  | NOTES ON USAGE* |
|--------|---|--------|---|-----------------|
| 23.1   | Outline of metamorphic core complex—Identity and existence certain, location accurate. Hachures on upper plate        |        | <i>lineweight .25 mm</i><br><i>H-8</i>  |                 |
| 23.2   | Outline of metamorphic core complex—Identity or existence questionable, location accurate. Hachures on upper plate    |        | <i>hachure lineweight .2 mm</i><br><i>.75 mm</i><br><i>12.0 mm</i><br><i>1.25 mm</i><br><i>.75 mm</i> |                 |
| 23.3   | Outline of metamorphic core complex—Identity and existence certain, location approximate. Hachures on upper plate     |        | <i>3.5 mm</i>   |                 |
| 23.4   | Outline of metamorphic core complex—Identity or existence questionable, location approximate. Hachures on upper plate |        | <i>.75 mm</i><br><i>.75 mm</i>  |                 |
| 23.5   | Outline of metamorphic core complex—Identity and existence certain, location inferred. Hachures on upper plate        |        | <i>1.5 mm</i><br><i>2.5 mm</i>  |                 |
| 23.6   | Outline of metamorphic core complex—Identity or existence questionable, location inferred. Hachures on upper plate    |        | <i>.75 mm</i><br><i>.75 mm</i>  |                 |
| 23.7   | Outline of metamorphic core complex—Identity and existence certain, location concealed. Hachures on upper plate       |        | <i>.5 mm</i><br><i>2.5 mm</i>   |                 |
| 23.8   | Outline of metamorphic core complex—Identity or existence questionable, location concealed. Hachures on upper plate   |        | <i>.75 mm</i><br><i>.75 mm</i>  |                 |
| 23.9   | Collapse structure or sinkhole (too small to draw to scale)   |        | <i>lineweight .2 mm</i><br><i>circle diameter 2.0 mm; dot diameter .5 mm</i>                          |                 |
| 23.10  | Collapse structure or sinkhole (drawn to scale)   |        | <i>all lineweights .2 mm</i><br><i>hachure height .55 mm; spacing 1.25 mm</i>                         |                 |
| 23.11  | Crater outline, unspecified origin  |        | <i>lineweight .2 mm</i><br><i>dash length 1.25 mm; spacing .375 mm</i>                                |                 |
| 23.12  | Uplift—Local, intensely disturbed   |        | <i>circle diameter 2.5 mm; lineweight .25 mm</i><br><i>crossbar lineweight .175 mm</i>                |                 |
| 23.13  | Salt dome   |        | <i>dot diameter 1.625 mm</i><br><i>H-7</i>  |                 |
| 23.14  | Possible salt dome  |        | <i>lineweight .2 mm</i><br><i>circle diameter 1.625 mm</i><br><i>H-7</i>                              |                 |
| 23.15  | Salt and (or) shale diapirs   |        | <i>100% black</i>   |                 |

\*For more information, see general guidelines on pages A-i to A-v.



**25—PLANETARY GEOLOGY FEATURES**

| REF NO | DESCRIPTION  | SYMBOL | CARTOGRAPHIC SPECIFICATIONS*  | NOTES ON USAGE* |
|--------|--|--------|---|-----------------|
| 25.1   | Contact, planetary—Location accurate   |        | lineweight .15 mm   |                 |
| 25.2   | Contact, planetary—Location approximate  |        | 3.5 mm<br>tick length .75 mm  |                 |
| 25.3   | Contact, planetary—Location inferred   |        | 1.5 mm<br>tick length .75 mm  |                 |
| 25.4   | Contact, planetary—Location concealed  |        | .5 mm<br>tick length .75 mm   |                 |
| 25.5   | Fault, planetary, sense of offset unspecified—Location accurate                                      |        | lineweight .375 mm  |                 |
| 25.6   | Fault, planetary, sense of offset unspecified—Location approximate                                   |        | 3.5 mm<br>tick length .75 mm  |                 |
| 25.7   | Fault, planetary, sense of offset unspecified—Location inferred                                      |        | 1.5 mm<br>tick length .75 mm  |                 |
| 25.8   | Fault, planetary, sense of offset unspecified—Location concealed                                     |        | .5 mm<br>tick length .75 mm   |                 |
| 25.9   | Normal fault, planetary—Location accurate. Ball and bar on downthrown block                          |        | lineweight .375 mm<br>ball .875 mm diameter<br>tick length 1.0 mm; lineweight .175 mm |                 |
| 25.10  | Normal fault, planetary—Location approximate. Ball and bar on downthrown block                       |        | 3.5 mm<br>tick length .75 mm  |                 |
| 25.11  | Normal fault, planetary—Location inferred. Ball and bar on downthrown block                          |        | 1.5 mm<br>tick length .75 mm  |                 |
| 25.12  | Normal fault, planetary—Location concealed. Ball and bar on downthrown block                         |        | .5 mm<br>tick length .75 mm   |                 |
| 25.13  | Strike-slip fault, planetary, right-lateral offset—Location accurate. Arrows show relative motion    |        | lineweight .375 mm<br>25°<br>1.75 mm<br>5.0 mm<br>arrow lineweight .2 mm              |                 |
| 25.14  | Strike-slip fault, planetary, right-lateral offset—Location approximate. Arrows show relative motion |        | 3.5 mm<br>tick length .75 mm  |                 |
| 25.15  | Strike-slip fault, planetary, right-lateral offset—Location inferred. Arrows show relative motion    |        | 1.5 mm<br>tick length .75 mm  |                 |
| 25.16  | Strike-slip fault, planetary, right-lateral offset—Location concealed. Arrows show relative motion   |        | .5 mm<br>tick length .75 mm   |                 |
| 25.17  | Strike-slip fault, planetary, left-lateral offset—Location accurate. Arrows show relative motion     |        | lineweight .375 mm<br>25°<br>1.75 mm<br>5.0 mm<br>arrow lineweight .2 mm              |                 |
| 25.18  | Strike-slip fault, planetary, left-lateral offset—Location approximate. Arrows show relative motion  |        | 3.5 mm<br>tick length .75 mm  |                 |
| 25.19  | Strike-slip fault, planetary, left-lateral offset—Location inferred. Arrows show relative motion     |        | 1.5 mm<br>tick length .75 mm  |                 |
| 25.20  | Strike-slip fault, planetary, left-lateral offset—Location concealed. Arrows show relative motion    |        | .5 mm<br>tick length .75 mm   |                 |
| 25.21  | Thrust fault, planetary—Location accurate. Sawteeth on upper plate                                   |        | sawtooth height 1.5 mm<br>lineweight .375 mm<br>60°                                   |                 |
| 25.22  | Thrust fault, planetary—Location approximate. Sawteeth on upper plate                                |        | 3.5 mm<br>tick length .75 mm  |                 |
| 25.23  | Thrust fault, planetary—Location inferred. Sawteeth on upper plate                                   |        | 1.5 mm<br>2.5 mm<br>tick length .75 mm  |                 |
| 25.24  | Thrust fault, planetary—Location concealed. Sawteeth on upper plate                                  |        | .5 mm<br>2.5 mm<br>tick length .75 mm   |                 |

\*For more information, see general guidelines on pages A-i to A-v.

**25—PLANETARY GEOLOGY FEATURES (continued)**

| REF NO | DESCRIPTION  | SYMBOL | CARTOGRAPHIC SPECIFICATIONS*                        | NOTES ON USAGE* |
|--------|--|--------|---|-----------------|
| 25.25  | Graben trace, planetary (shown as single line where bounding normal faults cannot be mapped separately)—Location accurate          |        | lineweight .375 mm<br>dot diameter 1.375 mm         |                 |
| 25.26  | Graben trace, planetary (shown as single line where bounding normal faults cannot be mapped separately)—Location approximate       |        | 3.5 mm<br>1.5 mm<br>.75 mm                          |                 |
| 25.27  | Graben trace, planetary (shown as single line where bounding normal faults cannot be mapped separately)—Location inferred          |        | 1.5 mm<br>.75 mm                                    |                 |
| 25.28  | Graben trace, planetary (shown as single line where bounding normal faults cannot be mapped separately)—Location concealed         |        | .5 mm<br>.75 mm                                     |                 |
| 25.29  | Regional fracture, planetary   |        | lineweight .3 mm<br>color 100% cyan                 |                 |
| 25.30  | Partly buried regional fracture, planetary   |        | 1.5 mm<br>.75 mm                                    |                 |
| 25.31  | Arcuate fracture, planetary  |        | lineweight .2 mm<br>color 100% purple               |                 |
| 25.32  | Partly buried arcuate fracture, planetary  |        | 1.5 mm<br>.75 mm                                    |                 |
| 25.33  | Radial fracture, planetary (associated with coronae)   |        | lineweight .325 mm<br>color 100% purple             |                 |
| 25.34  | Concentric fracture, planetary (associated with coronae)   |        | lineweight .25 mm<br>color 100% violet              |                 |
| 25.35  | Fold crest, planetary  |        | lineweight .3 mm<br>color 100% red                  |                 |
| 25.36  | Broad warp, planetary  |        | lineweight .635 mm<br>color 100% red<br>.75 mm      |                 |
| 25.37  | Wrinkle ridge, planetary   |        | lineweight .25 mm<br>color 100% magenta             |                 |
| 25.38  | Ribbon trends, planetary   |        | lineweight .25 mm<br>color 100% green               |                 |
| 25.39  | Ridge belt, planetary  |        | all lineweights .25 mm<br>color 100% red<br>1.75 mm |                 |
| 25.40  | Broad ridge crest, planetary (generally associated with coronae)   |        | lineweight .635 mm<br>color 100% red                |                 |
| 25.41  | Ridge crest, planetary (1st option)  |        | 3.0 mm<br>65°<br>lineweight .25 mm                  |                 |
| 25.42  | Ridge crest, planetary (2nd option)  |        | all lineweights .25 mm                              |                 |
| 25.43  | Ridge crest, planetary (1st option)—Arrowhead shows abrupt termination of ridge  |        | 65°<br>1.375 mm                                     |                 |
| 25.44  | Ridge crest, planetary (2nd option)—Arrowhead shows abrupt termination of ridge  |        |   |                 |
| 25.45  | Ridge crest (possible dike), planetary   |        | 70°<br>all lineweights .25 mm<br>3.5 mm             |                 |
| 25.46  | Corona annulus ridge, planetary—Showing axial trace and plunge. Short arrow indicates steeper limb or scarp bounding corona trough |        | 3.75 mm<br>all lineweights .25 mm<br>75°<br>2.0 mm  |                 |

\*For more information, see general guidelines on pages A-i to A-v.

**25—PLANETARY GEOLOGY FEATURES (continued)**

| REF NO | DESCRIPTION   | SYMBOL | CARTOGRAPHIC SPECIFICATIONS*   | NOTES ON USAGE* |
|--------|---|--------|--|-----------------|
| 25.47  | Groove (generic), planetary   |        | lineweight .25 mm  |                 |
| 25.48  | Sharp groove, planetary   |        | all lineweights .25 mm<br>   |                 |
| 25.49  | Subdued groove, planetary   |        | all lineweights .25 mm<br>   |                 |
| 25.50  | Radially grooved ejecta (schematic), planetary  |        | .75 mm .75 mm .25 mm<br>   |                 |
| 25.51  | Furrow, planetary   |        | lineweight .25 mm<br>  |                 |
| 25.52  | Trough or narrow depression, planetary  |        | lineweight .25 mm<br>  |                 |
| 25.53  | Depression (mapped to scale), planetary   |        | all lineweights .25 mm<br>   |                 |
| 25.54  | Large depression (mapped to scale), planetary   |        | all lineweights .25 mm<br>pattern 118-K<br>                              |                 |
| 25.55  | Shallow, linear depression or valley, or narrow channel, planetary                                |        | lineweight .25 mm<br>color 100% cyan                                     |                 |
| 25.56  | Channel (canali), planetary   |        | lineweight .25 mm<br>long dash 2.5 mm; short dash .5 mm; spacing .5 mm   |                 |
| 25.57  | Channel (canali), planetary—Two short dashes where structureless or indefinite                    |        | lineweight .25 mm<br>long dash 2.5 mm; short dashes .5 mm; spacing .5 mm |                 |
| 25.58  | Narrow channel (possible lava channel), planetary—Arrows point in direction of flow               |        | all lineweights .175 mm<br>  |                 |
| 25.59  | Erosional boundary, planetary—Erosion increases in direction of arrows                            |        | 2.5 mm<br>lineweight .175 mm<br>   |                 |
| 25.60  | Angular unconformity, planetary—Hachures indicate truncated beds                                  |        | lineweight .3 mm<br>hachure height 1.75 mm; spacing 2.5 mm               |                 |
| 25.61  | Angular unconformity, planetary—Uncertain. Hachures indicate truncated beds                       |        | 2.25 mm<br>hachure height .5 mm; spacing .5 mm                           |                 |
| 25.62  | Layer, planetary  |        | 1.125 mm<br>lineweight .2 mm<br>hachure height .75 mm; spacing .5 mm     |                 |
| 25.63  | Lineament, planetary  |        | lineweight .3 mm<br>hachure height 1.5 mm; spacing .5 mm                 |                 |
| 25.64  | Layering in canyon wall, planetary  |        | all lineweights .2 mm<br>lengths and spacing will vary                   |                 |
| 25.65  | Fabric of short radar-bright lineaments (schematic), planetary                                    |        | all lineweights .25 mm<br>lengths and spacing will vary                  |                 |
| 25.66  | Penetrative lineations, within tessera terrain, planetary   |        | all lineweights .125 mm<br>lengths and spacing will vary                 |                 |
| 25.67  | Flow direction, planetary   |        | lineweight .175 mm<br>length may vary<br>                                |                 |
| 25.68  | Wind streaks, planetary—Arrow points in inferred wind direction                                   |        | all lineweights .2 mm<br>length may vary<br>                             |                 |
| 25.69  | Area of channelized erosion and scouring, planetary—Arrow points in direction of interpreted flow |        | lineweight .375 mm<br>   |                 |
| 25.70  | Area of eolian transport, planetary—Arrow points in direction of air flow                         |        | all lineweights .375 mm<br>  |                 |

\*For more information, see general guidelines on pages A-i to A-v.

**25—PLANETARY GEOLOGY FEATURES (continued)**

| REF NO | DESCRIPTION  | SYMBOL | CARTOGRAPHIC SPECIFICATIONS*   | NOTES ON USAGE* |
|--------|--|--------|--|-----------------|
| 25.71  | Scarp, planetary—Hachures point downscarp  |        | all lineweights .25 mm<br>   |                 |
| 25.72  | Lobate scarp, planetary—Hachures point downscarp   |        | all lineweights .25 mm<br>   |                 |
| 25.73  | Basal scarp, planetary—Hachures point downscarp  |        | all lineweights .25 mm<br>   |                 |
| 25.74  | Base of scarp, planetary—Barb points downscarp   |        | lineweight .25 mm<br>  |                 |
| 25.75  | Dome, edifice, or circular scarp, planetary (mapped to scale)—Hachures point downscarp           |        | all lineweights .25 mm<br>   |                 |
| 25.76  | Very small shield, dome, or volcanic construct, planetary (not mapped to scale)                  |        | all lineweights .4 mm<br>  |                 |
| 25.77  | Small shield, dome, or volcanic construct, planetary (not mapped to scale)                       |        | all lineweights .6 mm<br>  |                 |
| 25.78  | Large, steep-sided shield, dome, or volcanic construct, planetary (not mapped to scale)          |        | all lineweights .375 mm<br>circle diameter 4.0 mm<br>                              |                 |
| 25.79  | Mesa, planetary (not mapped to scale)  |        | all lineweights .375 mm<br>circle diameter 4.0 mm<br>all barb lengths 1.625 mm<br> |                 |
| 25.80  | Large shield, dome, or volcanic construct, planetary (mapped to scale)—Hachures point downscarp  |        | all lineweights .3 mm<br>  |                 |
| 25.81  | Large cone, planetary (mapped to scale)—Hachures point downscarp                                 |        | all lineweights .25 mm<br>   |                 |
| 25.82  | Knob or central peak, planetary (not mapped to scale)  |        | all lineweights .25 mm<br>circle diameter 2.0 mm<br>                               |                 |
| 25.83  | Knob, planetary (mapped to scale)—Bar and ball indicate apical fissure. Hachures point downscarp |        | dot diameter 1.25 mm<br>all lineweights .25 mm<br>                                 |                 |
| 25.84  | Elevated plateau, planetary (mapped to scale)—Hachures point downscarp                           |        | all lineweights .25 mm<br>   |                 |
| 25.85  | Steep-sided edifice, planetary (not mapped to scale)   |        | 2.0 mm<br>all lineweights .25 mm<br>   |                 |
| 25.86  | Steep-sided edifice, planetary (not mapped to scale)—Dotted where concealed or buried            |        | short dashes .5 mm; spacing .5 mm<br>  |                 |
| 25.87  | Large edifice, planetary (not mapped to scale)   |        | all lineweights .25 mm<br>   |                 |
| 25.88  | Very small tholi, planetary (not mapped to scale)  |        | lineweight .25 mm<br>  |                 |
| 25.89  | Small tholi, planetary (not mapped to scale)   |        | all lineweights .25 mm<br>circle diameter 3.0 mm<br>                               |                 |
| 25.90  | Small tholi, planetary (mapped to scale)   |        | all lineweights .25 mm<br>   |                 |
| 25.91  | Corona, planetary  |        | lineweight .25 mm<br>dash length 1.5 mm; spacing .75 mm<br>                        |                 |
| 25.92  | Nova, planetary  |        | lineweight .5 mm<br>dash length 2.25 mm; spacing .75 mm<br>                        |                 |
| 25.93  | Palimpsest ring, planetary   |        | dot diameter .875 mm; spacing .375 mm<br>  |                 |

\*For more information, see general guidelines on pages A-i to A-v.

**25—PLANETARY GEOLOGY FEATURES (continued)**

| REF NO | DESCRIPTION   | SYMBOL | CARTOGRAPHIC SPECIFICATIONS*   | NOTES ON USAGE*                                     |
|--------|---|--------|--|---|
| 25.94  | Raised rim of larger impact crater, planetary—<br>Hachures point into crater  |        | all lineweights .3 mm<br>hachure height .75 mm; spacing of hachure pairs .5 mm |   |
| 25.95  | Raised rim of smaller impact crater, planetary  |        | lineweight .3 mm   |   |
| 25.96  | Raised rim of impact crater, planetary—Showing visible ejecta blanket   |        | lineweight .15 mm  |   |
| 25.97  | Degraded impact crater rim, planetary (1st option)  |        | lineweight .3 mm   | dash length 1.0 mm; spacing .5 mm                   |
| 25.98  | Rimless impact crater, subdued impact crater rim, degraded impact crater rim (2nd option), or buried impact crater rim, planetary |        | lineweight .3 mm   | long dash 4.0 mm; short dashes .2 mm; spacing .5 mm |
| 25.99  | Secondary impact crater chain and cluster, planetary  |        | lineweight .25 mm  | dash length 1.5 mm; spacing .5 mm                   |
| 25.100 | Basin ring, planetary   |        | lineweight .375 mm   | dash length .75 mm; spacing .75 mm                  |
| 25.101 | Central peak of impact crater, planetary (1st option)   |        | ellipse width 1.875 mm; height 2.625 mm  | <br>all lineweights .2 mm                           |
| 25.102 | Central peak of impact crater, planetary (2nd option)   |        | 2.375 mm   | <br>all lineweights .2 mm                           |
| 25.103 | Pit of impact crater floor, planetary (1st option)  |        | lineweight .2 mm   |   |
| 25.104 | Pit of impact crater floor, planetary (2nd option)  |        | dot diameter .875 mm   |   |
| 25.105 | Pit-crater chain (mapped to scale), planetary   |        | lineweight .2 mm   |   |
| 25.106 | Small endogenic crater, planetary   |        | dot diameter 1.0 mm  |   |
| 25.107 | Small endogenic crater (mapped to scale), planetary   |        | lineweight .25 mm  |   |
| 25.108 | Medium-sized endogenic crater (mapped to scale), planetary  |        | lineweight .25 mm<br>dot diameter 1.0 mm                                       |   |
| 25.109 | Large endogenic crater (mapped to scale), planetary   |        | all lineweights .25 mm   | hachure height 1.25 mm; spacing 3.175 mm            |
| 25.110 | Chain craters or collapsed lava tube (mapped to scale), planetary   |        | lineweight .2 mm   |   |
| 25.111 | Caldera, planetary  |        | all lineweights .25 mm   | hachure height .625 mm; spacing .875 mm             |
| 25.112 | Volcano, planetary, having summit crater  |        | lineweight .15 mm  |   |
| 25.113 | Volcano, planetary, without summit crater—Queried if origin is conjectural  |        |  | H-8   |
| 25.114 | Flow front, planetary—Arrow indicates flow direction  |        | 1.375 mm<br>lineweight .25 mm  | 1.125 mm<br>arrow lineweight .25 mm<br>40°          |
| 25.115 | Mountain (rugged), planetary—Origin uncertain   |        | lineweight .2 mm   | line color 50% black                                |
| 25.116 | Channel bars, planetary—May be erosional or depositional  |        | lineweight .2 mm   | line color 30% black                                |
| 25.117 | Slide or slump material, planetary—Arrow indicates direction of movement  |        | lineweight .25 mm  | 1.75 mm<br>arrow lineweight .2 mm<br>60°            |

\*For more information, see general guidelines on pages A-i to A-v.

**25—PLANETARY GEOLOGY FEATURES (continued)**

| REF NO | DESCRIPTION  | SYMBOL | CARTOGRAPHIC SPECIFICATIONS*  | NOTES ON USAGE*                             |
|--------|--|--------|---|---|
| 25.118 | Dark-colored ejecta, planetary   |        | <i>pattern 428-K</i>  | May also be shown in red or other colors.   |
| 25.119 | Light-colored ejecta, planetary  |        | <i>pattern 429-K</i>  |   |
| 25.120 | Terrace deposits, planetary  |        | <i>pattern 427-K</i>  |   |
| 25.121 | Dark-colored mantling material, planetary  |        | <i>pattern 214-K (at 45°)</i>   |   |
| 25.122 | Secondary crater field, planetary  |        | <i>pattern 102-R</i>  | May also be shown in black or other colors. |
| 25.123 | Diffuse highland-lowland boundary scarp, planetary   |        | <i>pattern 134-R</i>  |   |
| 25.124 | Joint or fracture pattern, planetary   |        | <i>pattern 430-K</i>  | May also be shown in red or other colors.   |
| 25.125 | Area of reticulate grooves, planetary—Showing trend  |        | <i>pattern 327-K</i>  |   |
| 25.126 | Detached lobe, planetary—Arrow points in direction of interpreted landslide or debris flow |        | <i>pattern 116-K</i><br>1.75 mm<br><i>lineweight .3 mm; length 4.5 mm 60°</i> |   |
| 25.127 | Low albedo smooth material, planetary—Interpreted as eolian material                       |        | <i>pattern 136-K</i>  |   |
| 25.128 | Airburst spot  |        | <i>pattern 434-K</i>  |   |
| 25.129 | Mantling material, planetary—Light-colored   |        | <i>pattern 435-K in 50% black</i>   |   |
| 25.130 | Splotch, planetary—Circular, radar-bright halo on surface                                  |        | <i>pattern 116-K</i>  |   |
| 25.131 | Reticulate pattern on plains, planetary  |        | <i>pattern 119-K</i>  |   |
| 25.132 | Fracture zone, planetary   |        | <i>pattern 137-K</i>  |   |
| 25.133 | Superficial crater material having weak radar backscatter coefficient, planetary           |        | <i>pattern 436-K</i>  |   |
| 25.134 | Crater-associated ejecta halo, planetary   |        | <i>pattern 429-K</i>  |   |
| 25.135 | Halo without associated crater, planetary  |        | <i>pattern 429-C</i>  |   |

\*For more information, see general guidelines on pages A-i to A-v.

