

GUIDE TO PRODUCTION OF 1:100,000-SERIES OPEN FILE REPORTS

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by
Bill Phillips

INTRODUCTION

This guide describes the preparation of map and text for release as an open-file report in the Division of Geology's 1:100,000-scale map series.

GEOLOGIC MAP

The geologic map is constructed of the following (Figure 1):

1. base map (supplied by cartographers);
2. geology overlay (~~lines and symbols~~); *(contacts & faults)*
3. specialty overlays as needed (~~structure~~, age dates, geochemistry, fossils, mines, etc.); *oil wells - fold axes & dikes*
4. title, author, date;
5. north arrow, ratio and bar scale (may already be on base map, but in the wrong place. Cartographers can move);
6. map explanation, including a) list of geologic units and b) symbols used on map;
7. DNR logo;
8. DGER block ("Washington Division of Geology and Earth Resources, Raymond Lasmanis, State Geologist");
9. Open file report number;
10. Contents statement ("This report consists of 1 map and a xx page text").

Responsibility of Geologist-Author

The author is responsible for supplying items 2, 3, 4 and 6 (geologic map overlay, specialty overlays as needed, title, and map explanation).

Special care must be taken to produce as error-free a map as possible. The geology overlay must be color-edited and edge-matched by the author.

Overlays

Carefully composite base map and overlays and inspect for overprints. Overprints may be corrected by moving map unit labels, numbers on structure symbols, or erasing (scraping off) topography or culture on the base map. If base map is altered, be sure and inform cartographers. They may need to alter 1:250,000 base map.