**26—GEOHYDROLOGIC FEATURES**

| REF NO                  | DESCRIPTION  | SYMBOL         | CARTOGRAPHIC SPECIFICATIONS*                                  | NOTES ON USAGE*                            |
|-------------------------|--|----------------|---|--|
| <b>26.1—Water wells</b> |  |                |   |  |
| 26.1.1                  | Water well, type unspecified   | ○              | lineweight .15 mm<br>○<br>diameter 1.75 mm                    | May also be shown in cyan or other colors. |
| 26.1.2                  | Unused water well  | ∅              | bar lineweight .3 mm<br>∅ 3.725 mm<br>circle lineweight .2 mm |  |
| 26.1.3                  | Capped water well  | ⊖              | 1.235 mm<br>⊖ 1.125 mm<br>all lineweights .2 mm               |  |
| 26.1.4                  | Shut-in water well   | ⊖              | 1.125 mm<br>⊖ 1.235 mm<br>all lineweights .2 mm               |  |
| 26.1.5                  | Dry hole used for water exploration  | ⊖              | 1.0 mm<br>⊖ 1.0 mm<br>all lineweights .2 mm                   |  |
| 26.1.6                  | Well used for collection of water data                                       | ⊖              | 1.0 mm<br>⊖<br>all lineweights .2 mm                          |  |
| 26.1.7                  | Well used for domestic-water supply  | ●              | ●<br>diameter 1.75 mm   |  |
| 26.1.8                  | Flowing artesian well, used for domestic-water supply                        | ▲              | 2.0 mm<br>▲ 1.25 mm<br>arrow lineweight .15 mm                |  |
| 26.1.9                  | Nonflowing artesian well, used for domestic-water supply                     | ⊖              | 1.375 mm<br>⊖ radius .3125 mm<br>lineweight .175 mm           |  |
| 26.1.10                 | Recharge or waste-injection well, once used for domestic-water supply        | ▼              | 2.0 mm<br>▼ 1.25 mm<br>arrow lineweight .15 mm                |  |
| 26.1.11                 | Observation well used for domestic-water supply                              | ⊖              | bar lineweight .3 mm<br>⊖ 3.725 mm 45°                        |  |
| 26.1.12                 | Observation well used for domestic-water supply—<br>Equipped with a recorder | ⊖ <sup>R</sup> | ⊖ <sup>R</sup> ← H-6  |  |
| 26.1.13                 | Dry well, once used for domestic-water supply                                | ⊖              | bar lineweight .2 mm<br>⊖ 3.725 mm 45°                        |  |
| 26.1.14                 | Destroyed well, once used for domestic-water supply                          | ⊖              | bar lineweights .2 mm<br>⊖ 90° 3.725 mm                       |  |
| 26.1.15                 | Test hole for well used for domestic-water supply                            | ⊖              | .6 mm<br>⊖ 2.75 mm<br>bar lineweights .15 mm                  |  |
| 26.1.16                 | Well used for stock-water supply   | ○              | ○<br>diameter 1.75 mm   |  |
| 26.1.17                 | Flowing artesian well, used for stock-water supply                           | ▲              | 2.0 mm<br>▲ 1.25 mm<br>arrow lineweight .15 mm                |  |
| 26.1.18                 | Nonflowing artesian well, used for stock-water supply                        | ⊖              | 1.375 mm<br>⊖ radius .3125 mm<br>lineweight .175 mm           |  |
| 26.1.19                 | Recharge or waste-injection well, once used for stock-water supply           | ▼              | 2.0 mm<br>▼ 1.25 mm<br>arrow lineweight .15 mm                |  |
| 26.1.20                 | Observation well used for stock-water supply                                 | ⊖              | bar lineweight .3 mm<br>⊖ 3.725 mm 45°                        |  |
| 26.1.21                 | Observation well used for stock-water supply—<br>Equipped with a recorder    | ⊖ <sup>R</sup> | ⊖ <sup>R</sup> ← H-6  |  |
| 26.1.22                 | Dry well, once used for stock-water supply                                   | ⊖              | bar lineweight .2 mm<br>⊖ 3.725 mm 45°                        |  |
| 26.1.23                 | Destroyed well, once used for stock-water supply                             | ⊖              | bar lineweights .2 mm<br>⊖ 90° 3.725 mm                       |  |
| 26.1.24                 | Test hole for well used for stock-water supply                               | ⊖              | .6 mm<br>⊖ 2.75 mm<br>bar lineweights .15 mm                  |  |

**26—GEOHYDROLOGIC FEATURES (continued)**

| REF NO                              | DESCRIPTION  | SYMBOL | CARTOGRAPHIC SPECIFICATIONS*  | NOTES ON USAGE*                            |
|-------------------------------------|--|--------|---|--|
| <b>26.1—Water wells (continued)</b> |  |        |   |  |
| 26.1.25                             | Well used for irrigation-water supply                                      |        | outer circle diameter 2.0 mm; lineweight .2 mm<br>inner circle diameter 1.125 mm; lineweight .15 mm | May also be shown in cyan or other colors. |
| 26.1.26                             | Flowing artesian well used for irrigation-water supply                     |        | 2.0 mm<br>1.25 mm<br>arrow lineweight .15 mm  |  |
| 26.1.27                             | Nonflowing artesian well used for irrigation-water supply                  |        | 1.375 mm<br>radius .3125 mm<br>lineweight .175 mm   |  |
| 26.1.28                             | Recharge or waste-injection well, once used for irrigation-water supply    |        | 2.0 mm<br>1.25 mm<br>arrow lineweight .15 mm  |  |
| 26.1.29                             | Observation well used for irrigation-water supply                          |        | bar lineweight .3 mm<br>3.725 mm<br>45°   |  |
| 26.1.30                             | Observation well used for irrigation-water supply—Equipped with a recorder |        | R ← H-6   |  |
| 26.1.31                             | Dry well, once used for irrigation-water supply                            |        | bar lineweight .2 mm<br>45°<br>3.725 mm   |  |
| 26.1.32                             | Destroyed well, once used for irrigation-water supply                      |        | bar lineweights .2 mm<br>90°<br>3.725 mm  |  |
| 26.1.33                             | Test hole for well used for irrigation-water supply                        |        | .6 mm<br>2.75 mm<br>bar lineweights .15 mm  |  |
| 26.1.34                             | Well used for industrial-water supply                                      |        | outer circle diameter 2.0 mm; lineweight .2 mm<br>inner dot diameter 1.125 mm                       |  |
| 26.1.35                             | Flowing artesian well used for industrial-water supply                     |        | 2.0 mm<br>1.25 mm<br>arrow lineweight .15 mm  |  |
| 26.1.36                             | Nonflowing artesian well used for industrial-water supply                  |        | 1.375 mm<br>radius .3125 mm<br>lineweight .175 mm   |  |
| 26.1.37                             | Recharge or waste-injection well, once used for industrial-water supply    |        | 2.0 mm<br>1.25 mm<br>arrow lineweight .15 mm  |  |
| 26.1.38                             | Observation well used for industrial-water supply                          |        | bar lineweight .3 mm<br>3.725 mm<br>45°   |  |
| 26.1.39                             | Observation well used for industrial-water supply—Equipped with a recorder |        | R ← H-6   |  |
| 26.1.40                             | Dry well, once used for industrial-water supply                            |        | bar lineweight .2 mm<br>45°<br>3.725 mm   |  |
| 26.1.41                             | Destroyed well, once used for industrial-water supply                      |        | bar lineweights .2 mm<br>90°<br>3.725 mm  |  |
| 26.1.42                             | Test hole for well used for industrial-water supply                        |        | .6 mm<br>2.75 mm<br>bar lineweights .15 mm  |  |

\*For more information, see general guidelines on pages A-i to A-v.

**26—GEOHYDROLOGIC FEATURES (continued)**

| REF NO                              | DESCRIPTION  | SYMBOL         | CARTOGRAPHIC SPECIFICATIONS*                            | NOTES ON USAGE*                            |
|-------------------------------------|--|----------------|---|--|
| <b>26.1—Water wells (continued)</b> |  |                |   |  |
| 26.1.43                             | Well used for public-water supply  | ○              | line weight .375 mm<br>○<br>diameter 2.0 mm             | May also be shown in cyan or other colors. |
| 26.1.44                             | Flowing artesian well used for public-water supply                         | ⤴              | 2.0 mm<br>⤴<br>1.25 mm<br>arrow line weight .15 mm      |  |
| 26.1.45                             | Nonflowing artesian well used for public-water supply                      | ⊕              | 1.375 mm<br>⊕<br>radius .3125 mm<br>line weight .175 mm |  |
| 26.1.46                             | Recharge or waste-injection well, once used for public-water supply        | ⤵              | 2.0 mm<br>⤵<br>1.25 mm<br>arrow line weight .15 mm      |  |
| 26.1.47                             | Observation well used for public-water supply                              | ⊗              | bar line weight .3 mm<br>⊗<br>3.725 mm<br>45°           |  |
| 26.1.48                             | Observation well used for public-water supply—<br>Equipped with a recorder | ⊗ <sup>R</sup> | ⊗ <sup>R</sup> ← H-6                                    |  |
| 26.1.49                             | Dry well, once used for public-water supply                                | ∅              | bar line weight .2 mm<br>∅<br>45°<br>3.725 mm           |  |
| 26.1.50                             | Destroyed well, once used for public-water supply                          | ⊗              | bar line weights .2 mm<br>90°<br>⊗<br>3.725 mm          |  |
| 26.1.51                             | Test hole for well used for public-water supply                            | ⊕              | .6 mm<br>⊕<br>bar line weights .15 mm<br>2.75 mm        |  |

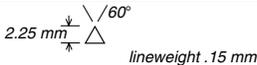
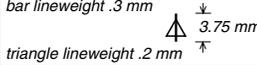
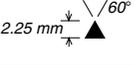
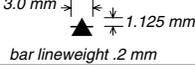
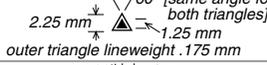
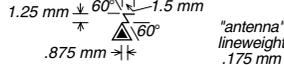
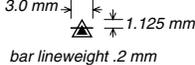
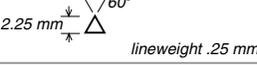
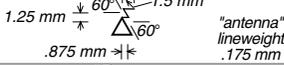
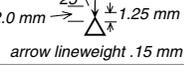
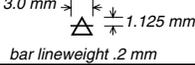
\*For more information, see general guidelines on pages A-i to A-v.

**26—GEOHYDROLOGIC FEATURES (continued)**

| REF NO              | DESCRIPTION   | SYMBOL | CARTOGRAPHIC SPECIFICATIONS*   | NOTES ON USAGE*  |
|---------------------|---|--------|--|--|
| <b>26.2—Springs</b> |   |        |  |  |
| 26.2.1              | Spring, type of use unspecified                       |        | all lineweights .15 mm<br>draft "tail" as shown<br>circle diameter 1.75 mm   | Rotate "tail" to point in direction of flow.<br>May also be shown in cyan, red, or other colors. |
| 26.2.2              | Unused spring   |        | bar lineweight .3 mm<br>circle and "tail" lineweight .2 mm<br>3.725 mm   |  |
| 26.2.3              | Spring used for collection of water-quality data      |        | circle and "tail" lineweight .2 mm<br>dot diameter .375 mm   |  |
| 26.2.4              | Spring used for domestic-water supply                 |        | "tail" lineweight .2 mm<br>draft "tail" as shown<br>dot diameter 1.75 mm   |  |
| 26.2.5              | Thermal spring used for domestic-water supply         |        | H-6 →  |  |
| 26.2.6              | Mineral spring used for domestic-water supply         |        | H-6 →  |  |
| 26.2.7              | Extinct spring, once used for domestic-water supply   |        | 3.725 mm<br>bar lineweight .2 mm   |  |
| 26.2.8              | Spring used for stock-water supply                    |        | "tail" lineweight .2 mm<br>draft "tail" as shown<br>circle diameter 1.75 mm; lineweight .2 mm  |  |
| 26.2.9              | Thermal spring used for stock-water supply            |        | H-6 →  |  |
| 26.2.10             | Mineral spring used for stock-water supply            |        | H-6 →  |  |
| 26.2.11             | Extinct spring, once used for stock-water supply      |        | 3.725 mm<br>bar lineweight .2 mm   |  |
| 26.2.12             | Spring used for irrigation-water supply               |        | inner circle diameter 1.125 mm; lineweight .15 mm<br>draft "tail" as shown<br>"tail" lineweight .2 mm<br>outer circle diameter 1.75 mm; lineweight .2 mm |  |
| 26.2.13             | Thermal spring used for irrigation-water supply       |        | H-6 →  |  |
| 26.2.14             | Mineral spring used for irrigation-water supply       |        | H-6 →  |  |
| 26.2.15             | Extinct spring, once used for irrigation-water supply |        | 3.725 mm<br>bar lineweight .2 mm   |  |
| 26.2.16             | Spring used for industrial-water supply               |        | inner dot diameter 1.125 mm<br>draft "tail" as shown<br>"tail" lineweight .2 mm<br>outer circle diameter 1.75 mm; lineweight .2 mm                       |  |
| 26.2.17             | Thermal spring used for industrial-water supply       |        | H-6 →  |  |
| 26.2.18             | Mineral spring used for industrial-water supply       |        | H-6 →  |  |
| 26.2.19             | Extinct spring, once used for industrial-water supply |        | 3.725 mm<br>bar lineweight .2 mm   |  |
| 26.2.20             | Spring used for public-water supply                   |        | "tail" lineweight .2 mm<br>draft "tail" as shown<br>circle diameter 2.0 mm; lineweight .375 mm   |  |
| 26.2.21             | Thermal spring used for public-water supply           |        | H-6 →  |  |
| 26.2.22             | Mineral spring used for public-water supply           |        | H-6 →  |  |
| 26.2.23             | Extinct spring, once used for public-water supply     |        | 3.725 mm<br>bar lineweight .2 mm   |  |

\*For more information, see general guidelines on pages A-i to A-v.

**26—GEOHYDROLOGIC FEATURES (continued)**

| REF NO                            | DESCRIPTION   | SYMBOL  | CARTOGRAPHIC SPECIFICATIONS*  | NOTES ON USAGE*                            |
|-----------------------------------|---|---|---|--|
| <b>26.3—Water gaging stations</b> |   |   |   |  |
| 26.3.1                            | Water gaging station, type of measurement unspecified                           |    |    | May also be shown in cyan or other colors. |
| 26.3.2                            | Discontinued water gaging station   |    |     |  |
| 26.3.3                            | Continuous-record water gaging station  |    |    |  |
| 26.3.4                            | Continuous-record water gaging station—Equipped with a telephone or radio       |    |     |  |
| 26.3.5                            | Continuous-record peak-flow measurement water gaging station                    |    |    |  |
| 26.3.6                            | Continuous-record low-flow measurement water gaging station                     |    |    |  |
| 26.3.7                            | Continuous-record stage-measurement water gaging station                        |    |    |  |
| 26.3.8                            | Partial-record water gaging station (floods)                                    |    |     |  |
| 26.3.9                            | Partial-record water gaging station (floods)—Equipped with a telephone or radio |    |     |  |
| 26.3.10                           | Partial-record peak-flow measurement water gaging station (floods)              |    |    |  |
| 26.3.11                           | Partial-record low-flow measurement water gaging station (floods)               |   |   |  |
| 26.3.12                           | Partial-record stage-measurement water gaging station (floods)                  |  |  |  |
| 26.3.13                           | Measurement site without a gage   |  |  |  |
| 26.3.14                           | Measurement site without a gage—Equipped with a telephone or radio              |  |   |  |
| 26.3.15                           | Peak-flow measurement site without a gage                                       |  |  |  |
| 26.3.16                           | Low-flow measurement site without a gage  |  |  |  |
| 26.3.17                           | Stage-measurement site without a gage   |  |  |  |

\*For more information, see general guidelines on pages A-i to A-v.

**26—GEOHYDROLOGIC FEATURES (continued)**

| REF NO                             | DESCRIPTION   | SYMBOL  | CARTOGRAPHIC SPECIFICATIONS*                                 | NOTES ON USAGE*                            |
|------------------------------------|---|---|--|--|
| <b>26.4—Quality-of-water sites</b> |   |   |  |  |
| 26.4.1                             | Quality-of-water site, type of measurement unspecified                        |    | <i>lineweight .15 mm</i><br>2.25 mm<br>60°                   | May also be shown in cyan or other colors. |
| 26.4.2                             | Inactive quality-of-water site  |    | triangle lineweight .2 mm<br>3.75 mm<br>bar lineweight .3 mm |  |
| 26.4.3                             | Active quality-of-water site  |    | 2.25 mm<br>60°   |  |
| 26.4.4                             | Active quality-of-water site, chemical measurement                            |    | 1.25 mm<br>bar lineweight .25 mm                             |  |
| 26.4.5                             | Active quality-of-water site, temperature measurement                         |    | 1.25 mm<br>bar lineweight .25 mm                             |  |
| 26.4.6                             | Active quality-of-water site, biological measurement                          |    | 1.25 mm<br>bar lineweight .25 mm                             |  |
| 26.4.7                             | Active quality-of-water site, sediment measurement                            |    | 1.25 mm<br>bar lineweight .25 mm                             |  |
| 26.4.8                             | Active quality-of-water site—Equipped with a monitor                          |    | <i>lineweight .375 mm</i><br>2.25 mm<br>60°                  |  |
| 26.4.9                             | Active quality-of-water site, chemical measurement—Equipped with a monitor    |    | 1.25 mm<br>bar lineweight .25 mm                             |  |
| 26.4.10                            | Active quality-of-water site, temperature measurement—Equipped with a monitor |    | 1.25 mm<br>bar lineweight .25 mm                             |  |
| 26.4.11                            | Active quality-of-water site, biological measurement—Equipped with a monitor  |   | 1.25 mm<br>bar lineweight .25 mm                             |  |
| 26.4.12                            | Active quality-of-water site, sediment measurement—Equipped with a monitor    |  | 1.25 mm<br>bar lineweight .25 mm                             |  |

\*For more information, see general guidelines on pages A-i to A-v.

**26—GEOHYDROLOGIC FEATURES (continued)**

| REF NO                             | DESCRIPTION   | SYMBOL | CARTOGRAPHIC SPECIFICATIONS*                              | NOTES ON USAGE*  |
|------------------------------------|---|--------|---|--|
| <b>26.5—Geohydrologic contours</b> |   |        |   |  |
| 26.5.1                             | Structure contour (index), as shown on hydrologic maps, showing altitude of top or base of, or horizon within, stratigraphic unit, aquifer, or confining bed—Accurately located           |        | lineweight .375 mm<br><br>line and text color 100% red    | On most maps, every fourth or fifth contour is an index contour, and usually only index contours are labeled. May be shown in black or other colors.   |
| 26.5.2                             | Structure contour (index), as shown on hydrologic maps, showing altitude of top or base of, or horizon within, stratigraphic unit, aquifer, or confining bed—Approximately located        |        | .5 mm<br><br>5.0 mm                                       |  |
| 26.5.3                             | Structure contour (intermediate), as shown on hydrologic maps, showing altitude of top or base of, or horizon within, stratigraphic unit, aquifer, or confining bed—Accurately located    |        | lineweight .275 mm<br><br>line color 100% red             |  |
| 26.5.4                             | Structure contour (intermediate), as shown on hydrologic maps, showing altitude of top or base of, or horizon within, stratigraphic unit, aquifer, or confining bed—Approximately located |        | .5 mm<br><br>5.0 mm                                       |  |
| 26.5.5                             | Bedrock contour (index), as shown on hydrologic maps, showing altitude of bedrock surface—Accurately located  |        | lineweight .375 mm<br><br>line and text color 100% violet | On most maps, every fourth or fifth contour is an index contour, and usually only index contours are labeled. May be shown in black or other colors.   |
| 26.5.6                             | Bedrock contour (index), as shown on hydrologic maps, showing altitude of bedrock surface—Approximately located   |        | .5 mm<br><br>5.0 mm                                       |  |
| 26.5.7                             | Bedrock contour (intermediate), as shown on hydrologic maps, showing altitude of bedrock surface—Accurately located   |        | lineweight .275 mm<br><br>line color 100% violet          |  |
| 26.5.8                             | Bedrock contour (intermediate), as shown on hydrologic maps, showing altitude of bedrock surface—Approximately located  |        | .5 mm<br><br>5.0 mm                                       |  |
| 26.5.9                             | Water-table contour (index), showing altitude of unconfined water table [date]—Accurately located   |        | lineweight .375 mm<br><br>line and text color 100% cyan   | Use only in reference to unconfined (water-table) conditions.  |
| 26.5.10                            | Water-table contour (index), showing altitude of unconfined water table [date]—Approximately located  |        | .5 mm<br><br>5.0 mm                                       |  |
| 26.5.11                            | Water-table contour (intermediate), showing altitude of unconfined water table [date]—Accurately located  |        | lineweight .275 mm<br><br>line color 100% cyan            | On most maps, every fourth or fifth contour is an index contour, and usually only index contours are labeled. May be shown in black or other colors.   |
| 26.5.12                            | Water-table contour (intermediate), showing altitude of unconfined water table [date]—Approximately located   |        | .5 mm<br><br>5.0 mm                                       |  |
| 26.5.13                            | Potentiometric or water-level contour (index), showing altitude at which water level would have stood in tightly cased wells [date]—Accurately located                                    |        | lineweight .375 mm<br><br>line and text color 100% cyan   |  |
| 26.5.14                            | Potentiometric or water-level contour (index), showing altitude at which water level would have stood in tightly cased wells [date]—Approximately located                                 |        | .5 mm<br><br>5.0 mm                                       | Use in reference to either confined (artesian) or unconfined conditions, when they are not differentiated on map. On most maps, every fourth or fifth contour is an index contour, and usually only index contours are labeled. May be shown in black or other colors. |
| 26.5.15                            | Potentiometric or water-level contour (intermediate), showing altitude at which water level would have stood in tightly cased wells [date]—Accurately located                             |        | lineweight .275 mm<br><br>line color 100% cyan            |  |
| 26.5.16                            | Potentiometric or water-level contour (intermediate), showing altitude at which water level would have stood in tightly cased wells [date]—Approximately located                          |        | .5 mm<br><br>5.0 mm                                       |  |
| 26.5.17                            | Water-quality-zone contour (index), showing altitude of top or base of, or horizon within, [type of] water-quality zone or water in aquifer [date]—Accurately located                     |        | lineweight .375 mm<br><br>line and text color 100% green  | On most maps, every fourth or fifth contour is an index contour, and usually only index contours are labeled. May be shown in black or other colors.   |
| 26.5.18                            | Water-quality-zone contour (index), showing altitude of top or base of, or horizon within, [type of] water-quality zone or water in aquifer [date]—Approximately located                  |        | .5 mm<br><br>5.0 mm                                       |  |
| 26.5.19                            | Water-quality-zone contour (intermediate), showing altitude of top or base of, or horizon within, [type of] water-quality zone or water in aquifer [date]—Accurately located              |        | lineweight .275 mm<br><br>line color 100% green           |  |
| 26.5.20                            | Water-quality-zone contour (intermediate), showing altitude of top or base of, or horizon within, [type of] water-quality zone or water in aquifer [date]—Approximately located           |        | .5 mm<br><br>5.0 mm                                       |  |

\*For more information, see general guidelines on pages A-i to A-v.

**26—GEOHYDROLOGIC FEATURES (continued)**

| REF NO                          | DESCRIPTION  | SYMBOL | CARTOGRAPHIC SPECIFICATIONS*                            | NOTES ON USAGE*   |
|---------------------------------|--|--------|---|---|
| <b>26.6—Geohydrologic lines</b> |  |        |   |   |
| 26.6.1                          | Line of equal, average, mean, or median (etc.) annual, monthly, or daily (etc.) precipitation [date]—Accurately located          |        | lineweight .375 mm<br><br>line and text color 100% cyan | Negative values must be preceded by a minus (-) sign.<br><br>Date needed only for parameters that vary with time.<br><br>May be shown in black or other colors. |
| 26.6.2                          | Line of equal, average, mean, or median (etc.) annual, monthly, or daily (etc.) precipitation [date]—Approximately located       |        |   |   |
| 26.6.3                          | Line of equal depth to geologic formation, bedrock, aquifer, or water (etc.) [date]—Accurately located                           |        | lineweight .375 mm<br><br>line and text color 100% cyan |   |
| 26.6.4                          | Line of equal depth to geologic formation, bedrock, aquifer, or water (etc.) [date]—Approximately located                        |        |   |   |
| 26.6.5                          | Line of equal thickness of geologic formation, aquifer, confining bed, or saturated material (etc.) [date]—Accurately located    |        | lineweight .375 mm<br><br>line and text color 100% cyan |   |
| 26.6.6                          | Line of equal thickness of geologic formation, aquifer, confining bed, or saturated material (etc.) [date]—Approximately located |        |   |   |
| 26.6.7                          | Line of equal water temperature [date]—Accurately located  |        | lineweight .375 mm<br><br>line and text color 100% cyan |   |
| 26.6.8                          | Line of equal water temperature [date]—Approximately located   |        |   |   |
| 26.6.9                          | Line of equal specific conductance [date]—Accurately located   |        | lineweight .375 mm<br><br>line and text color 100% cyan |   |
| 26.6.10                         | Line of equal specific conductance [date]—Approximately located  |        |   |   |
| 26.6.11                         | Line of equal dissolved-solids concentration, hardness, or chemical-constituent concentration [date]—Accurately located          |        | lineweight .375 mm<br><br>line and text color 100% cyan |   |
| 26.6.12                         | Line of equal dissolved-solids concentration, hardness, or chemical-constituent concentration [date]—Approximately located       |        |   |   |
| 26.6.13                         | Line of equal water-level change, rise, or decline [date]—Accurately located   |        | lineweight .375 mm<br><br>line and text color 100% cyan |   |
| 26.6.14                         | Line of equal water-level change, rise, or decline [date]—Approximately located  |        |   |   |
| 26.6.15                         | Line of equal runoff [date]—Accurately located   |        | lineweight .375 mm<br><br>line and text color 100% cyan |   |
| 26.6.16                         | Line of equal runoff [date]—Approximately located  |        |   |   |
| 26.6.17                         | Line of equal transmissivity, hydraulic conductivity, or porosity (etc.)—Accurately located                                      |        | lineweight .375 mm<br><br>line and text color 100% cyan |   |
| 26.6.18                         | Line of equal transmissivity, hydraulic conductivity, or porosity (etc.)—Approximately located                                   |        |   |   |

\*For more information, see general guidelines on pages A-i to A-v.

**26—GEOHYDROLOGIC FEATURES (continued)**

| REF NO   | DESCRIPTION   | SYMBOL | CARTOGRAPHIC SPECIFICATIONS*   | NOTES ON USAGE*                            |
|--|---|--------|--|--|
| <b>26.7—Miscellaneous geohydrologic features</b> |   |        |  |  |
| 26.7.1   | Watershed basin boundary, drainage divide, or surface-water basin boundary          |        | lineweight .6 mm dash length 7.5 mm<br>dot diameter .625 mm; spacing .5 mm                         | May also be shown in cyan or other colors. |
| 26.7.2   | Watershed subbasin boundary, drainage subdivide, or surface-water subbasin boundary |        | lineweight .425 mm dash length 5.0 mm<br>dot diameter .45 mm; spacing .5 mm                        |  |
| 26.7.3   | Ground-water divide—Accurately located  |        | dot diameter .675 mm; spacing .575 mm  |  |
| 26.7.4   | Ground-water divide—Approximately located   |        | lineweight .15 mm<br>circle diameter .675 mm; spacing .575 mm                                      |  |
| 26.7.5   | Ground-water barrier (geologic)—Accurately located                                  |        | lineweight .175 mm<br>dot diameter .675 mm; spacing .575 mm  |  |
| 26.7.6   | Ground-water barrier (geologic)—Approximately located                               |        | lineweight .175 mm<br>circle lineweight .15 mm; diameter .675 mm; spacing .575 mm                  |  |
| 26.7.7   | Infiltration gallery  |        | all lineweights .15 mm<br>square side length 1.125 mm<br>spacing .625 mm                           |  |
| 26.7.8   | Direction of ground-water flow (1st option)—Accurately located                      |        | lineweight .15 mm<br>arrow length 1.125 mm<br>arrowhead width 2.125 mm<br>arrowhead angle 30°      |  |
| 26.7.9   | Direction of ground-water flow (2nd option)—Accurately located                      |        | lineweight .15 mm<br>arrow length 1.125 mm<br>arrowhead width 2.125 mm<br>arrowhead angle 30°      |  |
| 26.7.10  | Direction of ground-water flow (1st option)—Approximately located                   |        | all lineweights .25 mm<br>arrow length 6.75 mm<br>arrowhead width 2.75 mm<br>arrowhead angle 25°   |  |
| 26.7.11  | Direction of ground-water flow (2nd option)—Approximately located                   |        | dash 1.5 mm; space .5 mm<br>arrow length 6.75 mm<br>arrowhead width 2.75 mm<br>arrowhead angle 25° |  |

\*For more information, see general guidelines on pages A-i to A-v.

**27—WEATHER STATIONS**

| REF NO | DESCRIPTION   | SYMBOL | CARTOGRAPHIC SPECIFICATIONS*  | NOTES ON USAGE* |
|--------|---|--------|---|-----------------|
| 27.1   | Weather station, type of measurement unspecified  |        | 2.0 mm  2.0 mm<br>all lineweights .15 mm  |                 |
| 27.2   | Discontinued weather station  |        | bar lineweight .3 mm<br>"foursquare"<br>lineweight .2 mm  |                 |
| 27.3   | Snow-survey course—Equipped with a telephone or radio                                   |        | 1.25 mm  60°  1.5 mm "antenna"<br>"foursquare" lineweight .175 mm<br>lineweight .2 mm  60°  .875 mm |                 |
| 27.4   | Snow-survey course—Equipped with a recorder   |        | ← H-6   |                 |
| 27.5   | Weather station measuring precipitation—Equipped with a telephone or radio              |        |   |                 |
| 27.6   | Weather station measuring precipitation—Equipped with a recorder                        |        |   |                 |
| 27.7   | Weather station measuring evaporation—Equipped with a telephone or radio                |        |   |                 |
| 27.8   | Weather station measuring evaporation—Equipped with a recorder                          |        |   |                 |
| 27.9   | Weather station measuring temperature—Equipped with a telephone or radio                |        |   |                 |
| 27.10  | Weather station measuring temperature—Equipped with a recorder                          |        |   |                 |
| 27.11  | Weather station measuring humidity—Equipped with a telephone or radio                   |        |   |                 |
| 27.12  | Weather station measuring humidity—Equipped with a recorder                             |        |   |                 |
| 27.13  | Weather station measuring solar radiation—Equipped with a telephone or radio            |        | H-6 →   |                 |
| 27.14  | Weather station measuring solar radiation—Equipped with a recorder                      |        |   |                 |
| 27.15  | Weather station measuring wind velocity—Equipped with an arrow and a telephone or radio |        | arrow<br>lineweight .175 mm  5.0 mm  25°  1.25 mm  1.25 mm  |                 |
| 27.16  | Weather station measuring wind velocity—Equipped with a recorder                        |        |   |                 |
| 27.17  | Complete weather station—Equipped with a telephone or radio                             |        |   |                 |
| 27.18  | Complete weather station—Equipped with a recorder                                       |        |   |                 |

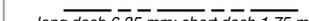
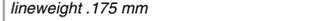
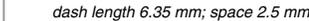
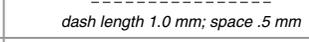
\*For more information, see general guidelines on pages A-i to A-v.

**28—TRANSPORTATION FEATURES**

| REF NO | DESCRIPTION  | SYMBOL | CARTOGRAPHIC SPECIFICATIONS*  | NOTES ON USAGE*   |
|--------|--|--------|---|---|
| 28.1   | Highway (generic)  |        | <br>lineweight .325 mm; line color 70% black  | May be used on non-topographic maps to show highways and streets. |
| 28.2   | Road or street (generic)   |        | <br>lineweight .25 mm; line color 50% black   |   |
| 28.3   | Primary highway, undivided (Class 1)                                     |        | outlines: lineweight .125 mm in 100% black<br>.5 mm<br>fill: lineweight .5 mm; line color 100% red  |   |
| 28.4   | Primary highway, divided by centerline (Class 1)                         |        | .5 mm  .5 mm  |   |
| 28.5   | Primary highway, divided by median strip (Class 1)                       |        | .5 mm  ← spacing may vary   |   |
| 28.6   | Secondary highway, undivided (Class 2)                                   |        | <br>fill: dash length 3.0 mm; space 3.0 mm  |   |
| 28.7   | Secondary highway, divided by centerline (Class 2)                       |        | .5 mm  .5 mm  |   |
| 28.8   | Secondary highway, divided by median strip (Class 2)                     |        | .5 mm  ← spacing may vary   |   |
| 28.9   | Light-duty road, paved (Class 3)   |        | outlines: lineweight .125 mm in 100% black<br>.5 mm<br>fill: lineweight .5 mm; line color 50% black |   |
| 28.10  | Light-duty road, gravel (Class 3)  |        | .5 mm<br>fill: dash length 3.0 mm; space 1.5 mm   |   |
| 28.11  | Light-duty road, dirt (Class 3)  |        | .5 mm<br>fill: dash length 1.5 mm; space 3.0 mm   |   |
| 28.12  | Street in urban area; light-duty road, composition unspecified (Class 3) |        | lineweights .125 mm<br>.5 mm  |   |
| 28.13  | Unimproved road (Class 4)  |        | lineweights .125 mm<br>.5 mm<br>dash length 1.25 mm; space .5 mm                                    |   |
| 28.14  | Four-wheel-drive road (Class 5)  |        | lineweights .125 mm<br>.5 mm  HI-5<br>dash length 1.25 mm; space .5 mm                              |   |
| 28.15  | Trail  |        | lineweight .15 mm<br>dash length 1.25 mm; space .5 mm   |   |
| 28.16  | Interstate route marker  |        | H-6 (100% red)<br>draft as shown  lineweight .2 mm; line color 100% red                             |   |
| 28.17  | U.S. route marker  |        | H-6 (100% red)<br>draft as shown  lineweight .2 mm; line color 100% red                             |   |
| 28.18  | State route marker   |        | H-6 (100% red)<br>circle diameter 4.375 mm  lineweight .2 mm; line color 100% red                   |   |
| 28.19  | Railroad (single track)  |        | all lineweights .125 mm<br><br>5.0 mm<br>1.0 mm   |   |
| 28.20  | Railroad (more than one track)—Showing number of tracks                  |        | all lineweights .125 mm<br>1.325 mm  5.0 mm<br>HI-5 → 4 TRACKS<br>1.0 mm<br>.5 mm                   |   |

\*For more information, see general guidelines on pages A-i to A-v.

**29—BOUNDARIES**

| REF NO | DESCRIPTION  | SYMBOL  | CARTOGRAPHIC SPECIFICATIONS*  | NOTES ON USAGE* |
|--------|--|---|---|-----------------|
| 29.1   | Boundary—National  |  | lineweight .4 mm<br><br>long dash 6.35 mm; short dash 1.75 mm; space .835 mm    |                 |
| 29.2   | Boundary—State, territory  |  | lineweight .3 mm<br><br>long dash 6.35 mm; short dash 1.75 mm; space .835 mm    |                 |
| 29.3   | Boundary—County, parish, Alaska borough, municipio, judicial division  |  | lineweight .25 mm<br><br>long dash 6.35 mm; short dash 1.75 mm; space .835 mm   |                 |
| 29.4   | Boundary—Civil township, town, district, precinct, barrio  |  | lineweight .175 mm<br><br>dash length 4.325 mm; space .835 mm                   |                 |
| 29.5   | Boundary—Incorporated city, village, town, borough, or hamlet  |  | lineweight .175 mm<br><br>long dash 2.0 mm; short dash 1.0 mm; space .5 mm      |                 |
| 29.6   | Boundary—National or state park, monument, reservation, forest, grassland, wilderness area, or wildlife refuge; Hawaii Homestead, Forest Reserve |  | lineweight .175 mm dot diameter .25 mm<br><br>dash length 6.35 mm; space 2.5 mm |                 |
| 29.7   | Boundary—Small park  |  | lineweight .125 mm<br><br>dash length 1.0 mm; space .5 mm                       |                 |
| 29.8   | Continental Divide   |  | lineweight .3 mm<br><br>dash 10.0 mm; space 2.5 mm                              |                 |

\*For more information, see general guidelines on pages A-i to A-v.

**30— TOPOGRAPHIC AND HYDROGRAPHIC FEATURES**

| REF NO  | DESCRIPTION  | SYMBOL | CARTOGRAPHIC SPECIFICATIONS*  | NOTES ON USAGE*  |
|---|--|--------|---|--|
| <b>30.1— Topographic, bathymetric, and glacier contours</b> |  |        |   |  |
| 30.1.1  | Index topographic contour (1st option)   |        | lineweight .25 mm<br>line and text color 100% brown<br>HI-6   | On most maps, every fourth or fifth contour is an index contour. |
| 30.1.2  | Index topographic contour (1st option)—<br>Approximate or indefinite                       |        | 1.75 mm<br>.5 mm<br>HI-6  |  |
| 30.1.3  | Intermediate topographic contour (1st option)  |        | lineweight .15 mm<br>line color 100% brown  | Usually only index and supplementary contours are labeled.       |
| 30.1.4  | Intermediate topographic contour (1st option)—<br>Approximate or indefinite                |        | 1.75 mm<br>.5 mm  |  |
| 30.1.5  | Supplementary topographic contour (1st option)   |        | lineweight .2 mm<br>line and text color 100% brown<br>HI-6  | Negative values must be preceded by a minus (-) sign.            |
| 30.1.6  | Supplementary topographic contour (1st option)—<br>Approximate or indefinite               |        | 1.75 mm<br>.5 mm<br>HI-6  |  |
| 30.1.7  | Index topographic depression contour (1st option)  |        | tick lineweight .15 mm;<br>length .5 mm;<br>spacing 3.0 mm<br>contour lineweight .25 mm<br>line color 100% brown                    | Hachures are added to indicate closed areas of low values.       |
| 30.1.8  | Intermediate topographic depression contour (1st option)                                   |        | tick length .5 mm;<br>spacing 3.0 mm<br>all lineweights .15 mm<br>line color 100% brown   |  |
| 30.1.9  | Supplementary topographic depression contour (1st option)                                  |        | tick lineweight .15 mm;<br>length .5 mm;<br>spacing 3.0 mm<br>contour lineweight .2 mm<br>line color 100% brown                     | Hachures are added to indicate closed areas of low values.       |
| 30.1.10   | Topographic depression contours (1st option)—<br>Showing tick spacing of adjacent contours |        | tick spacing 1.0 mm<br>on lowest contour;<br>on next contour, 2.0 mm; on all others, 3.0 mm<br>(lineweights, etc., are given above) |  |
| 30.1.11   | Index topographic contour (2nd option)   |        | lineweight .25 mm<br>300<br>line and text color 50% black<br>HI-6   | On most maps, every fourth or fifth contour is an index contour. |
| 30.1.12   | Index topographic contour (2nd option)—<br>Approximate or indefinite                       |        | 1.75 mm<br>.5 mm<br>HI-6  |  |
| 30.1.13   | Intermediate topographic contour (2nd option)  |        | lineweight .15 mm<br>line color 50% black   | Usually only index and supplementary contours are labeled.       |
| 30.1.14   | Intermediate topographic contour (2nd option)—<br>Approximate or indefinite                |        | 1.75 mm<br>.5 mm  |  |
| 30.1.15   | Supplementary topographic contour (2nd option)   |        | lineweight .2 mm<br>185<br>line and text color 50% black<br>HI-6  | Negative values must be preceded by a minus (-) sign.            |
| 30.1.16   | Supplementary topographic contour (2nd option)—<br>Approximate or indefinite               |        | 1.75 mm<br>.5 mm<br>HI-6  |  |
| 30.1.17   | Index topographic depression contour (2nd option)  |        | tick lineweight .15 mm;<br>length .5 mm;<br>spacing 3.0 mm<br>contour lineweight .25 mm<br>line color 50% black                     | Hachures are added to indicate closed areas of low values.       |
| 30.1.18   | Intermediate topographic depression contour (2nd option)                                   |        | tick length .5 mm;<br>spacing 3.0 mm<br>all lineweights .15 mm<br>line color 50% black  |  |
| 30.1.19   | Supplementary topographic depression contour (2nd option)                                  |        | tick lineweight .15 mm;<br>length .5 mm;<br>spacing 3.0 mm<br>contour lineweight .2 mm<br>line color 50% black                      | Hachures are added to indicate closed areas of low values.       |
| 30.1.20   | Topographic depression contours (2nd option)—<br>Showing tick spacing of adjacent contours |        | tick spacing 1.0 mm<br>on lowest contour;<br>on next contour, 2.0 mm; on all others, 3.0 mm<br>(lineweights, etc., are given above) |  |

\*For more information, see general guidelines on pages A-i to A-v.

**30—TOPOGRAPHIC AND HYDROGRAPHIC FEATURES (continued)**

| REF NO   | DESCRIPTION  | SYMBOL | CARTOGRAPHIC SPECIFICATIONS*                                       | NOTES ON USAGE*  |
|--|--|--------|--|--|
| <b>30.1—Topographic, bathymetric, and glacier contours (continued)</b> |  |        |  |  |
| 30.1.21  | Index primary bathymetric contour  |        | lineweight .275 mm<br>   | On most maps, every fourth or fifth contour is an index contour.<br><br>Do not break contours for contour values.<br>Bathymetric contour values are always given in "below sea-level" units, so they are not preceded by a minus (-) sign. |
| 30.1.22  | Index primary bathymetric contour—Approximate  |        |  |  |
| 30.1.23  | Primary bathymetric contour  |        | lineweight .175 mm<br>   |  |
| 30.1.24  | Primary bathymetric contour—Approximate  |        |  |  |
| 30.1.25  | Supplementary bathymetric contour  |        | lineweight .2 mm<br>   |  |
| 30.1.26  | Supplementary bathymetric contour—Approximate  |        |  |  |
| 30.1.27  | Index bathymetric contour  |        | lineweight .25 mm<br>  |  |
| 30.1.28  | Index bathymetric contour—Approximate  |        |  |  |
| 30.1.29  | Intermediate bathymetric contour   |        | lineweight .15 mm<br>  |  |
| 30.1.30  | Intermediate bathymetric contour—Approximate   |        |  |  |
| 30.1.31  | Index primary bathymetric depression contour   |        | tick lineweight .175 mm;<br>length .375 mm<br>(spacing varies)<br> | Hachures are added to the lowest contour(s) to indicate a closed area of low values (depression) and also an area of higher value (rise) inside a depression.  |
| 30.1.32  | Index primary bathymetric rise contour (inside depression)   |        |  |  |
| 30.1.33  | Primary bathymetric depression contour   |        | tick length .375 mm<br>(spacing varies)<br>                        |  |
| 30.1.34  | Primary bathymetric rise contour (inside depression)   |        |  |  |
| 30.1.35  | Supplementary bathymetric depression contour   |        | tick lineweight .175 mm;<br>length .375 mm<br>(spacing varies)<br> |  |
| 30.1.36  | Supplementary bathymetric rise contour (inside depression)   |        |  |  |
| 30.1.37  | Index bathymetric depression contour   |        | tick lineweight .175 mm;<br>length .375 mm<br>(spacing varies)<br> |  |
| 30.1.38  | Index bathymetric rise contour (inside depression)   |        |  |  |
| 30.1.39  | Intermediate bathymetric depression contour  |        | tick length .375 mm<br>(spacing varies)<br>                        |  |
| 30.1.40  | Intermediate bathymetric rise contour (inside depression)  |        |  |  |
| 30.1.41  | Bathymetric rise contour (inside depression)—Showing hachure spacing for closed contours less than 12.7 mm in circumference      |        | tick spacing 1.0 mm<br>  |  |
| 30.1.42  | Bathymetric depression contours—Showing hachure spacing for closed contours less than 12.7 mm in circumference                   |        | tick spacing 1.0 mm<br>  |  |
| 30.1.43  | Bathymetric depression or rise contours—Showing hachure spacing for closed contours between 12.7 mm and 76.2 mm in circumference |        | tick spacing 2.0 mm<br>  |  |
| 30.1.44  | Bathymetric depression or rise contours—Showing hachure spacing for closed contours more than 76.2 mm in circumference           |        | tick spacing 2.5 mm<br>  |  |

**30—TOPOGRAPHIC AND HYDROGRAPHIC FEATURES (continued)**

| REF NO   | DESCRIPTION   | SYMBOL  | CARTOGRAPHIC SPECIFICATIONS*   | NOTES ON USAGE   |
|--|---|---|--|--|
| <b>30.1—Topographic, bathymetric, and glacier contours (continued)</b> |   |   |  |  |
| 30.1.45  | Index contour on glacier or permanent snowfield   |  | lineweight .225 mm<br>line color 100% cyan   | On most maps, every fourth or fifth contour is an index contour. |
| 30.1.46  | Index contour on glacier or permanent snowfield—Approximate or indefinite                   |  | 2.5 mm<br>tick length .5 mm  |  |
| 30.1.47  | Intermediate contour on glacier or permanent snowfield                                      |  | lineweight .125 mm<br>line color 100% cyan   |  |
| 30.1.48  | Intermediate contour on glacier or permanent snowfield—Approximate or indefinite            |  | 2.5 mm<br>tick length .5 mm  |  |
| 30.1.49  | Index depression contour on glacier or permanent snowfield                                  |  | tick lineweight .15 mm;<br>length .5 mm;<br>spacing 3.0 mm<br>contour lineweight .225 mm<br>line color 100% cyan | Hachures are added to indicate closed areas of low values.       |
| 30.1.50  | Intermediate depression contour on glacier or permanent snowfield—Approximate or indefinite |  | tick length .5 mm;<br>spacing 3.0 mm<br>all lineweights .125 mm<br>line color 100% cyan                          |  |

\*For more information, see general guidelines on pages A-i to A-v.