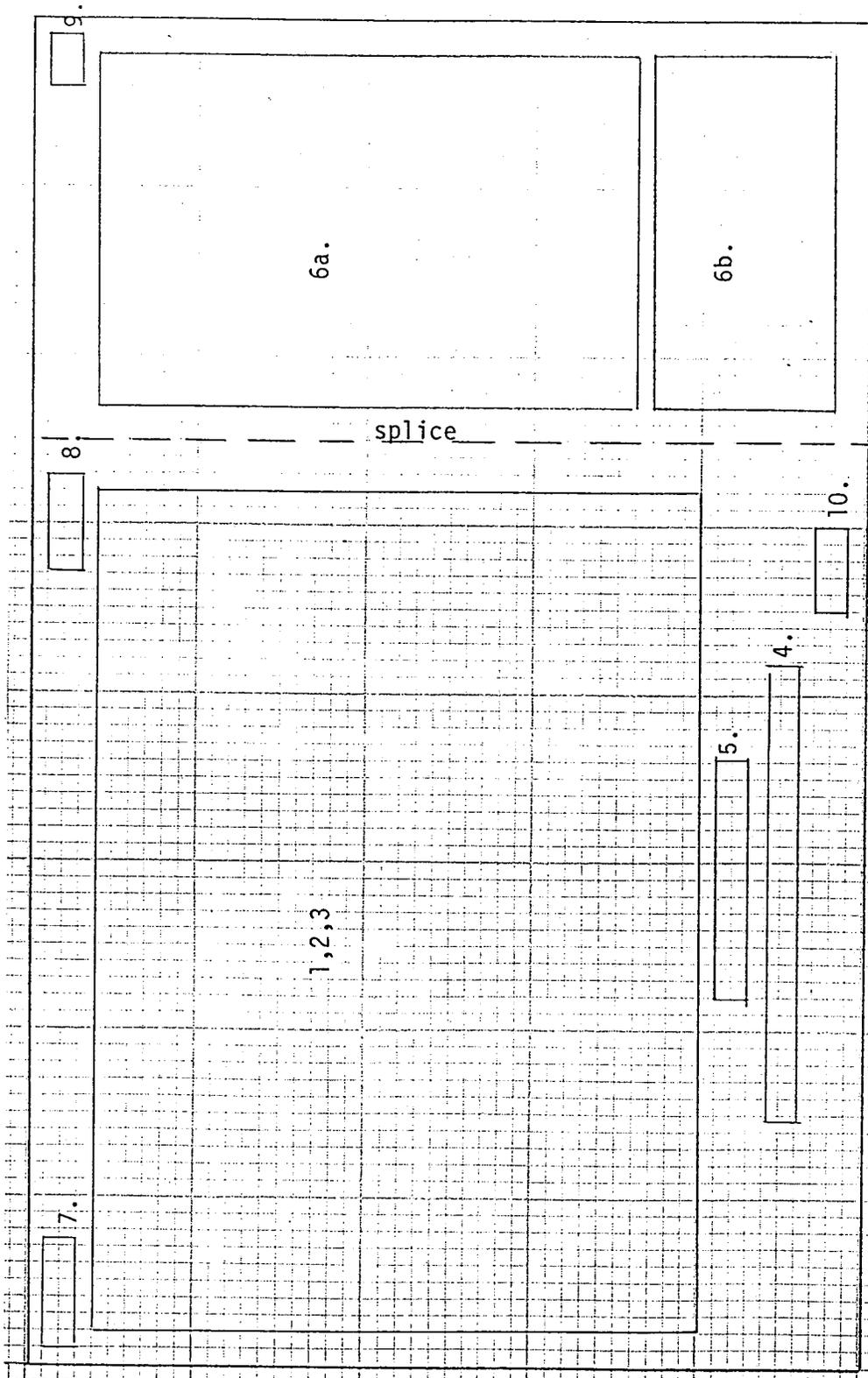


Figure 1 ♦ Components of the open-file geologic map.

Color-Editing

To color-edit, fill in each polygon with an appropriate color using colored pencils. Use colors that match as closely as possible the actual 1:250,000-scale map colors. This will help in spotting problems with the 1:250,000-scale color scheme.

While color editing, check that each polygon is closed and contains a map symbol, or that a symbol is leadered to the polygon.

Make a list of all symbols used on the map. Check to ensure that the symbols used are correct and legible.

Do not outline and label open bodies of water (lakes, ocean, large rivers) and ice (glaciers).

Edge-Matching

Make sure that the geology overlays do not have unintentional "scratch" boundaries with surrounding 1:100,000-scale quads. Work with the authors of the surrounding quads to correct any edge-match problems. If the scratch boundary is intentional, include a statement to reviewers to that effect.

Map Explanation

The map explanation consists of a list of the map symbols used on the map. Symbols include geologic map units and structural symbols.

The map units are listed by age; from youngest to oldest, in the following order:

- OK to combine*
1. sedimentary deposits and rocks;
 2. volcanic deposits and rocks;
 3. intrusive igneous rocks;
 4. metamorphic rocks.

If it is not possible to determine the relative ages of a group of map unit symbols, arrange them in alphabetical order. Also, sedimentary and volcanic rocks may be grouped together as "Sedimentary and volcanic deposits and rocks." Headings for the map explanation use the same format as in Description of Map Units in the open file report text (see p. 9).

The map unit portion of the explanation should be typed into a WordPerfect file and delivered on a disk to the cartographers. Carefully proof-read the explanation using the list of symbols from color-editing as the master.

For structural symbols, highlight the symbols used on the

map on the master symbol sheet (Figure 2) and turn it in to the cartographers. If you require a new symbol not on the list, please contact Bill Phillips. The proposed symbol will be reviewed with the cartographers and editor to ensure it does not conflict with standard USGS/DGER usage.

Drafting the Map

Structural symbols such as strike and dip of bedding have the center of the symbol as close as possible to the locality where the measurement was made.

Carefully draft corner tick marks on all 1:100,000 sheets. When the sheets are reduced to 1:250,000, the tick marks will be used to register the map sheets.

Be certain that registration between the base map and overlays is perfect and unambiguously marked.