**30—TOPOGRAPHIC AND HYDROGRAPHIC FEATURES (continued)**

| REF NO                        | DESCRIPTION   | SYMBOL | CARTOGRAPHIC SPECIFICATIONS*   | NOTES ON USAGE*   |
|-------------------------------|---|--------|--|---|
| <b>30.2—Drainage features</b> |   |        |  |   |
| 30.2.1                        | Perennial river, stream, or creek (single-line drainage)          |        | <br>line weight .2 mm line color 100% cyan   | Letter size and spacing may be increased along longer features. |
| 30.2.2                        | Intermittent river, stream, creek, or wash (single-line drainage) |        | <br>line weight .2 mm long dash length 4.3 mm; very short dash, .2 mm; spacing .6 mm color 100% cyan |   |
| 30.2.3                        | Perennial river, stream, or creek (double-line drainage)          |        | <br>TI-8 (100% black) color fill 20% cyan spacing may vary all line weights .2 mm                    | Letter size and spacing may be increased along wider features.  |
| 30.2.4                        | River mileage marker  |        | <br>line weight .2 mm H-6  |   |
| 30.2.5                        | Intermittent river, stream, creek, or wash (double-line drainage) |        | <br>pattern 132-C  |   |
| 30.2.6                        | Braided river, stream, or creek                                   |        | <br>all line weights .2 mm color 100% cyan   |   |
| 30.2.7                        | Canal or ditch (single-line drainage)                             |        | <br>line weight .2 mm HI-6 (100% cyan)   |   |
| 30.2.8                        | Canal or ditch (double-line drainage)                             |        | <br>color fill 20% cyan spacing may vary all line weights .2 mm                                      |   |
| 30.2.9                        | Canal lock (single-line drainage) (1st option)                    |        | <br>1.25 mm H-6 (100% black) line weight .325 mm   |   |
| 30.2.10                       | Canal lock (single-line drainage) (2nd option)                    |        | <br>H-6 (100% black) line weight .325 mm   |   |
| 30.2.11                       | Canal lock (double-line drainage)                                 |        | <br>line weight .325 mm width may vary   |   |
| 30.2.12                       | Floodgate   |        | <br>line weight .325 mm H-6 (100% black)   |   |
| 30.2.13                       | Tidegate  |        | <br>line weight .325 mm H-6 (100% black)   |   |
| 30.2.14                       | Sluice gate   |        | <br>line weight .325 mm H-6 (100% black)   |   |
| 30.2.15                       | Fish ladder   |        | <br>line weight .5 mm H-6 (100% black) length may vary   |   |
| 30.2.16                       | Aqueduct (single-line drainage)                                   |        | <br>line weight .2 mm HI-6 (100% cyan)   |   |
| 30.2.17                       | Aqueduct (double-line drainage)                                   |        | <br>color fill 20% cyan spacing may vary all line weights .2 mm                                      |   |
| 30.2.18                       | Underground or underwater aqueduct                                |        | <br>dash length 1.25 mm; spacing .5 mm   |   |
| 30.2.19                       | Aboveground water pipeline  |        | <br>HI-6 (100% cyan) line weight .2 mm   |   |
| 30.2.20                       | Underground or submerged water pipeline                           |        | <br>HI-6 (100% cyan) line weight .2 mm dash length 1.25 mm; spacing .5 mm                            |   |
| 30.2.21                       | Elevated water pipeline   |        | <br>wing length .575 mm; angle 45 degrees all line weights .2 mm HI-6 (100% cyan) line weight .2 mm  |   |
| 30.2.22                       | Flume   |        | <br>HI-6 (100% cyan) line weight .2 mm   |   |
| 30.2.23                       | Siphon  |        | <br>HI-6 (100% cyan) line weight .2 mm dash length 1.25 mm; spacing .5 mm                            |   |
| 30.2.24                       | Penstock  |        | <br>HI-6 (100% cyan) line weight .2 mm   |   |

**30—TOPOGRAPHIC AND HYDROGRAPHIC FEATURES (continued)**

| REF NO                                    | DESCRIPTION   | SYMBOL | CARTOGRAPHIC SPECIFICATIONS*  | NOTES ON USAGE*  |
|---|---|--------|---|--|
| <b>30.2—Drainage features (continued)</b> |   |        |   |  |
| 30.2.25                                   | Falls (single-line drainage)  |        | TBI-7 (100% black) → Falls<br>line color 100% cyan<br>all lineweights .2 mm<br>1.25 mm                                |  |
| 30.2.26                                   | Falls (double-line drainage)  |        | Falls<br>lineweights .125 mm  |  |
| 30.2.27                                   | Rapids (single-line drainage)   |        | Rapids<br>6 mm<br>1.25 mm   |  |
| 30.2.28                                   | Rapids (double-line drainage)   |        | Rapids<br>lineweights .125 mm   |  |
| 30.2.29                                   | Shoreline—Showing open water  |        | line color 100% cyan<br>color fill 20% cyan<br>lineweight .2 mm   |  |
| 30.2.30                                   | Indefinite or unsurveyed shoreline                                      |        | dash length 1.75 mm; spacing .5 mm  |  |
| 30.2.31                                   | Approximate mean low water line   |        | lineweight .15 mm   |  |
| 30.2.32                                   | Perennial lake or pond—Showing name                                     |        | TI-8 (100% black) → Bass Lake<br>line color 100% cyan<br>color fill 20% cyan<br>lineweight .2 mm                      | Letter size and spacing may be increased within larger features. |
| 30.2.33                                   | Intermittent lake or pond   |        | lineweight .2 mm; dash length 1.75 mm; spacing .5 mm<br>pattern 132-C<br>line color 100% cyan                         |  |
| 30.2.34                                   | Dry lake or pond  |        | pattern 132-B   |  |
| 30.2.35                                   | Land subject to inundation  |        | pattern 231-C (@90%)  |  |
| 30.2.36                                   | Reservoir with natural shoreline  |        | line color 100% cyan<br>color fill 20% cyan   |  |
| 30.2.37                                   | Dammed reservoir  |        | color fill 20% cyan<br>lineweight .3 mm   |  |
| 30.2.38                                   | Area to be submerged behind dam   |        | pattern 132-C   |  |
| 30.2.39                                   | Reservoir (uncovered) with man-made shoreline                           |        | color fill 20% cyan<br>lineweight .15 mm  |  |
| 30.2.40                                   | Covered water storage reservoir   |        | lineweight .15 mm<br>pattern 214-K (@45°) [pattern overprints 20% cyan color fill]                                    |  |
| 30.2.41                                   | Salt flat   |        | H-7 → Salt Flat<br>line color 100% cyan<br>lineweight .2 mm   |  |
| 30.2.42                                   | Carolina bay  |        | dash length 1.75 mm; spacing .5 mm<br>line color 100% cyan<br>lineweight .2 mm  |  |
| 30.2.43                                   | Tailings pond   |        | H-7 → Tailings Pond<br>line color 100% brown<br>pattern 232-B<br>dash length 1.75 mm; spacing .5 mm; lineweight .2 mm |  |
| 30.2.44                                   | Outline of glacier or permanent snowfield                               |        | color 100% cyan<br>lineweight .2 mm<br>dash length 1.75 mm; spacing .5 mm   |  |
| 30.2.45                                   | Outline of glacier or permanent snowfield—Form lines show glacial trend |        | pattern 522-C (rotated perpendicular to glacial trend)  |  |
| 30.2.46                                   | Marsh, wetland, swamp, or bog   |        | pattern 420-C   |  |
| 30.2.47                                   | Mangrove area   |        | pattern 424-C   |  |
| 30.2.48                                   | Rice field  |        | pattern 423-C   |  |

**30—TOPOGRAPHIC AND HYDROGRAPHIC FEATURES (continued)**

| REF NO  | DESCRIPTION  | SYMBOL               | CARTOGRAPHIC SPECIFICATIONS*   | NOTES ON USAGE*   |
|---|--|----------------------|--|---|
| <b>30.3—Miscellaneous topographic and hydrographic features</b> |  |                      |  |   |
| 30.3.1  | Open pit mine or quarry, as shown on topographic maps or on general-purpose or smaller scale maps                      | Quarry               | H-7 → Quarry<br>draft as shown   |   |
| 30.3.2  | Gravel, sand, clay, or borrow pit, as shown on topographic maps or on general-purpose or smaller scale maps            | Gravel Pit           | H-7 → Gravel Pit<br>2.235 mm<br>line weight .15 mm<br>.75 mm   |   |
| 30.3.3  | Adit or mine tunnel entrance, as shown on topographic maps or on general-purpose or smaller scale maps                 | Mine                 | H-7 → Mine<br>2.225 mm<br>1.175 mm<br>1.75 mm<br>55°<br>all line weights .15 mm                              | Rotate symbol so that long line points in direction of cave or mine entrance. |
| 30.3.4  | Cave entrance, as shown on topographic maps or on general-purpose or smaller scale maps                                | Cave                 | H-7 → Cave   |   |
| 30.3.5  | Prospect, as shown on topographic maps or on general-purpose or smaller scale maps                                     | Prospect             | H-7 → Prospect<br>line weight .15 mm<br>1.75 mm<br>45°   |   |
| 30.3.6  | Mine shaft, as shown on topographic maps or on general-purpose or smaller scale maps—Showing name                      | Garnet Mine          | line weight .15 mm<br>1.0 mm<br>Garnet Mine ← H-7  |   |
| 30.3.7  | Landmark object, as shown on topographic maps or on general-purpose or smaller scale maps                              | Lookout              | H-7 → Lookout<br>dot diameter .225 mm<br>circle diameter 1.0 mm<br>line weight .15 mm                        | Add label for type of object (as is shown for example of "lookout").          |
| 30.3.8  | Windmill, as shown on topographic maps or on general-purpose or smaller scale maps                                     | Windmill             | H-7 → Windmill<br>1.125 mm<br>1.25 mm<br>line weight .15 mm<br>675 mm<br>angles 110°, 70°                    |   |
| 30.3.9  | Oil or gas well, as shown on topographic maps or on general-purpose or smaller scale maps                              | Well                 | H-7 → Well<br>circle diameter 1.0 mm<br>line weight .15 mm   |   |
| 30.3.10   | Water well, as shown on topographic maps or on general-purpose or smaller scale maps                                   | Well                 | H-7 → Well<br>circle diameter 1.0 mm<br>line weight .2 mm<br>line color 100% cyan                            |   |
| 30.3.11   | Geothermal well, as shown on topographic maps or on general-purpose or smaller scale maps                              | Geothermal           | H-7 → Geothermal<br>circle diameter 1.0 mm<br>line weight .2 mm<br>line color 100% cyan                      |   |
| 30.3.12   | Spring, as shown on topographic maps or on general-purpose or smaller scale maps                                       | Spring               | H-7 → Spring<br>circle diameter 1.0 mm<br>draft "tail" as shown<br>line color 100% cyan<br>line weight .2 mm |   |
| 30.3.13   | Geyser, fumarole, mud pot, or thermal spring, as shown on topographic maps or on general-purpose or smaller scale maps | Geyser               | H-7 → Geyser<br>circle diameter 1.25 mm<br>line weight .2 mm<br>line color 100% cyan                         |   |
| 30.3.14   | Gaging station, as shown on topographic maps or on general-purpose or smaller scale maps                               | Gaging Station       | H-7 → Gaging Station<br>circle diameter 1.25 mm<br>line weight .15 mm  |   |
| 30.3.15   | Pumping station, as shown on topographic maps or on general-purpose or smaller scale maps                              | Pumping Station      | H-7 → Pumping Station<br>.875 mm   |   |
| 30.3.16   | Rock   | Rock                 | H-7 → Rock<br>line weight .2 mm<br>1.25 mm<br>60°  |   |
| 30.3.17   | Exposed wreck  |                      | line weight .15 mm<br>draft as shown   |   |
| 30.3.18   | Coral reef   | Coral                | H-7 → Coral<br>line weight .15 mm  |   |
| 30.3.19   | Shoal  | Shoal                | dash length .2 mm;<br>spacing .425 mm<br>Shoal ← H-7<br>line weight .2 mm                                    |   |
| 30.3.20   | Ruins  | Ruins                | dash length 1.0 mm;<br>spacing .5 mm<br>Ruins ← H-7<br>line weight .15 mm                                    |   |
| 30.3.21   | Power transmission line  |                      | line weight .125 mm<br>dot diameter .425 mm<br>.825 mm<br>line weight .125 mm                                |   |
| 30.3.22   | Telephone line   | TELEPHONE            | line weight .125 mm<br>dash length 2.5 mm; space .5 mm<br>TELEPHONE ← HI-5                                   |   |
| 30.3.23   | Underground gas or oil pipeline  | PIPELINE             | PIPELINE ← HI-5<br>line weight .125 mm   |   |
| 30.3.24   | Aboveground gas or oil pipeline  | ABOVEGROUND PIPELINE | ABOVEGROUND PIPELINE ← HI-5<br>line weight .125 mm   |   |

**31 – MISCELLANEOUS MAP ELEMENTS**

| REF NO | DESCRIPTION   | SYMBOL           | CARTOGRAPHIC SPECIFICATIONS*   | NOTES ON USAGE*  |
|--------|---|------------------|--|--|
| 31.1   | Township and range line—Definite  |                  | <i>line and text color 100% red</i>                                      | <p>On larger scale maps (for example, 1:24,000 scale), usually every section (nos. 1–36) is numbered.</p> <p>On smaller scale maps (for example, 1:100,000 scale), usually only corner sections (nos. 1, 6, 31, 36) are numbered (type size may be decreased if necessary). Every township and range, regardless of scale, should be numbered.</p> <p>May also be shown in 50% black, especially if contours or other base-map information is shown in 50% black (see Section 30.1).</p> |
| 31.2   | Township and range line—Location approximate  |                  | <i>lineweight .275 mm</i>  |  |
| 31.3   | Township label  | T 32 N           | <i>lineweight .15 mm</i>   |  |
| 31.4   | Range label   | R 44 E           | <i>lineweight .15 mm</i>   |  |
| 31.5   | Section line—Definite   |                  | <i>lineweight .275 mm; dash length 2.5 mm; space .5 mm</i>               |  |
| 31.6   | Section line—Location approximate   |                  | <i>lineweight .15 mm; dash length 2.5 mm; space .5 mm</i>                |  |
| 31.7   | Section number  | 5                |  |  |
| 31.8   | Map neatline  |                  | <i>lineweight .25 mm</i>   |  |
| 31.9   | Map neatline—Showing latitude or longitude tick and value                                   | 40°37'30"        | <i>lineweight .25 mm</i>   |  |
| 31.10  | Cross section line and label  | A—A'             | <i>lineweight .2 mm</i>  |  |
| 31.11  | Leader  |                  | <i>lineweight .175 mm</i>  |  |
| 31.12  | Map-unit label (add leader where necessary)   |                  | <i>contact [lineweight .15 mm]</i><br><i>leader [lineweight .175 mm]</i> |  |
| 31.13  | Map-unit label containing geologic age character (add leader where necessary)               |                  | <i>FG-8</i><br><i>H-8</i>  |  |
| 31.14  | Area of outcrop (1st option)  |                  | <i>100% black</i>  | <p>Patterns should overprint other map units. Do not outline with contact (use scratch boundary instead). May be shown in other colors.</p>  |
| 31.15  | Area of outcrop (2nd option)  |                  | <i>scratch boundary [lineweight 0.0 mm]</i><br><i>50% black</i>          |  |
| 31.16  | Area of outcrop (3rd option)  |                  | <i>100% red</i>  |  |
| 31.17  | Area of outcrop (4th option)  |                  | <i>50% red</i>   |  |
| 31.18  | Area of outcrop in surficial deposits (1st option)  |                  | <i>pattern 134-K</i>   |  |
| 31.19  | Area of outcrop in surficial deposits (2nd option)  |                  | <i>pattern 134-K in 50% black</i>  |  |
| 31.20  | Area of outcrop in surficial deposits (3rd option)  |                  | <i>pattern 134-R</i>   |  |
| 31.21  | Sample locality—Showing sample number   | ● 98-103         | <i>dot diameter 1.25 mm</i>  | <p>May be shown in red or other colors.</p>  |
| 31.22  | Field station locality, as shown on small-scale maps or on page-size illustrations          | ●                | <i>dot diameter .5 mm</i>  |  |
| 31.23  | Chronostratigraphic zone, chronozone, or stage boundary                                     |                  | <i>dot diameter .5 mm; spacing .5 mm</i><br><i>color 100% red</i>        | <p>May be shown in black or other colors. Names may either be placed along zone boundary or within zones.</p>  |
| 31.24  | Chronostratigraphic-zone, chronozone, or stage boundary—Showing names of stratigraphic ages | Aptian<br>Albian | <i>color 100% red</i>  |  |

\*For more information, see general guidelines on pages A-i to A-v.

**32—GEOLOGIC AGE SYMBOL FONT ("FGDC-GeoAge")**

| REF NO | STRATIGRAPHIC AGE         | SUBDIVISION TYPE | AGE SYMBOL*    | KEYBOARD POSITION FOR "FGDC-GeoAge" FONT*            |
|--------|---------------------------|------------------|----------------|--|
| 32.1   | Cenozoic                  | Era              | Cz             | { (left curly bracket = shift-left square bracket)   |
| 32.2   | Quaternary                | Period           | Q              | No keyboard substitution needed (or, use Helvetica)  |
| 32.3   | Tertiary                  | Period           | T              | No keyboard substitution needed (or, use Helvetica)  |
| 32.4   | Neogene                   | Subperiod        | N              | No keyboard substitution needed (or, use Helvetica)  |
| 32.5   | Paleogene                 | Subperiod        | Pē             | : (colon = shift-semi-colon)                         |
| 32.6   | Mesozoic                  | Era              | Mz             | } (right curly bracket = shift-right square bracket) |
| 32.7   | Cretaceous                | Period           | K              | No keyboard substitution needed (or, use Helvetica)  |
| 32.8   | Jurassic                  | Period           | J              | No keyboard substitution needed (or, use Helvetica)  |
| 32.9   | Triassic                  | Period           | T̄             | ^ (caret = shift-6)                                  |
| 32.10  | Paleozoic                 | Era              | Pz             | (vertical line = shift-backslash)                    |
| 32.11  | Permian                   | Period           | P              | No keyboard substitution needed (or, use Helvetica)  |
| 32.12  | Carboniferous             | Period           | C              | No keyboard substitution needed (or, use Helvetica)  |
| 32.13  | Pennsylvanian             | Period           | P*             | * (asterisk = shift-8)                               |
| 32.14  | Mississippian             | Period           | M              | No keyboard substitution needed (or, use Helvetica)  |
| 32.15  | Devonian                  | Period           | D              | No keyboard substitution needed (or, use Helvetica)  |
| 32.16  | Silurian                  | Period           | S              | No keyboard substitution needed (or, use Helvetica)  |
| 32.17  | Ordovician                | Period           | O              | No keyboard substitution needed (or, use Helvetica)  |
| 32.18  | Cambrian                  | Period           | €              | _ (underscore = shift-hyphen)                        |
| 32.19  | Precambrian               | Era              | p€             | = (equal sign)                                       |
| 32.20  | Proterozoic               | Eon              | P              | < ("less than" sign = shift-comma)                   |
| 32.21  | Late Proterozoic          | Era              | Z              | No keyboard substitution needed (or, use Helvetica)  |
| 32.22  | Middle Proterozoic        | Era              | Y              | No keyboard substitution needed (or, use Helvetica)  |
| 32.23  | Late Middle Proterozoic   | Era              | Y <sup>3</sup> | E (capital E = shift-e)                              |
| 32.24  | Middle Middle Proterozoic | Era              | Y <sup>2</sup> | F (capital F = shift-f)                              |

\*For more information, see general guidelines on pages A-i to A-v.

**32—GEOLOGIC AGE SYMBOL FONT ("FGDC-GeoAge") (continued)**

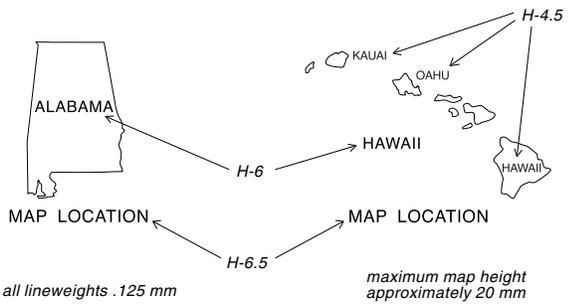
| REF NO | STRATIGRAPHIC AGE        | SUBDIVISION TYPE | AGE SYMBOL*    | KEYBOARD POSITION FOR "FGDC-GeoAge" FONT*           |
|--------|--------------------------|------------------|----------------|---|
| 32.25  | Early Middle Proterozoic | Era              | Y <sup>1</sup> | G (capital G = shift-g)                             |
| 32.26  | Early Proterozoic        | Era              | X              | No keyboard substitution needed (or, use Helvetica) |
| 32.27  | Late Early Proterozoic   | Era              | X <sup>3</sup> | I (capital I = shift-i)                             |
| 32.28  | Middle Early Proterozoic | Era              | X <sup>2</sup> | L (capital L = shift-l)                             |
| 32.29  | Early Early Proterozoic  | Era              | X <sup>1</sup> | R (capital R = shift-r)                             |
| 32.30  | Archean                  | Eon              | A              | No keyboard substitution needed (or, use Helvetica) |
| 32.31  | Late Archean             | Era              | W              | No keyboard substitution needed (or, use Helvetica) |
| 32.32  | Middle Archean           | Era              | V              | No keyboard substitution needed (or, use Helvetica) |
| 32.33  | Early Archean            | Era              | U              | No keyboard substitution needed (or, use Helvetica) |
| 32.34  | pre-Archean              | Eon              | pA             | B (capital B = shift-b)                             |

*\*For more information, see general guidelines on pages A-i to A-v.*

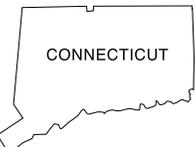
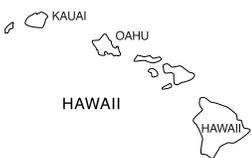
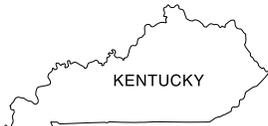
**33—SUGGESTED RANGES OF MAP-UNIT COLORS FOR VOLCANIC AND PLUTONIC ROCKS AND FOR STRATIGRAPHIC AGES OF SEDIMENTARY AND METAMORPHIC ROCKS**

| CMYK* values (K = 0): A = 8%; 1 = 13%; 2 = 20%; 3 = 30%; 4 = 40%; 5 = 50%; 6 = 60%; 7 = 70%; X = 100% |     |     |     |     |     |     |     |     |     |
|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 33.1—Suggested range of map-unit colors for volcanic and plutonic rocks*                              |     |     |     |     |     |     |     |     |     |
| 010   | 030 | 050 | 070 | 0X0 | 057 | 07X | 036 | 047 | 05X |
| A60   | 270 | 3X0 | 150 | 370 | 5X0 | 033 | 055 | 077 | 0XX |
| 33.2—Suggested range of map-unit colors for stratigraphic ages of sedimentary and metamorphic rocks*  |     |     |     |     |     |     |     |     |     |
| Q<br>007  | 001 |     | 0A6 |     | 005 |     | 003 |     |     |
| T<br>037  | 0A3 | A4X | A37 | 026 | 014 | A25 | 024 |     |     |
| K<br>507  | 104 | 517 | 415 | 406 | 305 |     |     |     |     |
| J<br>604  | 202 | 705 | 504 | 303 |     |     |     |     |     |
| Ṛ<br>602  | 20A | 6A3 | 402 | 301 |     |     |     |     |     |
| P<br>600  | 300 | 701 | 501 | 40A |     |     |     |     |     |
| Ṗ<br>620  | 4A0 | 72A | 61A | 510 |     |     |     |     |     |
| M<br>431  | 21A | 531 | 42A | 32A |     |     |     |     |     |
| D<br>540  | 220 | 650 | 440 | 330 |     |     |     |     |     |
| S<br>350  | A20 | 460 | 34A | 230 |     |     |     |     |     |
| O<br>051  | 02A | A51 | 041 | 031 |     |     |     |     |     |
| €<br>054  | 022 | A54 | 043 | A33 |     |     |     |     |     |
| p€<br>446   | A11 | 455 | 344 | 233 | 122 | 121 |     |     |     |
|   | A12 | 457 | 346 | 235 | 124 | A13 |     |     |     |
|   | 1A3 | 537 | 436 | 326 | 324 | 214 |     |     |     |
|   | 1AA | 533 | 433 | 422 | 322 | 211 |     |     |     |

**34—STATE LOCATION MAPS**

| CARTOGRAPHIC SPECIFICATIONS  | NOTES ON USAGE  |
|--|---|
|  <p>all lineweights .125 mm<br/>             maximum map height approximately 20 mm</p> | <p>State location maps are at various scales; projection is Albers Equal-Area, based on parallels 29 1/2° and 45 1/2°.</p> <p>Maps are modified from the United States Base Map (U.S. Geological Survey, 1965, scale 1:3,168,000) and the Digital Shaded-Relief Image of Alaska (J.R. Riehle and others, 1997, U.S. Geological Survey Miscellaneous Investigations Map I-2585, scale 1:2,500,000; see fig. 2, approximate scale 1:8,000,000).</p> <p>To show a quadrangle or map-area location, place a small black-filled rectangle (■) or polygon (▭) that shows the approximate location within state (adjust size and shape accordingly). Reposition state name if necessary.</p> <p>If a quadrangle or map-area location is within two or more adjoining states, create one new location map that contains each state. Extract states from location map of 48 conterminous states (see Section 34.2). Rotate new location map so that it is approximately horizontal, and resize it so that it is about 2–2.5 cm high. Add rectangle or polygon showing location of mapped area, then add names to each state. Center "MAP LOCATION" below new location map.</p> |

**34.1—Individual states; District of Columbia; Guam; Puerto Rico; U.S. Virgin Islands**

|  |  |   |   |  |
|--|--|---|---|--|
| <br>ALABAMA<br>MAP LOCATION     | <br>ALASKA<br>MAP LOCATION    | <br>ARIZONA<br>MAP LOCATION    | <br>ARKANSAS<br>MAP LOCATION       |  |
| <br>CALIF.<br>MAP LOCATION     | <br>COLORADO<br>MAP LOCATION | <br>CONNECTICUT<br>MAP LOCATION | <br>DEL.<br>MAP LOCATION          | <br>DISTRICT OF COLUMBIA<br>MAP LOCATION |
| <br>FLORIDA<br>MAP LOCATION   | <br>GEORGIA<br>MAP LOCATION | <br>GUAM<br>MAP LOCATION       | <br>HAWAII<br>MAP LOCATION        | <br>IDAHO<br>MAP LOCATION               |
| <br>ILLINOIS<br>MAP LOCATION  | <br>INDIANA<br>MAP LOCATION | <br>IOWA<br>MAP LOCATION       | <br>KANSAS<br>MAP LOCATION        | <br>KENTUCKY<br>MAP LOCATION            |
| <br>LOUISIANA<br>MAP LOCATION | <br>MAINE<br>MAP LOCATION   | <br>MARYLAND<br>MAP LOCATION   | <br>MASSACHUSETTS<br>MAP LOCATION | <br>MICHIGAN<br>MAP LOCATION            |

**34—STATE LOCATION MAPS (continued)**

**34.1—Individual states; District of Columbia; Guam; Puerto Rico; U.S. Virgin Islands (continued)**



MAP LOCATION



MAP LOCATION



MAP LOCATION



MAP LOCATION



MAP LOCATION



MAP LOCATION



MAP LOCATION



MAP LOCATION



MAP LOCATION



MAP LOCATION



MAP LOCATION



MAP LOCATION



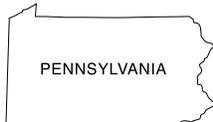
MAP LOCATION



MAP LOCATION



MAP LOCATION



MAP LOCATION



MAP LOCATION



MAP LOCATION



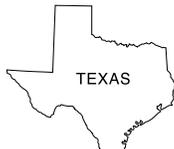
MAP LOCATION



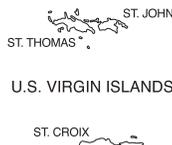
MAP LOCATION



MAP LOCATION



MAP LOCATION



MAP LOCATION



MAP LOCATION



MAP LOCATION



MAP LOCATION



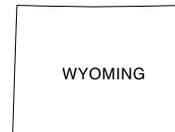
MAP LOCATION



MAP LOCATION



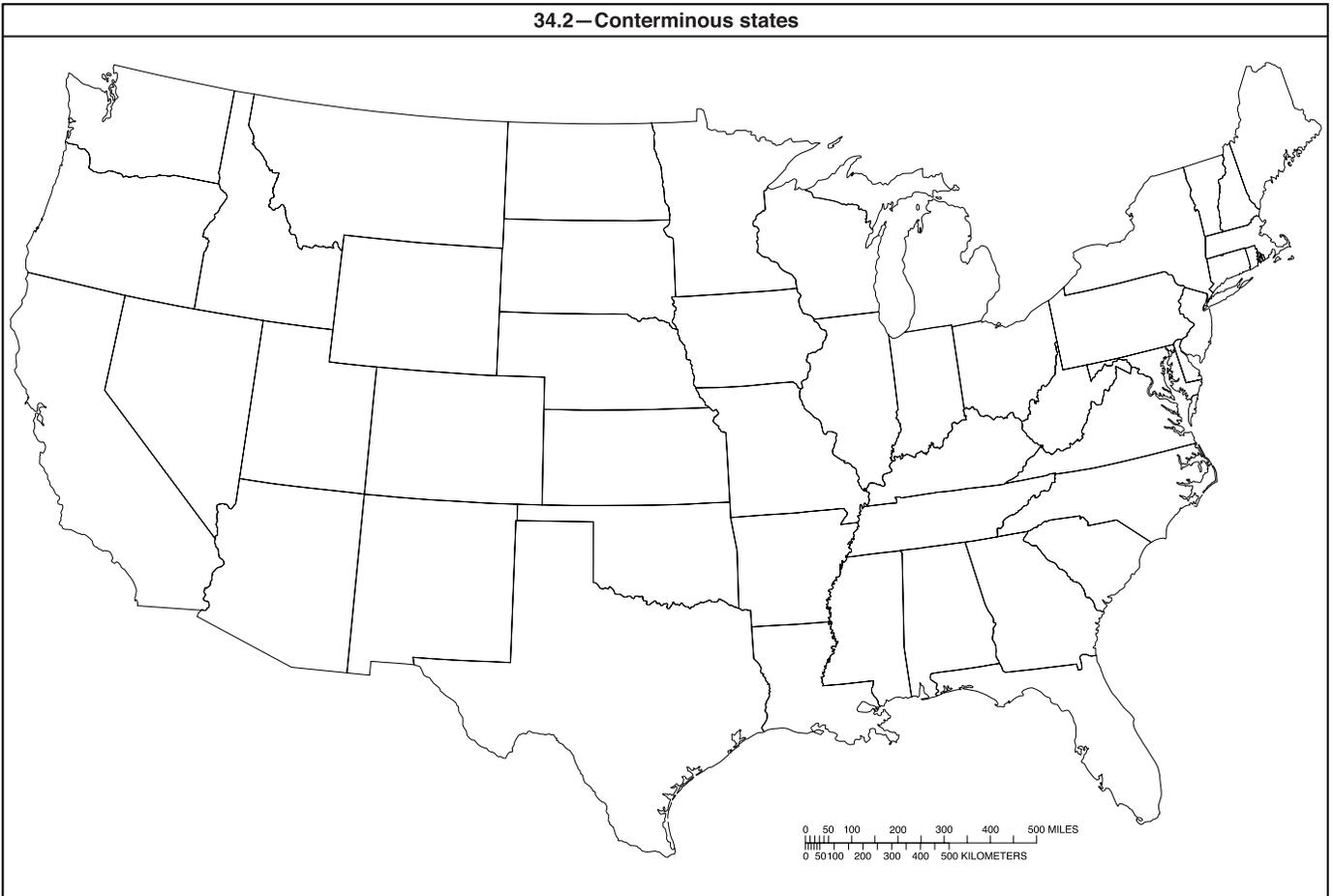
MAP LOCATION



MAP LOCATION

**34—STATE LOCATION MAPS (continued)**

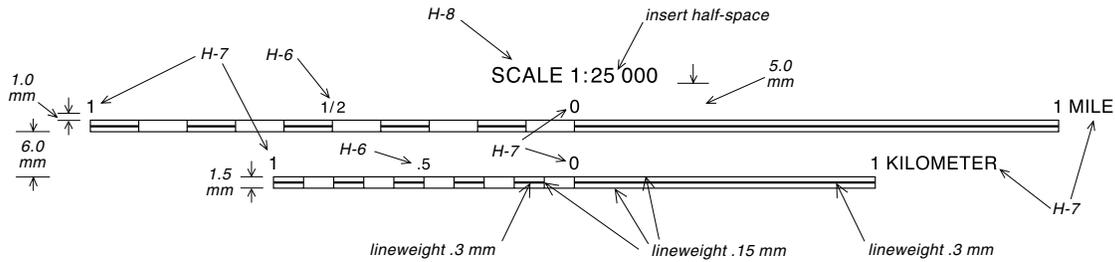
**34.2—Conterminous states**



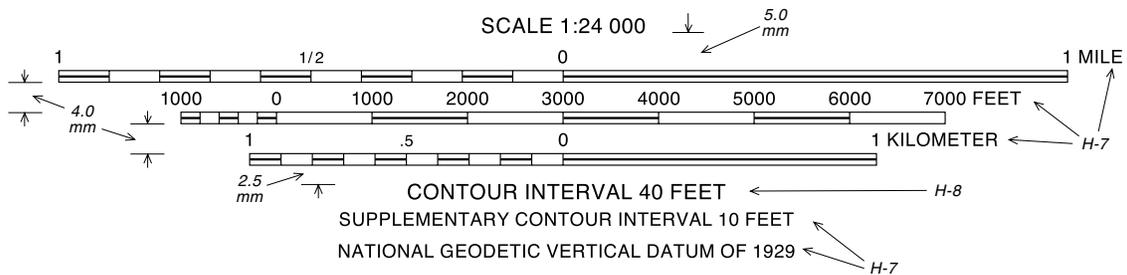
### 35—BAR SCALES

#### CARTOGRAPHIC SPECIFICATIONS

#### 2 UNITS OF MEASUREMENT:



#### 3 UNITS OF MEASUREMENT:



#### DISTANCE MEASURES

#### MEASUREMENT EQUIVALENTS

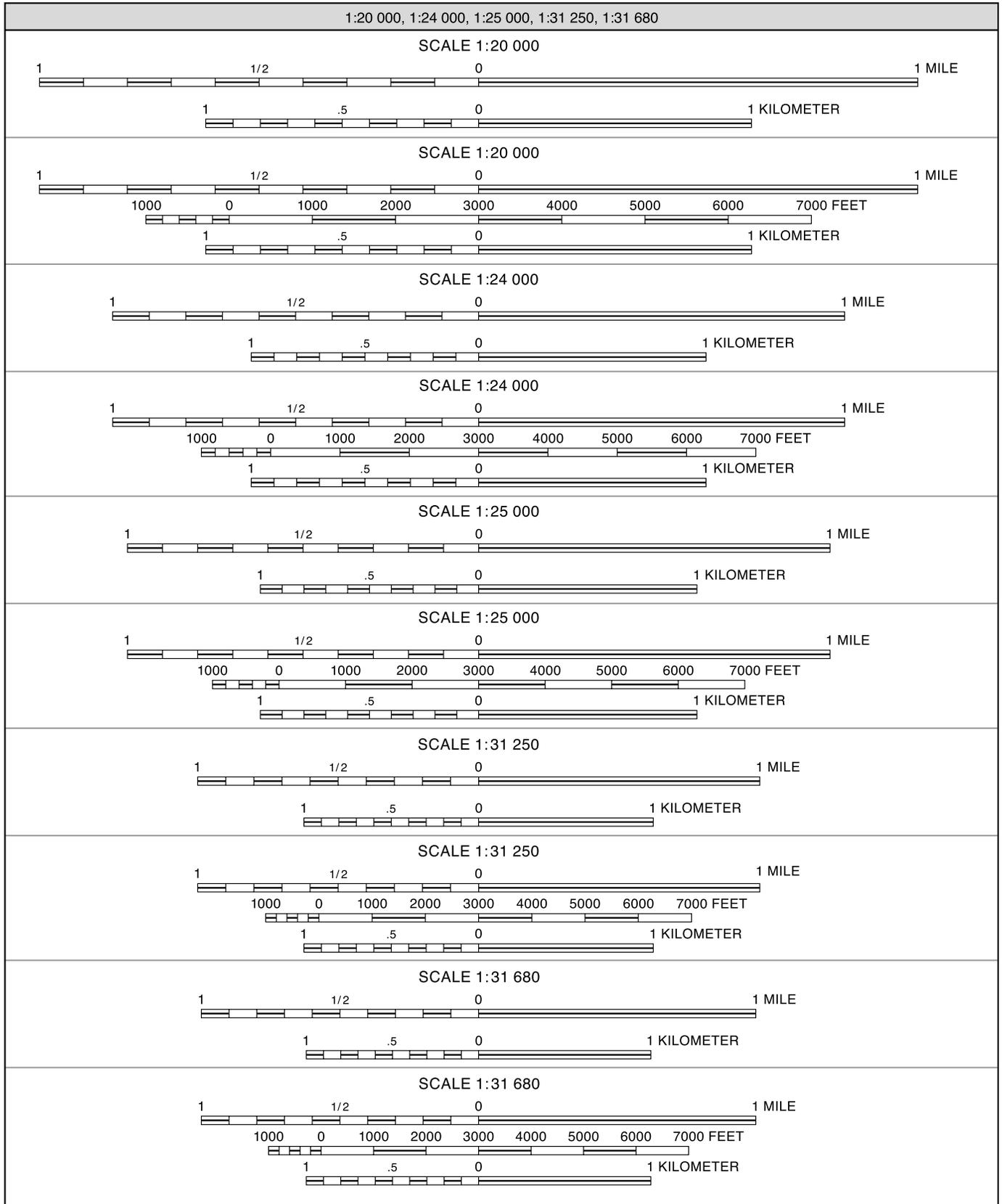
1 mile (mi) = 63,360 inches (in)  
 = 5,280 feet (ft)

1 kilometer (km) = 3,280.833 ft  
 = 0.62137 mi

| Metric            | English   |
|-------------------|---|
| 1 millimeter (mm) | = 1/10 cm<br>= 1/1000 m<br>= 0.039 in   |
| 1 centimeter (cm) | = 10 mm<br>= 1/100 m<br>= 0.393 in  |
| 1 meter (m)       | = 100 cm<br>= 1,000 mm<br>= 1/1,000 km<br>= 39.37 in<br>or 3.28 ft<br>or 0.00062 mi |
| 1 kilometer (km)  | = 1,000 m<br>= 100,000 cm<br>= 1,000,000 mm<br>= 3,280.833 ft<br>or 0.62137 mi      |

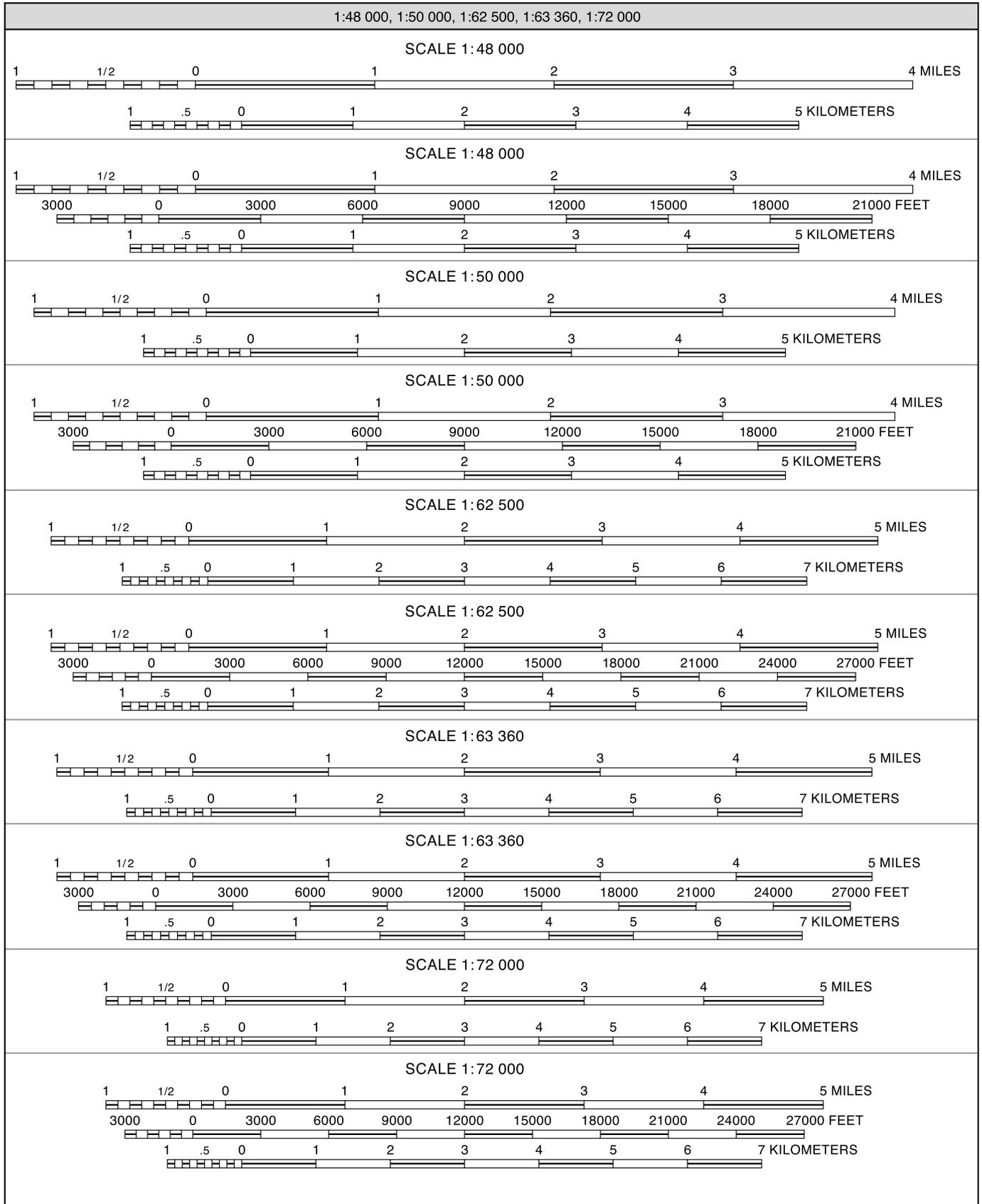
**35—BAR SCALES (continued)**

1:20 000, 1:24 000, 1:25 000, 1:31 250, 1:31 680



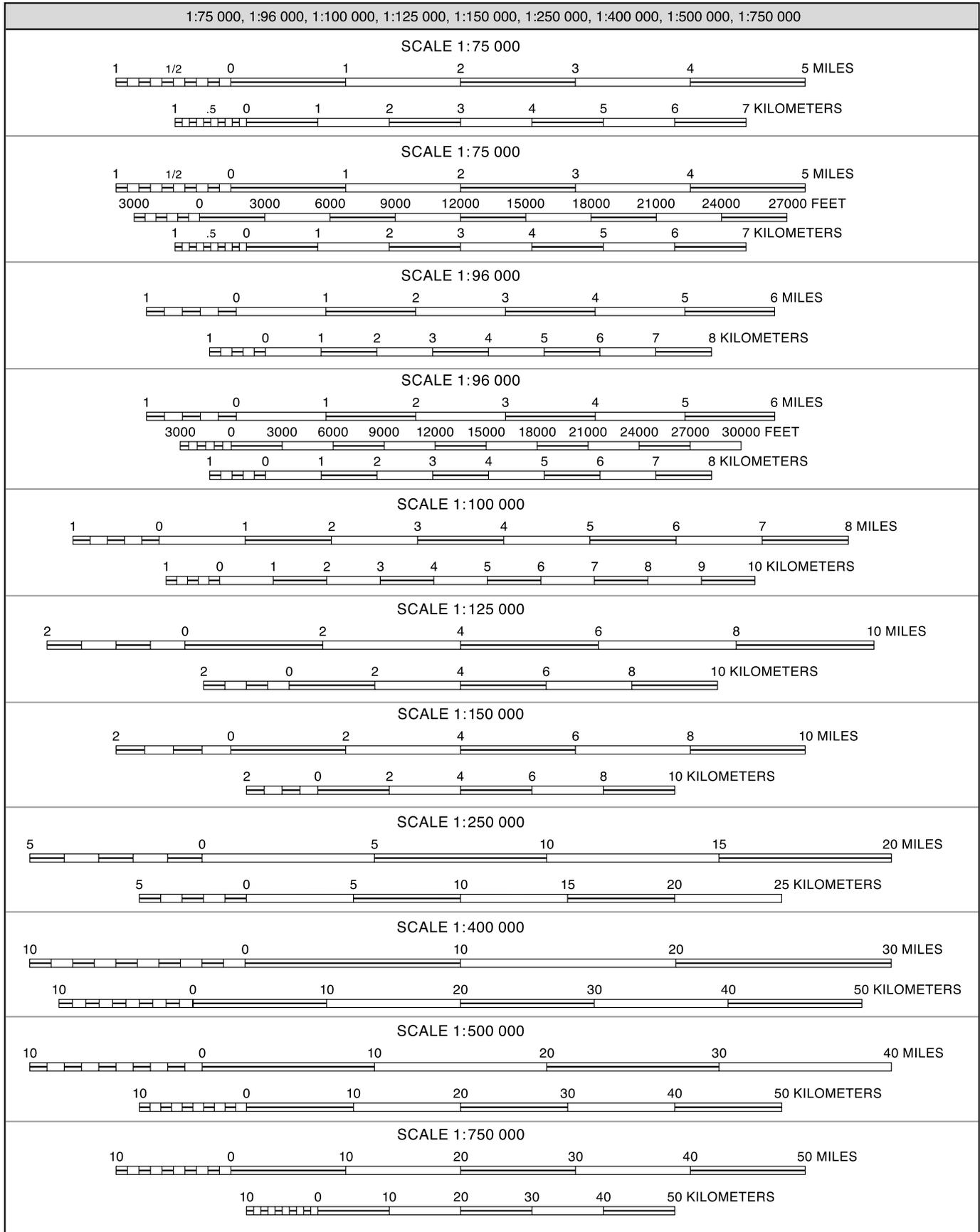
**35—BAR SCALES (continued)**

1:48 000, 1:50 000, 1:62 500, 1:63 360, 1:72 000



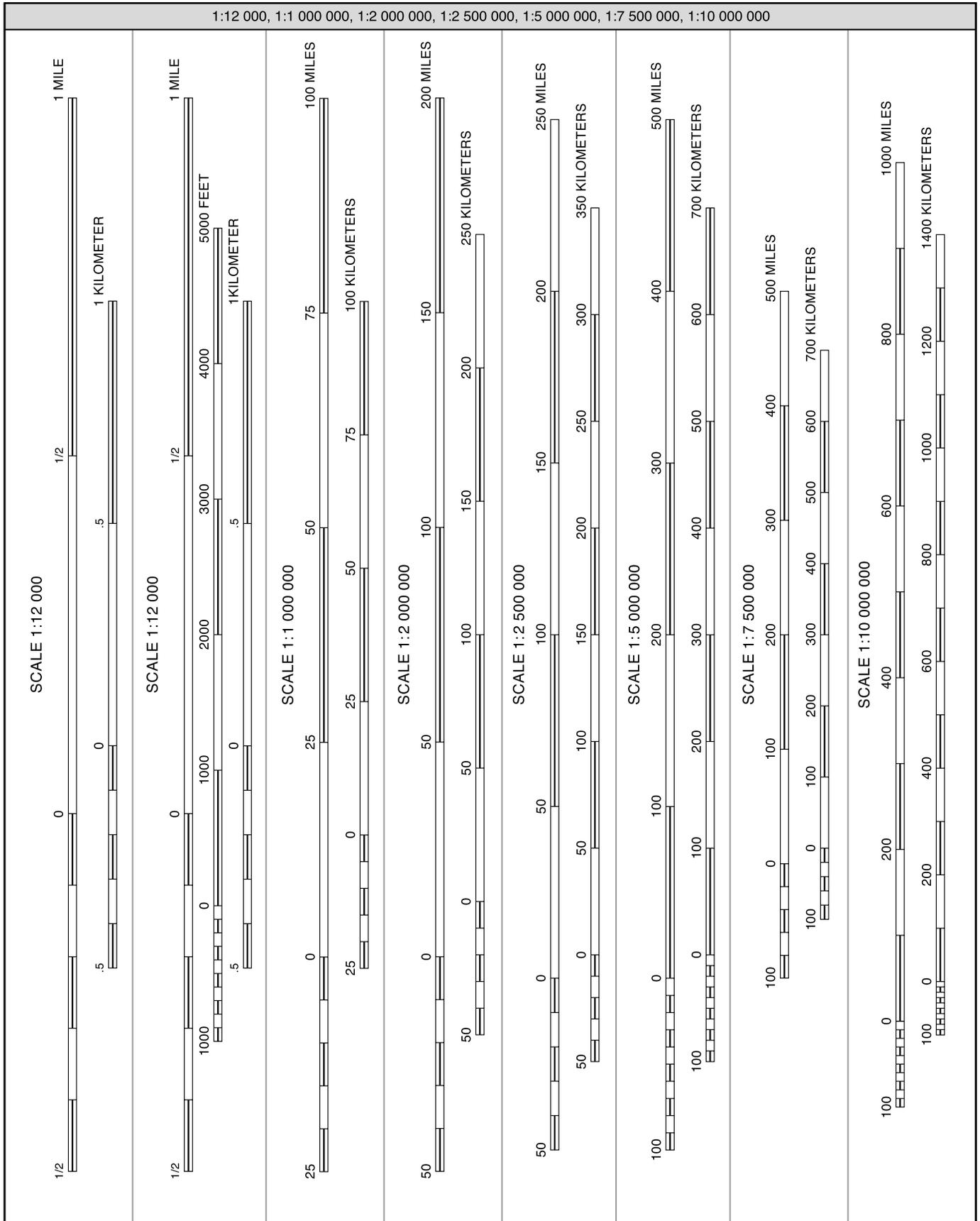
**35—BAR SCALES (continued)**

1:75 000, 1:96 000, 1:100 000, 1:125 000, 1:150 000, 1:250 000, 1:400 000, 1:500 000, 1:750 000



**35—BAR SCALES (continued)**

1:12 000, 1:1 000 000, 1:2 000 000, 1:2 500 000, 1:5 000 000, 1:7 500 000, 1:10 000 000