Responsibility of Cartographic Staff

The cartographers produce all remaining map items (numbers 1,5,7,8,9,10). They print the map unit explanation and copy it onto MacTac. Structural symbols are taken from the master list and inserted into the explanation. The cartographers also do the map layout and paste-up, and arrange for photo compositing of the base map and overlays.

OPEN-FILE TEXT

The text consists of the following:

1. title page;
2. contents page(s) with lists of illustrations and tables;
3. introduction;
4. acknowledgments;
5. description of map units;
6. references cited;
7. source of data map(s);
8. table of geochemical analyses;
9. table of age determinations.

A standard text format is used for all text. Additional text items may be added to the report at the discretion of the author. Good examples are a correlation chart, stratigraphic columns, structure discussion, table of fossil localities, and cross-sections.

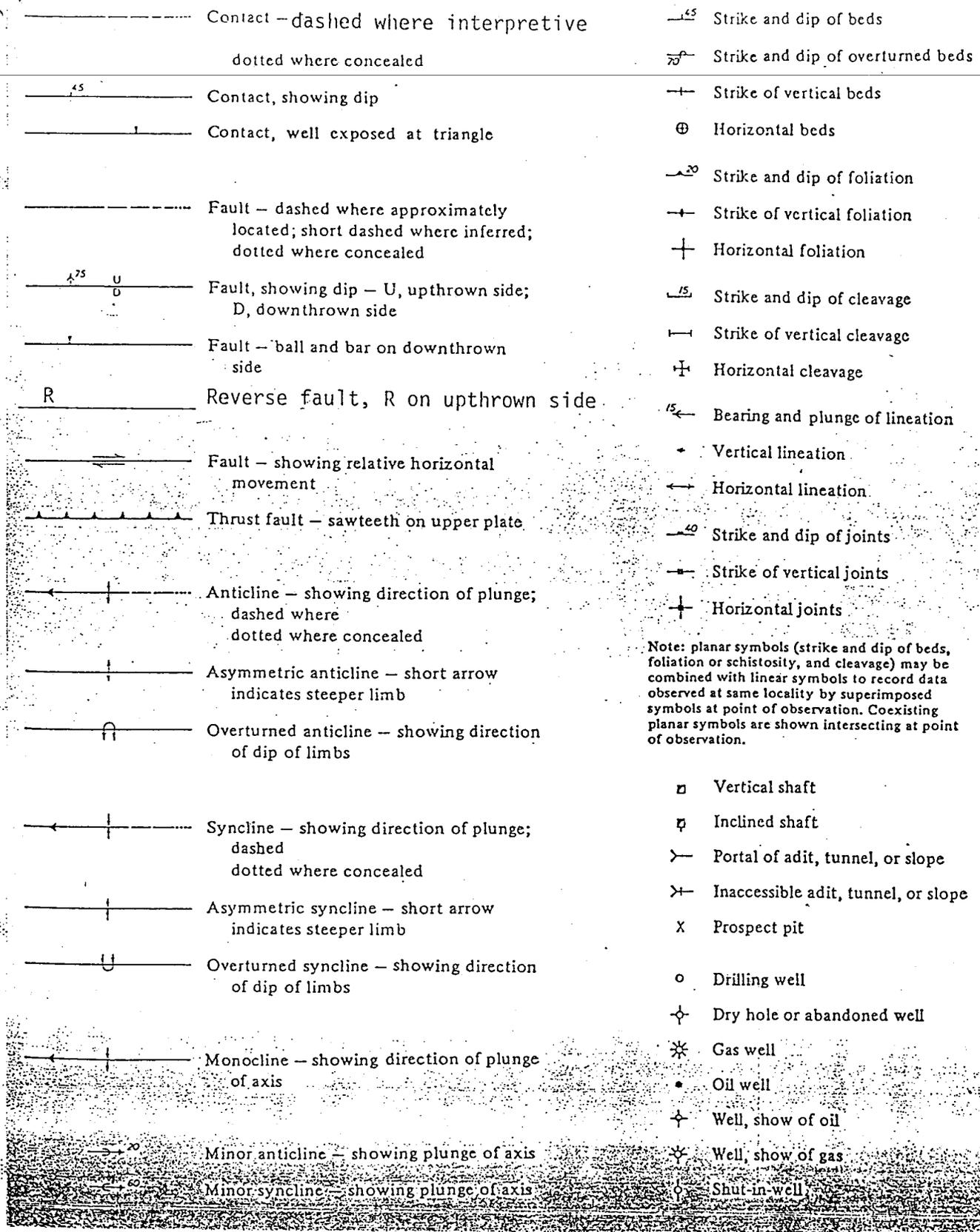


Figure 2: Map symbols used on open-file reports

Open File Text Format

WordPerfect Settings

WordPerfect settings are margins of 10 and 74, single spacing, page length of 55 lines, justification and hyphenation off. This corresponds to the default settings of most of our computers. Set pitch (Ctrl-F8) to 12 if variable pitch settings are available on your printer. Set page numbering to center at bottom of the page (ALT-F8,1,6).

Send reviewers double spaced text. Be sure your review text is as clean as possible so that you are not embarrassed by negative review comments concerning poor spelling or grammar.

Use WordPerfect's spell-checker but be sure to check unusual geologic words not in the computer dictionary.

Headings

First-order headings are all caps, centered, and bold. The title and contents, illustrations, tables, introduction, description of map units, and references cited are all first-order headings.

Second-order headings are caps and lower case, centered, and underscored. "Acknowledgments" and major time-lithology headings in unit descriptions are second-order headings.

Third-order headings are caps and lower case, centered, not underscored.

Fourth-order headings are caps and lower case, flush left.

Fifth-order headings are capitalized first letter only, the rest lower case (except for proper nouns). The heading is part of the first line of the paragraph and is followed by "--" to set it off. Place no spaces on either side of the hyphens. Such a heading should be limited to the contents of one paragraph. Individual unit descriptions are fifth-order headings.