**35—BAR SCALES (continued)**

| BAR SCALE CALCULATIONS — MILES (1 mile = 63,360 inches) |                             |                     |   |                |                      |  |                             |
|---|-----------------------------|---------------------|---|----------------|----------------------|--|-----------------------------|
| FRACTIONAL SCALE  | SCALE TO MAP REPRESENTATION |                     | TO FIND MILES PER INCH (x in ratio)               | MILES PER INCH | TOTAL MILES ON SCALE | TO FIND TOTAL SCALE LENGTH IN INCHES (y in ratio)                        | TOTAL SCALE LENGTH (INCHES) |
|   | Scale Unit :                | represents Map Unit | Use ratio below or $\frac{\text{SCALE}}{63\ 360}$ |                |                      | Use ratio below or $\frac{\text{Miles on scale}}{\text{Miles per inch}}$ |                             |
| 1:12 000  | 1inch                       | 12 000 in           | $\frac{63\ 360}{1} = \frac{12\ 000}{x}$           | 0.1893939      | 1.5                  | $\frac{0.1893939}{1} = \frac{1.5}{y}$                                    | 7.920                       |
| 1:20 000  | 1inch                       | 20 000 in           | $\frac{63\ 360}{1} = \frac{20\ 000}{x}$           | 0.3156565      | 2                    | $\frac{0.3156565}{1} = \frac{2}{y}$                                      | 6.336                       |
| 1:24 000  | 1inch                       | 24 000 in           | $\frac{63\ 360}{1} = \frac{24\ 000}{x}$           | 0.3787878      | 2                    | $\frac{0.3787878}{1} = \frac{2}{y}$                                      | 5.280                       |
| 1:25 000  | 1inch                       | 25 000 in           | $\frac{63\ 360}{1} = \frac{25\ 000}{x}$           | 0.3945707      | 2                    | $\frac{0.3945707}{1} = \frac{2}{y}$                                      | 5.068                       |
| 1:31 250  | 1inch                       | 31 250 in           | $\frac{63\ 360}{1} = \frac{31\ 250}{x}$           | 0.4932133      | 2                    | $\frac{0.4932133}{1} = \frac{2}{y}$                                      | 4.055                       |
| 1:31 680  | 1inch                       | 31 680 in           | $\frac{63\ 360}{1} = \frac{31\ 680}{x}$           | 0.500          | 2                    | $\frac{0.500}{1} = \frac{2}{y}$  | 4.000                       |
| 1:48 000  | 1inch                       | 48 000 in           | $\frac{63\ 360}{1} = \frac{48\ 000}{x}$           | 0.7575757      | 5                    | $\frac{0.7575757}{1} = \frac{5}{y}$                                      | 6.600                       |
| 1:50 000  | 1inch                       | 50 000 in           | $\frac{63\ 360}{1} = \frac{50\ 000}{x}$           | 0.7891414      | 5                    | $\frac{0.7891414}{1} = \frac{5}{y}$                                      | 6.336                       |
| 1:62 500  | 1inch                       | 62 500 in           | $\frac{63\ 360}{1} = \frac{62\ 500}{x}$           | 0.9864267      | 6                    | $\frac{0.9864267}{1} = \frac{6}{y}$                                      | 6.082                       |
| 1:63 360  | 1inch                       | 63 360 in           | $\frac{63\ 360}{1} = \frac{63\ 360}{x}$           | 1.000          | 6                    | $\frac{1.000}{1} = \frac{6}{y}$  | 6.000                       |
| 1:72 000  | 1inch                       | 72 000 in           | $\frac{63\ 360}{1} = \frac{72\ 000}{x}$           | 1.1363636      | 6                    | $\frac{1.1363636}{1} = \frac{6}{y}$                                      | 5.280                       |
| 1:75 000  | 1inch                       | 75 000 in           | $\frac{63\ 360}{1} = \frac{75\ 000}{x}$           | 1.1837121      | 6                    | $\frac{1.1837121}{1} = \frac{6}{y}$                                      | 5.068                       |
| 1:96 000  | 1inch                       | 96 000 in           | $\frac{63\ 360}{1} = \frac{96\ 000}{x}$           | 1.5151515      | 7                    | $\frac{1.5151515}{1} = \frac{7}{y}$                                      | 4.620                       |
| 1:100 000   | 1inch                       | 100 000 in          | $\frac{63\ 360}{1} = \frac{100\ 000}{x}$          | 1.5782828      | 9                    | $\frac{1.5782828}{1} = \frac{9}{y}$                                      | 5.702                       |
| 1:125 000   | 1inch                       | 125 000 in          | $\frac{63\ 360}{1} = \frac{125\ 000}{x}$          | 1.9728535      | 12                   | $\frac{1.9728535}{1} = \frac{12}{y}$                                     | 6.082                       |
| 1:150 000   | 1inch                       | 150 000 in          | $\frac{63\ 360}{1} = \frac{150\ 000}{x}$          | 2.3674242      | 12                   | $\frac{2.3674242}{1} = \frac{12}{y}$                                     | 5.068                       |

**To find miles per inch on 1: 12 000 map . . .**

63,360 inches = 1 mile  
 Show in ratio as ...  
 $\frac{63\ 360}{1}$  inches  
 miles

Let SCALE (12 000) be in inches  
 Fractional scale says 1 inch represents 12,000 in  
 Let x be miles that 1 inch represents on map  
 Show in ratio as ...  
 $\frac{12\ 000}{x}$  inches  
 miles

**Solution . . .**

$$\frac{63\ 360}{1} = \frac{12\ 000}{x}$$

$$63\ 360 \cdot x = 12\ 000 \cdot 1$$

$$\frac{63\ 360 x}{63\ 360} = \frac{12\ 000}{63\ 360}$$

$$x = \frac{12\ 000}{63\ 360} \text{ (SCALE)}$$

$$x = 0.1893939$$

**35—BAR SCALES (continued)**

| BAR SCALE CALCULATIONS — MILES (1 mile = 63,360 inches)—continued |                             |                     |   |                |                      |  |                             |
|---|-----------------------------|---------------------|---|----------------|----------------------|--|-----------------------------|
| FRACTIONAL SCALE  | SCALE TO MAP REPRESENTATION |                     | TO FIND MILES PER INCH (x in ratio)               | MILES PER INCH | TOTAL MILES ON SCALE | TO FIND TOTAL SCALE LENGTH IN INCHES (y in ratio)                        | TOTAL SCALE LENGTH (INCHES) |
|   | Scale Unit                  | represents Map Unit | Use ratio below or $\frac{\text{SCALE}}{63\,360}$ |                |                      | Use ratio below or $\frac{\text{Miles on scale}}{\text{Miles per inch}}$ |                             |
| 1:250 000   | 1inch                       | 250 000 in          | $\frac{63\,360}{1} = \frac{250\,000}{x}$          | 3.945707       | 25                   | $\frac{3.945707}{1} = \frac{25}{y}$                                      | 6.336                       |
| 1:400 000   | 1inch                       | 400 000 in          | $\frac{63\,360}{1} = \frac{400\,000}{x}$          | 6.3131313      | 40                   | $\frac{6.3131313}{1} = \frac{40}{y}$                                     | 6.336                       |
| 1:500 000   | 1inch                       | 500 000 in          | $\frac{63\,360}{1} = \frac{500\,000}{x}$          | 7.8914141      | 50                   | $\frac{7.8914141}{1} = \frac{50}{y}$                                     | 6.336                       |
| 1:750 000   | 1inch                       | 750 000 in          | $\frac{63\,360}{1} = \frac{750\,000}{x}$          | 11.837121      | 60                   | $\frac{11.837121}{1} = \frac{60}{y}$                                     | 5.068                       |
| 1:1 000 000   | 1inch                       | 1 000 000 in        | $\frac{63\,360}{1} = \frac{1\,000\,000}{x}$       | 15.782828      | 125                  | $\frac{15.782828}{1} = \frac{125}{y}$                                    | 7.920                       |
| 1:2 000 000   | 1inch                       | 2 000 000 in        | $\frac{63\,360}{1} = \frac{2\,000\,000}{x}$       | 31.565656      | 250                  | $\frac{31.565656}{1} = \frac{250}{y}$                                    | 7.920                       |
| 1:2 500 000   | 1inch                       | 2 500 000 in        | $\frac{63\,360}{1} = \frac{2\,500\,000}{x}$       | 39.45707       | 300                  | $\frac{39.45707}{1} = \frac{300}{y}$                                     | 7.603                       |
| 1:5 000 000   | 1inch                       | 5 000 000 in        | $\frac{63\,360}{1} = \frac{5\,000\,000}{x}$       | 78.914141      | 600                  | $\frac{78.914141}{1} = \frac{600}{y}$                                    | 7.603                       |
| 1:7 500 000   | 1inch                       | 7 500 000 in        | $\frac{63\,360}{1} = \frac{7\,500\,000}{x}$       | 118.37121      | 600                  | $\frac{118.37121}{1} = \frac{600}{y}$                                    | 5.068                       |
| 1:10 000 000  | 1inch                       | 10 000 000 in       | $\frac{63\,360}{1} = \frac{10\,000\,000}{x}$      | 157.82828      | 1100                 | $\frac{157.82828}{1} = \frac{1100}{y}$                                   | 6.969                       |

**To find miles per inch on 1: 250 000 map . . .**

63,360 inches = 1 mile  
 Show in ratio as ...  
 $\frac{63\,360}{1} \frac{\text{inches}}{\text{miles}}$

Let SCALE (250 000) be in inches  
 Fractional scale says 1 inch represents 250,000 in  
 Let x be miles that 1 inch represents on map  
 Show in ratio as ...  
 $\frac{250\,000}{x} \frac{\text{inches}}{\text{miles}}$

**Solution . . .**

$$63\,360 \cdot x = 250\,000 \cdot 1$$

$$\frac{63\,360}{1} = \frac{250\,000}{x}$$

$$\frac{63\,360 x}{63\,360} = \frac{250\,000}{63\,360}$$

$$x = \frac{250\,000}{63\,360} \text{ (SCALE)}$$

$$x = 3.945707$$

**35—BAR SCALES (continued)**

| BAR SCALE CALCULATIONS — FEET (1 foot = 12 inches) |                             |                     |                                       |               |                     |  |                             |
|--|-----------------------------|---------------------|---------------------------------------|---------------|---------------------|--|-----------------------------|
| FRACTIONAL SCALE                                   | SCALE TO MAP REPRESENTATION |                     | TO FIND FEET PER INCH (x in ratio)    | FEET PER INCH | TOTAL FEET ON SCALE | TO FIND TOTAL SCALE LENGTH IN INCHES (y in ratio)            | TOTAL SCALE LENGTH (INCHES) |
|  | Scale Unit :                | represents Map Unit | Use ratio below or $\frac{SCALE}{12}$ |               |                     | Use ratio below or $\frac{Feet\ on\ scale}{Feet\ per\ inch}$ |                             |
| 1:12 000   | 1inch                       | 12 000 in           | $\frac{12}{1} = \frac{12\ 000}{x}$    | 1000.000      | 6000                | $\frac{1000.000}{1} = \frac{6000}{y}$                        | 6.000                       |
| 1:20 000   | 1inch                       | 20 000 in           | $\frac{12}{1} = \frac{20\ 000}{x}$    | 1666.6666     | 8000                | $\frac{1666.6666}{1} = \frac{8000}{y}$                       | 4.800                       |
| 1:24 000   | 1inch                       | 24 000 in           | $\frac{12}{1} = \frac{24\ 000}{x}$    | 2000.000      | 8000                | $\frac{2000.000}{1} = \frac{8000}{y}$                        | 4.000                       |
| 1:25 000   | 1inch                       | 25 000 in           | $\frac{12}{1} = \frac{25\ 000}{x}$    | 2083.3333     | 8000                | $\frac{2083.3333}{1} = \frac{8000}{y}$                       | 3.840                       |
| 1:31 250   | 1inch                       | 31 250 in           | $\frac{12}{1} = \frac{31\ 250}{x}$    | 2604.1666     | 8000                | $\frac{2604.1666}{1} = \frac{8000}{y}$                       | 3.072                       |
| 1:31 680   | 1inch                       | 31 680 in           | $\frac{12}{1} = \frac{31\ 680}{x}$    | 2640.000      | 8000                | $\frac{2640.000}{1} = \frac{8000}{y}$                        | 3.030                       |
| 1:48 000   | 1inch                       | 48 000 in           | $\frac{12}{1} = \frac{48\ 000}{x}$    | 4000.000      | 24 000              | $\frac{4000.000}{1} = \frac{24\ 000}{y}$                     | 6.000                       |
| 1:50 000   | 1inch                       | 50 000 in           | $\frac{12}{1} = \frac{50\ 000}{x}$    | 4166.6666     | 24 000              | $\frac{4166.6666}{1} = \frac{24\ 000}{y}$                    | 5.760                       |
| 1:62 500   | 1inch                       | 62 500 in           | $\frac{12}{1} = \frac{62\ 500}{x}$    | 5208.3333     | 30 000              | $\frac{5208.3333}{1} = \frac{30\ 000}{y}$                    | 5.760                       |
| 1:63 360   | 1inch                       | 63 360 in           | $\frac{12}{1} = \frac{63\ 360}{x}$    | 5280.000      | 30 000              | $\frac{5280.000}{1} = \frac{30\ 000}{y}$                     | 5.681                       |
| 1:72 000   | 1inch                       | 72 000 in           | $\frac{12}{1} = \frac{72\ 000}{x}$    | 6000.000      | 30 000              | $\frac{6000.000}{1} = \frac{30\ 000}{y}$                     | 5.000                       |
| 1:75 000   | 1inch                       | 75 000 in           | $\frac{12}{1} = \frac{75\ 000}{x}$    | 6250.000      | 30 000              | $\frac{6250.000}{1} = \frac{30\ 000}{y}$                     | 4.800                       |
| 1:96 000   | 1inch                       | 96 000 in           | $\frac{12}{1} = \frac{96\ 000}{x}$    | 8000.000      | 33 000              | $\frac{8000.000}{1} = \frac{33\ 000}{y}$                     | 4.125                       |

To find feet per inch on 1: 12 000 map . . .

12 inches = 1 foot  
 Show in ratio as ...  
 $\frac{12}{1} \frac{\text{inches}}{\text{feet}}$

Let SCALE (12 000) be in inches  
 Fractional scale says 1 inch represents 12,000 in  
 Let x be feet that 1 inch represents on map  
 Show in ratio as ...  
 $\frac{12\ 000}{x} \frac{\text{inches}}{\text{feet}}$

Solution . . .

$$\frac{12}{1} = \frac{12\ 000}{x}$$

$$12 \cdot x = 12\ 000 \cdot 1$$

$$\frac{12x}{12} = \frac{12\ 000}{12}$$

$$x = \frac{12\ 000}{12} \text{ (SCALE)}$$

$$x = 1000.00$$

**35—BAR SCALES (continued)**

| BAR SCALE CALCULATIONS — KILOMETERS (1 kilometer = 100,000 centimeters) |                             |                     |   |                   |                           |  |                       |              |
|---|-----------------------------|---------------------|---|-------------------|---------------------------|--|-----------------------|--------------|
| FRACTIONAL SCALE  | SCALE TO MAP REPRESENTATION |                     | TO FIND KILOMETERS PER CENTIMETER (CM) (x in ratio) | KILOMETERS PER CM | TOTAL KILOMETERS ON SCALE | TO FIND TOTAL SCALE LENGTH IN CENTIMETERS (y in ratio)                           | TOTAL SCALE LENGTH IN |              |
|   | Scale Unit                  | represents Map Unit | Use ratio below or $\frac{\text{SCALE}}{100\,000}$  |                   |                           | Use ratio below or $\frac{\text{Kilometers on scale}}{\text{Kilometers per cm}}$ | CENTI-METERS          | MILLI-METERS |
| 1:12 000  | 1cm                         | 12 000 cm           | $\frac{100\,000}{1} = \frac{12\,000}{x}$            | 0.120             | 1.5                       | $\frac{0.120}{1} = \frac{1.5}{y}$  | 12.500                | 125.00       |
| 1:20 000  | 1cm                         | 20 000 cm           | $\frac{100\,000}{1} = \frac{20\,000}{x}$            | 0.200             | 2                         | $\frac{0.200}{1} = \frac{2}{y}$  | 10.000                | 100.00       |
| 1:24 000  | 1cm                         | 24 000 cm           | $\frac{100\,000}{1} = \frac{24\,000}{x}$            | 0.240             | 2                         | $\frac{0.240}{1} = \frac{2}{y}$  | 8.333                 | 83.33        |
| 1:25 000  | 1cm                         | 25 000 cm           | $\frac{100\,000}{1} = \frac{25\,000}{x}$            | 0.250             | 2                         | $\frac{0.250}{1} = \frac{2}{y}$  | 8.000                 | 80.00        |
| 1:31 250  | 1cm                         | 31 250 cm           | $\frac{100\,000}{1} = \frac{31\,250}{x}$            | 0.3125            | 2                         | $\frac{0.3125}{1} = \frac{2}{y}$   | 6.400                 | 64.00        |
| 1:31 680  | 1cm                         | 31 680 cm           | $\frac{100\,000}{1} = \frac{31\,680}{x}$            | 0.3168            | 2                         | $\frac{0.3168}{1} = \frac{2}{y}$   | 6.313                 | 63.13        |
| 1:48 000  | 1cm                         | 48 000 cm           | $\frac{100\,000}{1} = \frac{48\,000}{x}$            | 0.480             | 6                         | $\frac{0.480}{1} = \frac{6}{y}$  | 12.500                | 125.00       |
| 1:50 000  | 1cm                         | 50 000 cm           | $\frac{100\,000}{1} = \frac{50\,000}{x}$            | 0.500             | 6                         | $\frac{0.500}{1} = \frac{6}{y}$  | 12.000                | 120.00       |
| 1:62 500  | 1cm                         | 62 500 cm           | $\frac{100\,000}{1} = \frac{62\,500}{x}$            | 0.625             | 8                         | $\frac{0.625}{1} = \frac{8}{y}$  | 12.800                | 128.00       |
| 1:63 360  | 1cm                         | 63 360 cm           | $\frac{100\,000}{1} = \frac{63\,360}{x}$            | 0.6336            | 8                         | $\frac{0.6336}{1} = \frac{8}{y}$   | 12.626                | 126.26       |
| 1:72 000  | 1cm                         | 72 000 cm           | $\frac{100\,000}{1} = \frac{72\,000}{x}$            | 0.720             | 8                         | $\frac{0.720}{1} = \frac{8}{y}$  | 11.111                | 111.11       |
| 1:75 000  | 1cm                         | 75 000 cm           | $\frac{100\,000}{1} = \frac{75\,000}{x}$            | 0.750             | 8                         | $\frac{0.750}{1} = \frac{8}{y}$  | 10.666                | 106.66       |
| 1:96 000  | 1cm                         | 96 000 cm           | $\frac{100\,000}{1} = \frac{96\,000}{x}$            | 0.960             | 9                         | $\frac{0.960}{1} = \frac{9}{y}$  | 9.375                 | 93.75        |
| 1:100 000   | 1cm                         | 100 000 cm          | $\frac{100\,000}{1} = \frac{100\,000}{x}$           | 1.000             | 11                        | $\frac{1.000}{1} = \frac{11}{y}$   | 11.000                | 110.00       |
| 1:125 000   | 1cm                         | 125 000 cm          | $\frac{100\,000}{1} = \frac{125\,000}{x}$           | 1.250             | 12                        | $\frac{1.250}{1} = \frac{12}{y}$   | 9.600                 | 96.00        |
| 1:150 000   | 1cm                         | 150 000 cm          | $\frac{100\,000}{1} = \frac{150\,000}{x}$           | 1.500             | 12                        | $\frac{1.500}{1} = \frac{12}{y}$   | 8.000                 | 80.00        |

To find kilometers per centimeter on 1: 12 000 map ...

Solution ...

$$100\,000 \cdot x = 12\,000 \cdot 1$$

100 000 centimeters = 1 kilometer  
 Show in ratio as ...

$$\frac{100\,000 \text{ centimeters}}{1 \text{ kilometers}}$$

Let SCALE (12 000) be in centimeters  
 Fractional scale says 1 centimeter represents  
 12,000 centimeters  
 Let x be kilometers that 1 cm represents on map  
 Show in ratio as ...

$$\frac{12\,000 \text{ centimeters}}{x \text{ kilometers}}$$

$$\frac{100\,000}{1} = \frac{12\,000}{x} \quad \frac{100\,000}{100\,000} x = \frac{12\,000}{100\,000}$$

$$x = \frac{12\,000}{100\,000} \text{ (SCALE)}$$

$$x = 0.120$$

**35—BAR SCALES (continued)**

| BAR SCALE CALCULATIONS — KILOMETERS (1 kilometer = 100,000 centimeters)—continued |                             |                     |   |                   |                           |  |                       |              |
|---|-----------------------------|---------------------|---|-------------------|---------------------------|--|-----------------------|--------------|
| FRACTIONAL SCALE  | SCALE TO MAP REPRESENTATION |                     | TO FIND KILOMETERS PER CENTIMETER (CM) (x in ratio) | KILOMETERS PER CM | TOTAL KILOMETERS ON SCALE | TO FIND TOTAL SCALE LENGTH IN CENTIMETERS (y in ratio)                           | TOTAL SCALE LENGTH IN |              |
|   | Scale Unit                  | represents Map Unit | Use ratio below or $\frac{\text{SCALE}}{100\,000}$  |                   |                           | Use ratio below or $\frac{\text{Kilometers on scale}}{\text{Kilometers per cm}}$ | CENTI-METERS          | MILLI-METERS |
| 1:250 000   | 1cm                         | 250 000 cm          | $\frac{100\,000}{1} = \frac{250\,000}{x}$           | 2.500             | 30                        | $\frac{2.500}{1} = \frac{30}{y}$   | 12.000                | 120.00       |
| 1:400 000   | 1cm                         | 400 000 cm          | $\frac{100\,000}{1} = \frac{400\,000}{x}$           | 4.000             | 60                        | $\frac{4.000}{1} = \frac{60}{y}$   | 15.000                | 150.00       |
| 1:500 000   | 1cm                         | 500 000 cm          | $\frac{100\,000}{1} = \frac{500\,000}{x}$           | 5.000             | 60                        | $\frac{5.000}{1} = \frac{60}{y}$   | 12.000                | 120.00       |
| 1:750 000   | 1cm                         | 750 000 cm          | $\frac{100\,000}{1} = \frac{750\,000}{x}$           | 7.500             | 60                        | $\frac{7.500}{1} = \frac{60}{y}$   | 8.000                 | 80.00        |
| 1:1 000 000   | 1cm                         | 1 000 000 cm        | $\frac{100\,000}{1} = \frac{1\,000\,000}{x}$        | 10.000            | 125                       | $\frac{10.000}{1} = \frac{125}{y}$   | 12.500                | 125.00       |
| 1:2 000 000   | 1cm                         | 2 000 000 cm        | $\frac{100\,000}{1} = \frac{2\,000\,000}{x}$        | 20.000            | 300                       | $\frac{20.000}{1} = \frac{300}{y}$   | 15.000                | 150.00       |
| 1:2 500 000   | 1cm                         | 2 500 000 cm        | $\frac{100\,000}{1} = \frac{2\,500\,000}{x}$        | 25.000            | 400                       | $\frac{25.000}{1} = \frac{400}{y}$   | 16.000                | 160.00       |
| 1:5 000 000   | 1cm                         | 5 000 000 cm        | $\frac{100\,000}{1} = \frac{5\,000\,000}{x}$        | 50.000            | 800                       | $\frac{50.000}{1} = \frac{800}{y}$   | 16.000                | 160.00       |
| 1:7 500 000   | 1cm                         | 7 500 000 cm        | $\frac{100\,000}{1} = \frac{7\,500\,000}{x}$        | 75.000            | 800                       | $\frac{75.000}{1} = \frac{800}{y}$   | 10.666                | 106.66       |
| 1:10 000 000  | 1cm                         | 10 000 000 cm       | $\frac{100\,000}{1} = \frac{10\,000\,000}{x}$       | 100.000           | 1500                      | $\frac{100.000}{1} = \frac{1500}{y}$   | 15.000                | 150.00       |

**To find kilometers per centimeter on 1: 250 000 map . . .**

**Solution . . .**

$$100\,000 \cdot x = 250\,000 \cdot 1$$

100 000 centimeters = 1 kilometer  
 Show in ratio as ...

$$\frac{100\,000 \text{ centimeters}}{1 \text{ kilometers}}$$

Let SCALE (250 000) be in centimeters  
 Fractional scale says 1 centimeter represents  
 250,000 centimeters  
 Let x be kilometers that 1 cm represents on map  
 Show in ratio as ...

$$\frac{250\,000 \text{ centimeters}}{x \text{ kilometers}}$$

$$\frac{100\,000}{1} = \frac{250\,000}{x} \quad \frac{100\,000}{100\,000} x = \frac{250\,000}{100\,000}$$

$$x = \frac{250\,000}{100\,000} \text{ (SCALE)}$$

$$x = 2.5$$

**36—MEAN DECLINATION ARROWS**

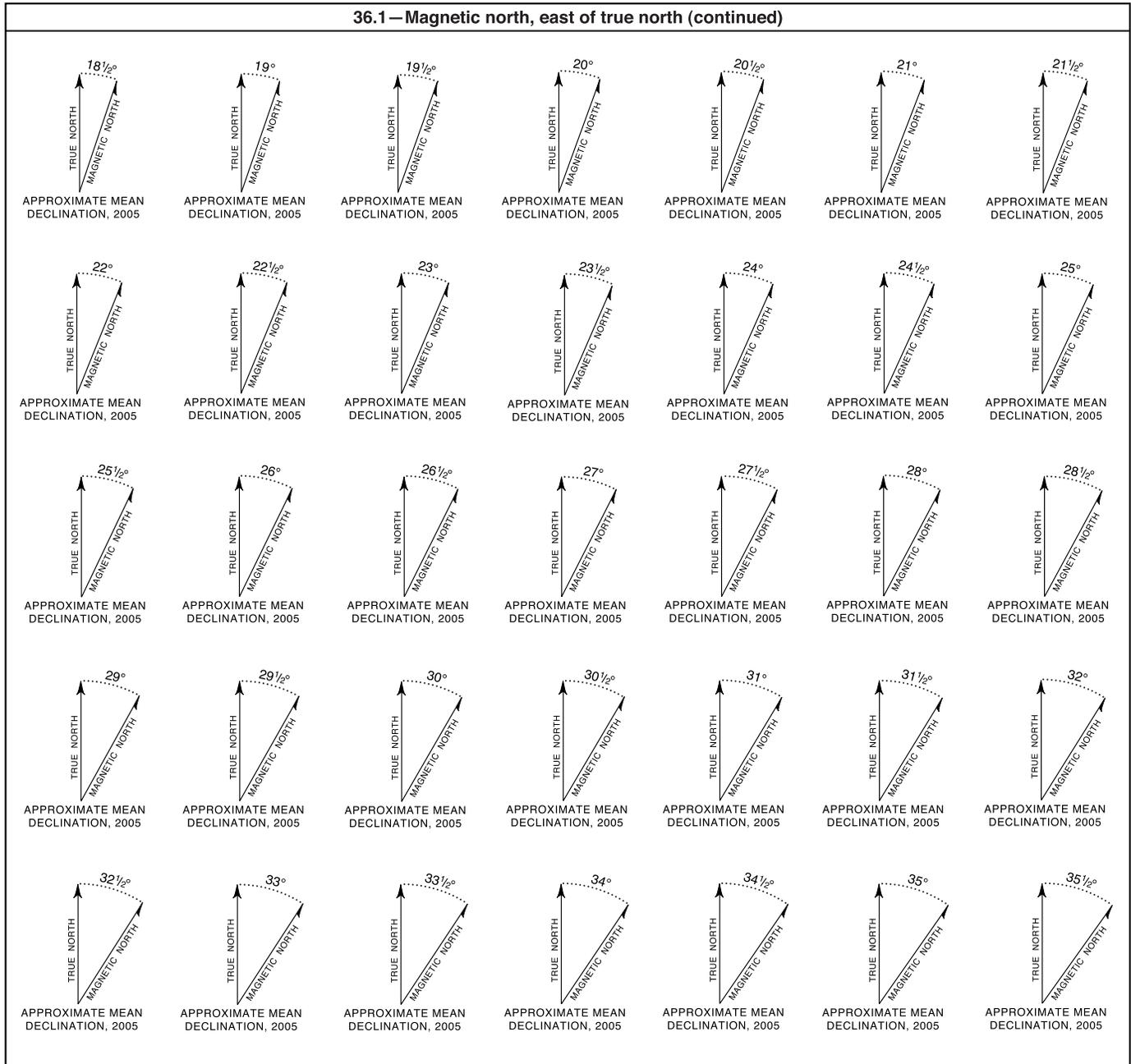
| CARTOGRAPHIC SPECIFICATIONS | NOTES ON USAGE   |
|-----------------------------|--|
|                             | <p>Because magnetic declination changes over time, the degree of declination should be determined at the time of publication, and the year of the declination measurement should be changed to the year of publication.</p> <p>In northern latitudes where the change in declination can be significant, it may be helpful to also note what the degree of declination was at the time of mapping, especially if the geologic information was gathered several years before the date of publication.</p> |

**36.1—Magnetic north, east of true north**

|                                    |                                    |                                    |                                    |                                    |                                    |                                    |
|------------------------------------|------------------------------------|------------------------------------|------------------------------------|------------------------------------|------------------------------------|------------------------------------|
|                                    |                                    |                                    |                                    |                                    |                                    |                                    |
| APPROXIMATE MEAN DECLINATION, 2005 |
|                                    |                                    |                                    |                                    |                                    |                                    |                                    |
| APPROXIMATE MEAN DECLINATION, 2005 |
|                                    |                                    |                                    |                                    |                                    |                                    |                                    |
| APPROXIMATE MEAN DECLINATION, 2005 |
|                                    |                                    |                                    |                                    |                                    |                                    |                                    |
| APPROXIMATE MEAN DECLINATION, 2005 |
|                                    |                                    |                                    |                                    |                                    |                                    |                                    |
| APPROXIMATE MEAN DECLINATION, 2005 |

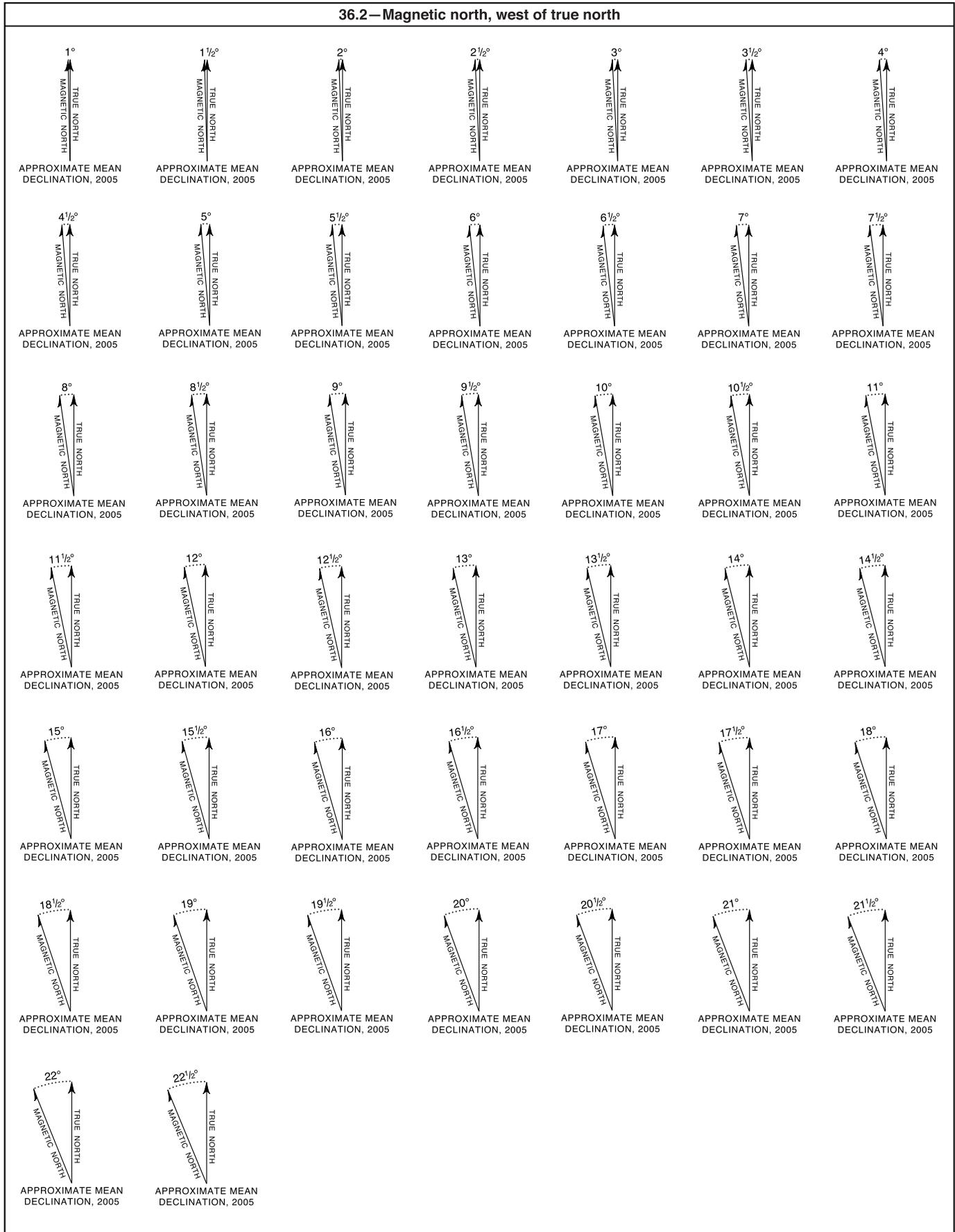
### 36—MEAN DECLINATION ARROWS (continued)

#### 36.1—Magnetic north, east of true north (continued)



**36—MEAN DECLINATION ARROWS (continued)**

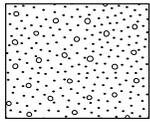
**36.2—Magnetic north, west of true north**



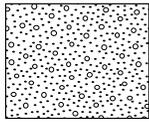
### 37—LITHOLOGIC PATTERNS

[Lithologic patterns are usually reserved for use on stratigraphic columns, sections, or charts]

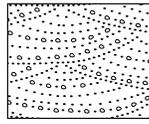
#### 37.1—Sedimentary-rock lithologic patterns



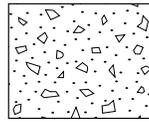
**601**  
 Gravel or conglomerate  
 (1st option)



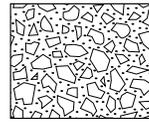
**602**  
 Gravel or conglomerate  
 (2nd option)



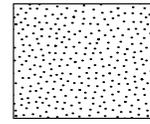
**603**  
 Crossbedded gravel or conglomerate



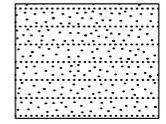
**605**  
 Breccia (1st option)



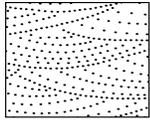
**606**  
 Breccia (2nd option)



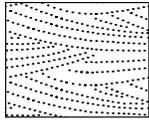
**607**  
 Massive sand or sandstone



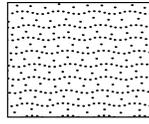
**608**  
 Bedded sand or sandstone



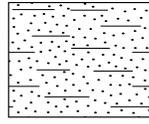
**609**  
 Crossbedded sand or sandstone  
 (1st option)



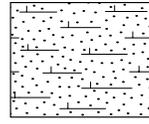
**610**  
 Crossbedded sand or sandstone  
 (2nd option)



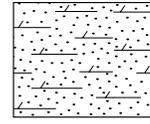
**611**  
 Ripple-bedded sand or sandstone



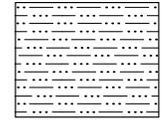
**612**  
 Argillaceous or shaly sandstone



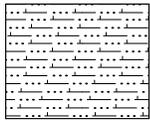
**613**  
 Calcareous sandstone



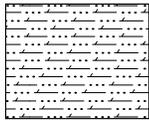
**614**  
 Dolomitic sandstone



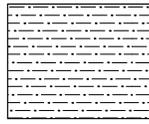
**616**  
 Silt, siltstone,  
 or shaly silt



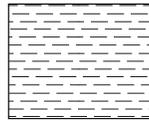
**617**  
 Calcareous siltstone



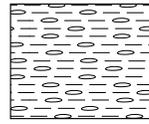
**618**  
 Dolomitic siltstone



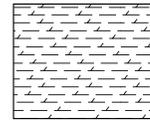
**619**  
 Sandy or silty shale



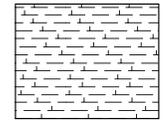
**620**  
 Clay or clay shale



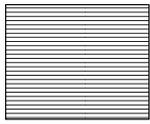
**621**  
 Cherty shale



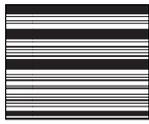
**622**  
 Dolomitic shale



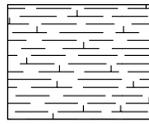
**623**  
 Calcareous shale or marl



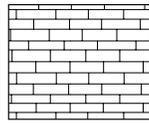
**624**  
 Carbonaceous shale



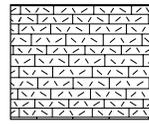
**625**  
 Oil shale



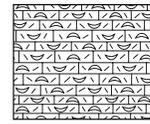
**626**  
 Chalk



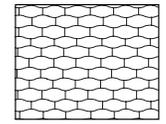
**627**  
 Limestone



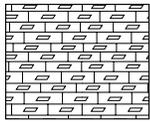
**628**  
 Clastic limestone



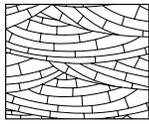
**629**  
 Fossiliferous clastic limestone



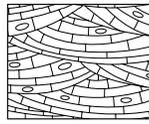
**630**  
 Nodular or irregularly bedded limestone



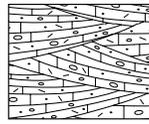
**631**  
 Limestone, irregular (burrow?) fillings of saccharoidal dolomite



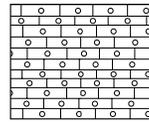
**632**  
 Crossbedded limestone



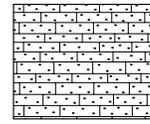
**633**  
 Cherty crossbedded limestone



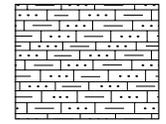
**634**  
 Cherty and sandy crossbedded clastic limestone



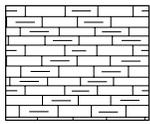
**635**  
 Oolitic limestone



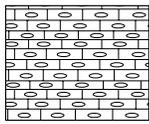
**636**  
 Sandy limestone



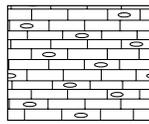
**637**  
 Silty limestone



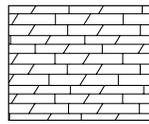
**638**  
 Argillaceous or shaly limestone



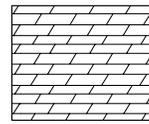
**639**  
 Cherty limestone  
 (1st option)



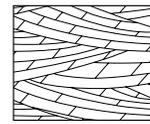
**640**  
 Cherty limestone  
 (2nd option)



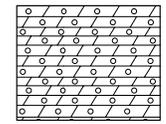
**641**  
 Dolomitic limestone,  
 limy dolomite, or  
 limy dolomite



**642**  
 Dolostone or dolomite



**643**  
 Crossbedded dolostone or dolomite



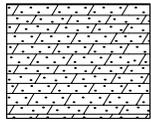
**644**  
 Oolitic dolostone or dolomite

\*For more information, see general guidelines on pages A-i to A-v.

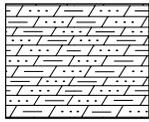
**37—LITHOLOGIC PATTERNS (continued)**

[Lithologic patterns are usually reserved for use on stratigraphic columns, sections, or charts]

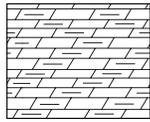
**37.1—Sedimentary-rock lithologic patterns (continued)**



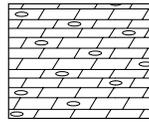
**645**  
Sandy dolomite  
or dolomite



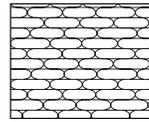
**646**  
Silty dolomite  
or dolomite



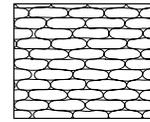
**647**  
Argillaceous or  
shaly dolomite  
or dolomite



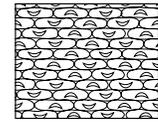
**648**  
Cherty dolomite  
or dolomite



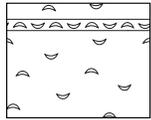
**649**  
Bedded chert  
(1st option)



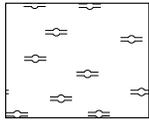
**650**  
Bedded chert  
(2nd option)



**651**  
Fossiliferous  
bedded chert



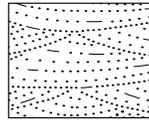
**652**  
Fossiliferous rock



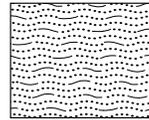
**653**  
Diatomaceous  
rock



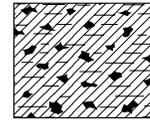
**654**  
Subgraywacke



**655**  
Crossbedded  
subgraywacke



**656**  
Ripple-bedded  
subgraywacke



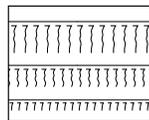
**657**  
Peat



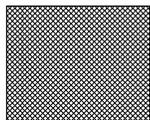
**658**  
Coal



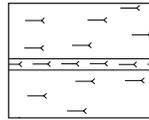
**659**  
Bony coal or  
impure coal



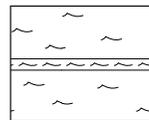
**660**  
Underclay



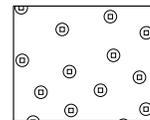
**661**  
Flint clay



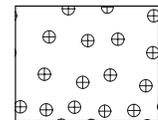
**662**  
Bentonite



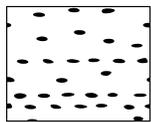
**663**  
Glauconite



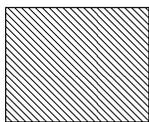
**664**  
Limonite



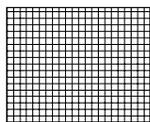
**665**  
Siderite



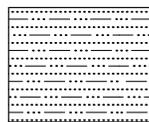
**666**  
Phosphatic-nodular  
rock



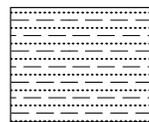
**667**  
Gypsum



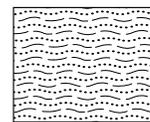
**668**  
Salt



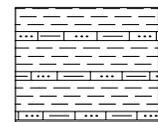
**669**  
Interbedded  
sandstone and  
siltstone



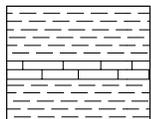
**670**  
Interbedded  
sandstone and  
shale



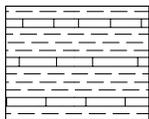
**671**  
Interbedded ripple-  
bedded sandstone  
and shale



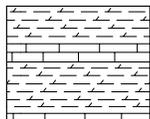
**672**  
Interbedded shale  
and silty limestone  
(shale dominant)



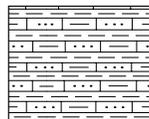
**673**  
Interbedded shale  
and limestone  
(shale dominant)  
(1st option)



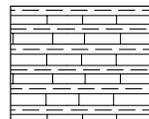
**674**  
Interbedded shale  
and limestone  
(shale dominant)  
(2nd option)



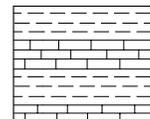
**675**  
Interbedded calcareous  
shale and limestone  
(shale dominant)



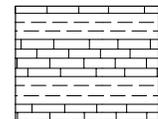
**676**  
Interbedded  
silty limestone  
and shale



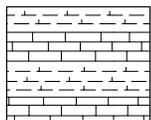
**677**  
Interbedded  
limestone and  
shale (1st option)



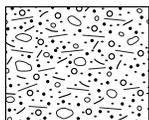
**678**  
Interbedded  
limestone and  
shale (2nd option)



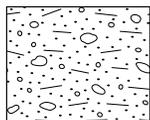
**679**  
Interbedded  
limestone and shale  
(limestone dominant)



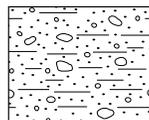
**680**  
Interbedded  
limestone and  
calcareous shale



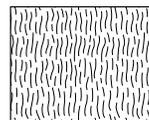
**681**  
Till or diamiction  
(1st option)



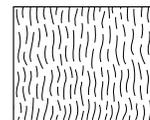
**682**  
Till or diamiction  
(2nd option)



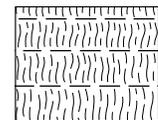
**683**  
Till or diamiction  
(3rd option)



**684**  
Loess (1st option)



**685**  
Loess (2nd option)



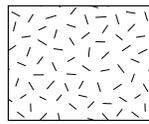
**686**  
Loess (3rd option)

\*For more information, see general guidelines on pages A-i to A-v.

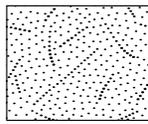
**37—LITHOLOGIC PATTERNS (continued)**

[Lithologic patterns are usually reserved for use on stratigraphic columns, sections, or charts]

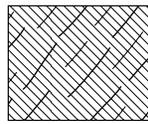
**37.2—Metamorphic-rock, igneous-rock, and vein-matter lithologic patterns**



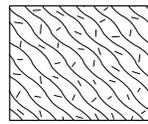
**701**  
Metamorphism



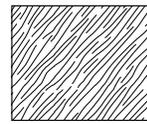
**702**  
Quartzite



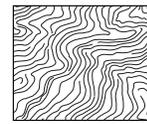
**703**  
Slate



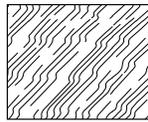
**704**  
Schistose or  
gneissoid granite



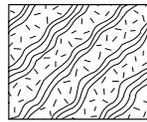
**705**  
Schist



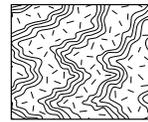
**706**  
Contorted schist



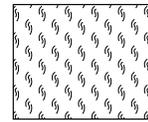
**707**  
Schist and gneiss



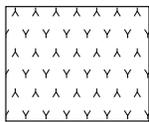
**708**  
Gneiss



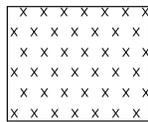
**709**  
Contorted gneiss



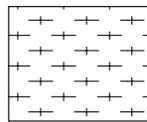
**710**  
Soapstone, talc,  
or serpentine



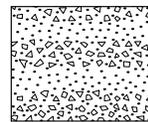
**711**  
Tuffaceous rock



**712**  
Crystal tuff



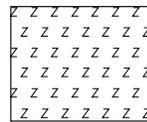
**713**  
Devitrified  
tuff



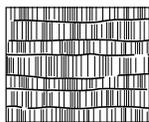
**714**  
Volcanic breccia  
and tuff



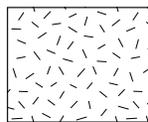
**715**  
Volcanic breccia  
or agglomerate



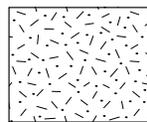
**716**  
Zeolitic rock



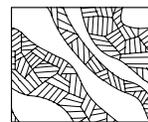
**717**  
Basaltic flows



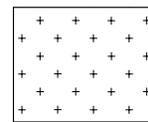
**718**  
Granite (1st option)



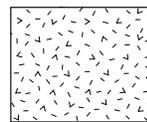
**719**  
Granite (2nd option)



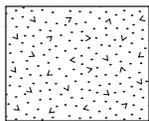
**720**  
Banded  
igneous rock



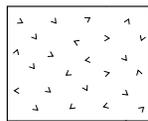
**721**  
Igneous rock  
(1st option)



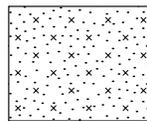
**722**  
Igneous rock  
(2nd option)



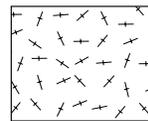
**723**  
Igneous rock  
(3rd option)



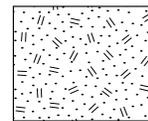
**724**  
Igneous rock  
(4th option)



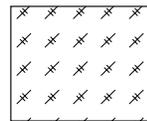
**725**  
Igneous rock  
(5th option)



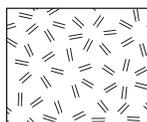
**726**  
Igneous rock  
(6th option)



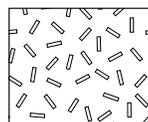
**727**  
Igneous rock  
(7th option)



**728**  
Igneous rock  
(8th option)



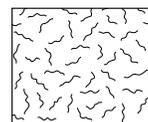
**729**  
Porphyritic rock  
(1st option)



**730**  
Porphyritic rock  
(2nd option)



**731**  
Vitrophyre



**732**  
Quartz



**733**  
Ore

\*For more information, see general guidelines on pages A-i to A-v.

### 38—EXPLANATION FOR PATTERN CHART

#### DISCUSSION\*

This diagram provides some basic information on how to use the new Pattern Chart, which is enclosed in the sleeve on the inside back cover of this standard volume. For more specific information on the use of patterns (and color) on geologic maps, see Section 5, entitled "Guidelines for Map Color and Pattern Selection," in the accompanying introductory text.

Most patterns on this new chart were designed (in Adobe Illustrator 8.0.1) to closely replicate patterns in the informal "Technical Cartographic Standards" volume (U.S. Geological Survey, ca. 1975). In some cases, however, lineweights of pattern elements had to be increased to facilitate higher resolution (1800 dpi) digital output; therefore, some patterns may not plot or print correctly if output at lower resolutions.

Each pattern has been assigned a new pattern number (see below each box). In addition, each pattern now has associated with it a generic look-up table number that can be used to access a pattern if it has been incorporated into a patternset.

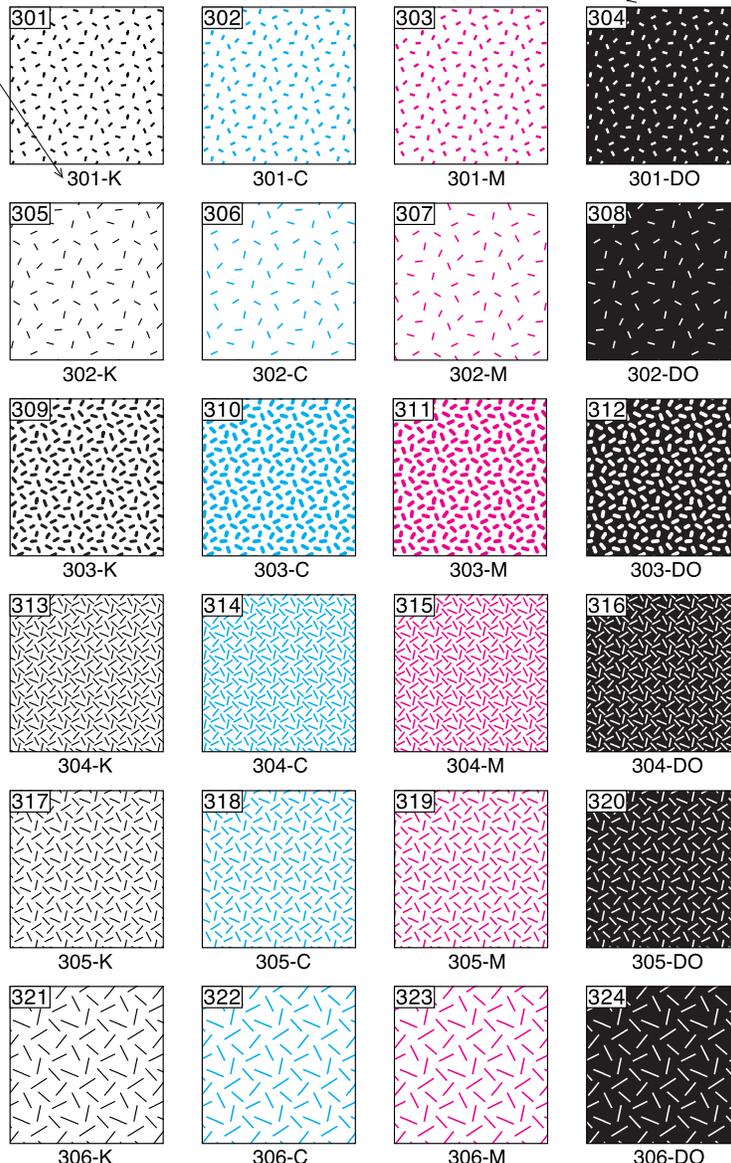
#### DESCRIPTION

|  |  |
|--|--|
| Abbreviations used in pattern numbers:   | • K, black; C, cyan; M, magenta; DO, dropout; R, red; B, brown   |
| Overprint patterns have white background | • Pattern is in front. One bounding box (having Fill and Stroke set to 'None') is in back<br>• White background is transparent (underlying map-unit color will be visible)   |
| Dropout patterns have black background   | • Pattern is in front. Two bounding boxes are in back: box directly beneath pattern has Fill set to 100% black and Stroke set to 'None'; box to rear has both Fill and Stroke set to 'None'<br>• Black background represents underlying map-unit color. If white pattern is used "as is," it will knock out the underlying map-unit color; if pattern is changed to one of the CMYK values in the underlying map-unit color, it will knock out the other CMYK value(s) in map-unit color |

#### IGNEOUS PATTERNS (Series 300)

Pattern number shown below box

Generic lookup-table number shown in upper left-hand corner of box (can be used to access a particular pattern from a patternset)



### 39—EXPLANATION FOR CMYK COLOR CHART

#### DISCUSSION\*

This diagram explains how to use the new CMYK Color Chart, which is enclosed in the sleeve on the inside back cover of this standard volume. For more specific information on the use of color (and patterns) on geologic maps, see Section 5, entitled "Guidelines for Map Color and Pattern Selection," in the accompanying introductory text.

This new CMYK Color Chart was designed in Adobe Illustrator 8.0.1 (Macintosh) to closely replicate the colors on the U.S. Geological Survey's original offset-printed process-ink color chart, entitled "Printing Colors and Screens in Use by the U.S. Geological Survey for Geologic and Hydrologic Maps" [yellow/magenta/cyan version], which has long been used at the USGS for choosing colors on geologic maps. The new color chart contains the same colors that were in the original offset-printed USGS color chart; however, the old color codes indicating the YMC (yellow/magenta/cyan) values have been updated to show CMYK (cyan/magenta/yellow, with K = 0) values, to conform to industry standards. In addition, each color now has associated with it a generic look-up table number that can be used to access a particular color if it has been incorporated into a shadeset.

CMYK (K = 0) value shown below box (see left side of diagram for explanation of abbreviations used)

Generic lookup-table number shown in upper left-hand corner of box (can be used to access a particular color from a shadeset)



Abbreviations used to specify CMY values

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INTRODUCTORY TEXT  
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| 1877 | Approximately located adit (2nd option).....   | A-19-3     19.3.15 |
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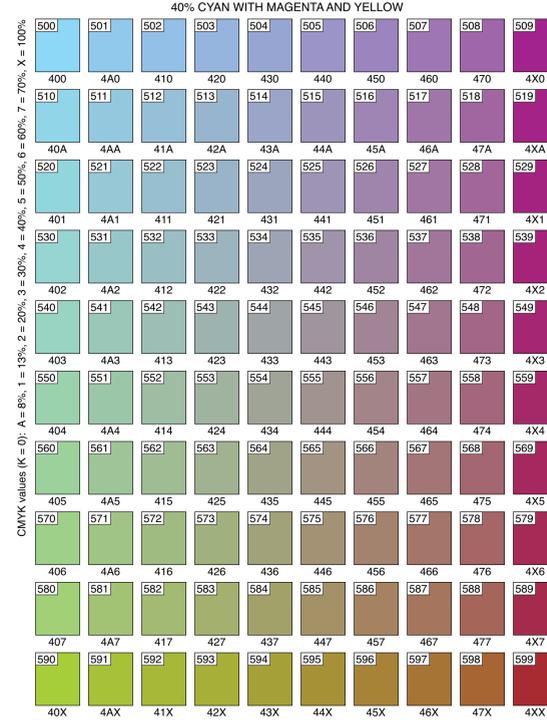
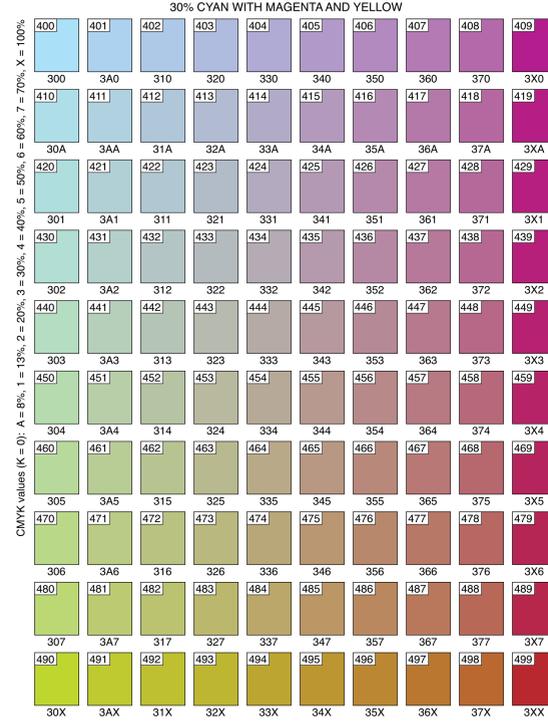
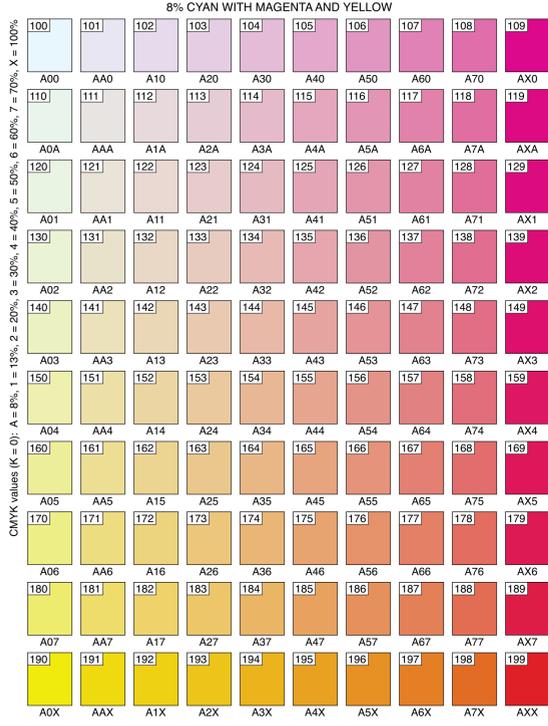
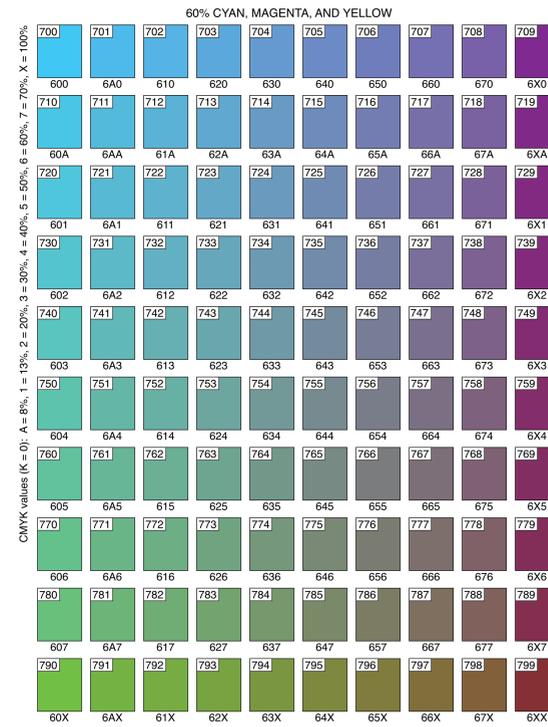
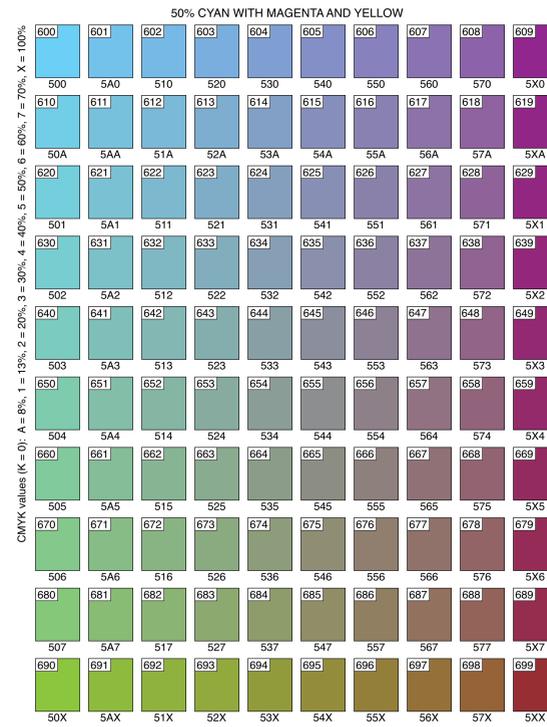
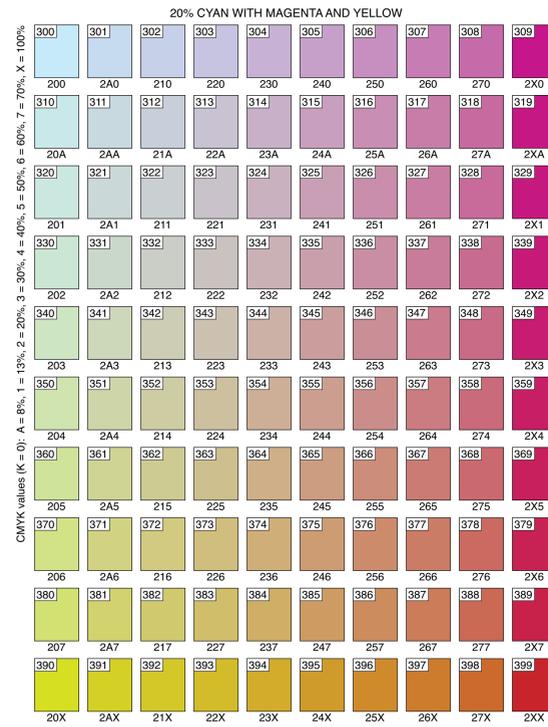
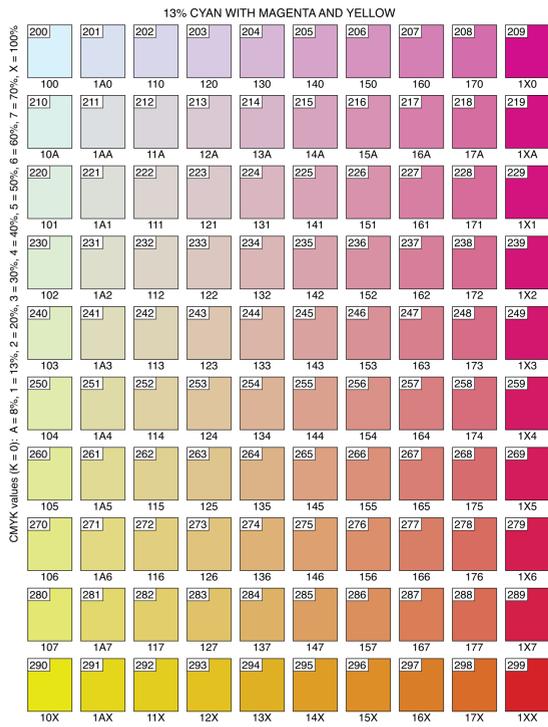
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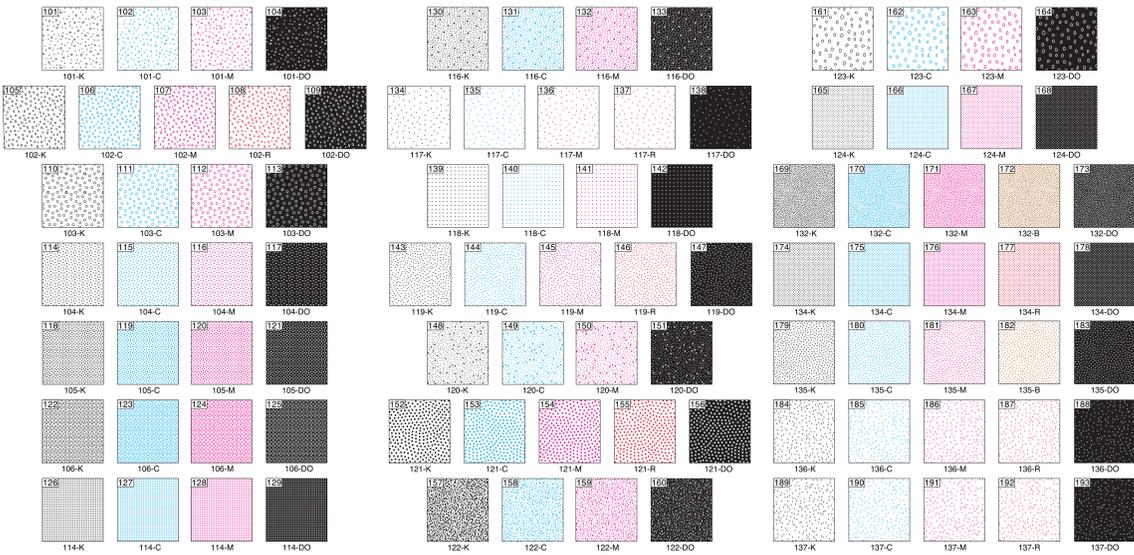
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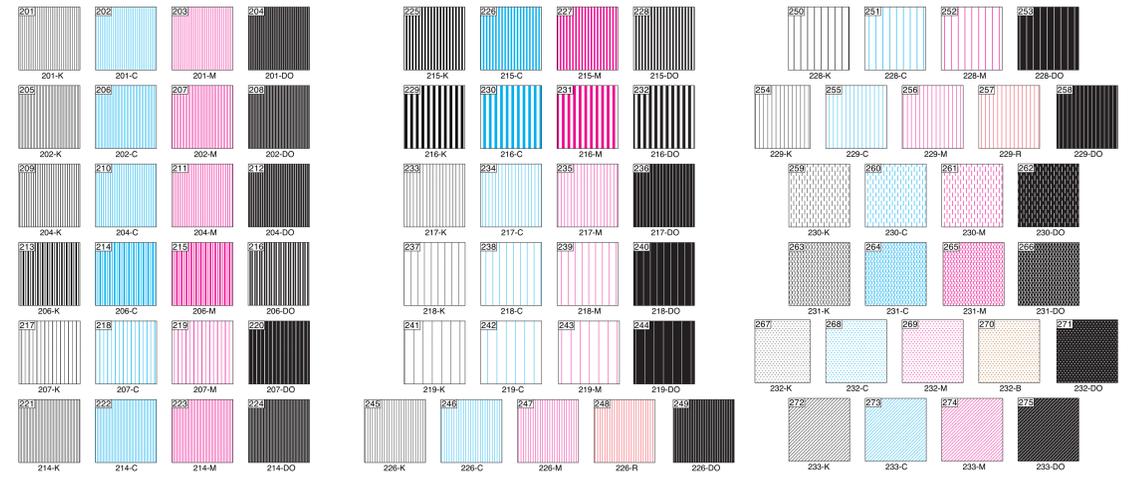
# Pattern Chart

[Pattern number below pattern box; generic lookup table symbol number in upper left-hand corner of pattern box]

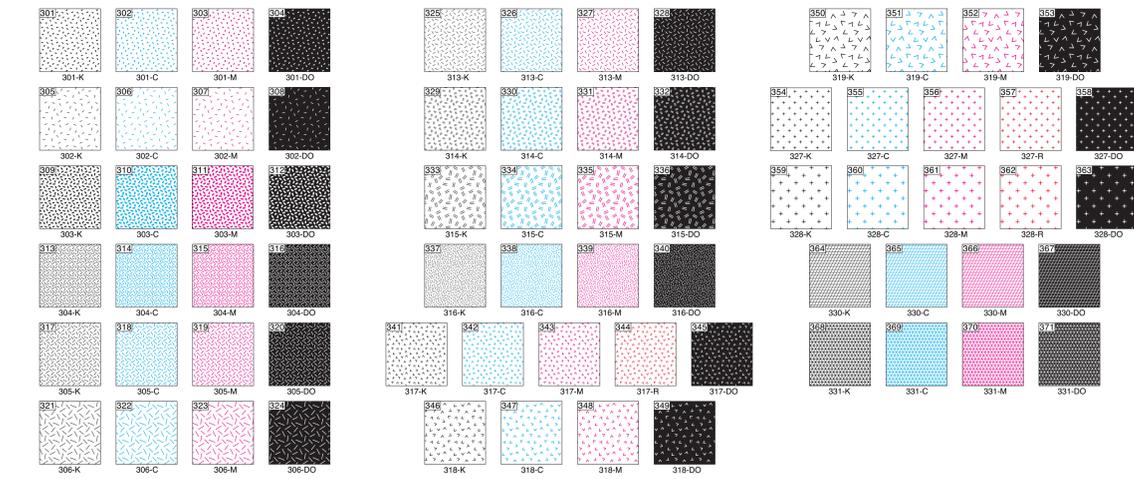
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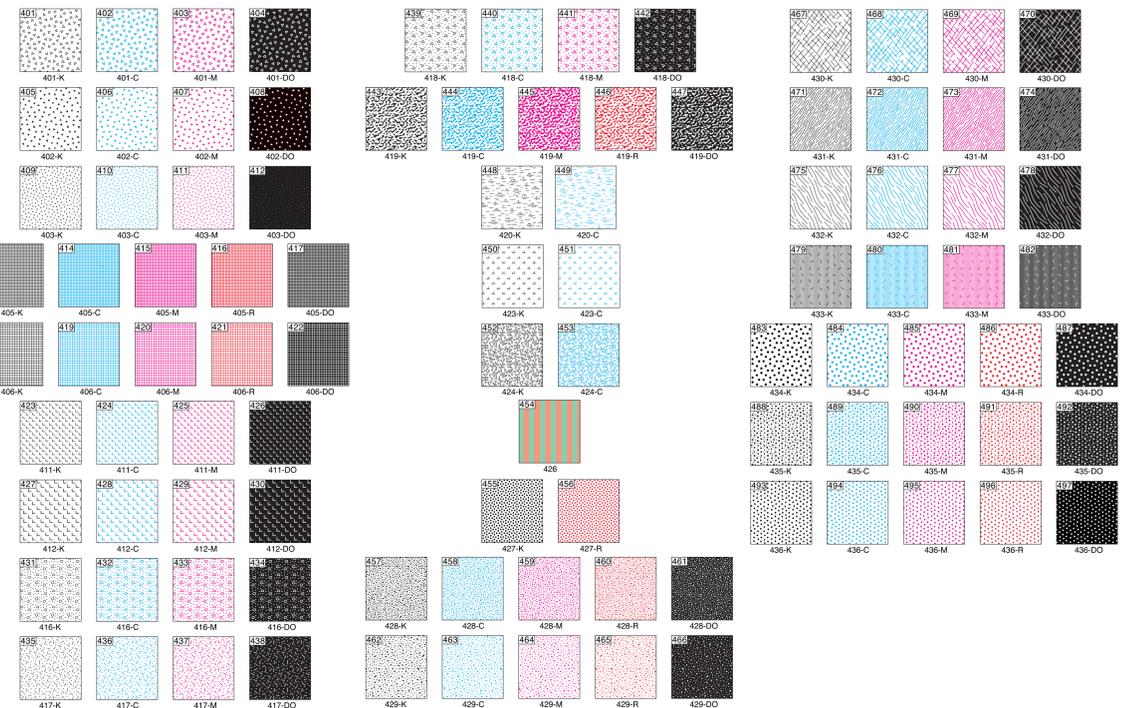
## SEDIMENTARY PATTERNS (Series 200)



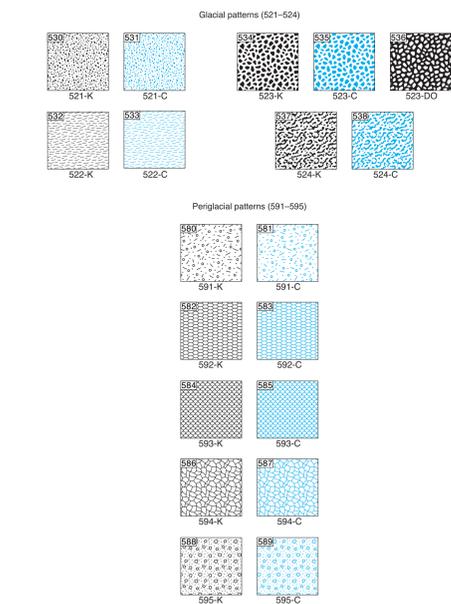
## IGNEOUS PATTERNS (Series 300)



## MISCELLANEOUS AND METAMORPHIC PATTERNS (Series 400)



## GLACIAL AND PERIGLACIAL PATTERNS (Series 500)



## SEDIMENTARY LITHOLOGY PATTERNS (Series 600)

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