Well-constructed text always has two or more subheads for each higher rank. That is, there will be a pair or more of second-order headings for each first order, and so on. An exception is Acknowledgments, which comes in the Introduction.

Place an empty line of space before and after each heading of ranks one to four.

Indent paragraphs five spaces or one tab setting. Place one empty line between paragraphs.

Quoted Material

Quoted material that takes up more than three text lines should be isolated. Indent that material 5 spaces from both left and right margins. Use Shift-Indent (Shift-F4) in WordPerfect for this. Be sure that the page number for every quotation is given in the source reference in the text (not in the References Cited).

If you add any text to a quote, use square brackets [] to frame your words. If you omit words in a sentence, put in three periods. If you drop words at the end of a sentence, put in four periods.

Title Page

The title page (Figure 3) consists of the DGER block, report title, author block, open-file-report-number block, disclaimer block, and the DNR logo. Note that the MONTH as well as the YEAR of open file publication are indicated on the title page.

Contents, Illustrations, and Tables Pages

The Contents, Illustrations, and Tables pages are numbered with lower case roman numerals. Contents always starts on page iii (the Title page is i and the blank page after it is ii. However, these pages are not numbered.). Only first words of the entry and proper nouns are capitalized (see example on page iii of this report). Numbers are stacked so that the right margin is straight.

The Contents page rarely exceeds one page. Be brief and include only the important headings. Normally, only first and second order headings are included. Indent five spaces or one tab setting between first and second (or second and third) order headings.

Illustration and Tables pages often take multiple pages in long reports.

In the Illustrations, one says "Map showing....," or "Graph of...." That way, the reader knows what kind of illustration it is and what it contains. The actual in-text caption does not say "Map showing..." or "Photo of..." because it is obvious to the user. Only the first phrase or sentence of the caption is used. Do not include notes or credits.

Tables need only be listed by title. Often there are additional sentences in the table caption; these notes are not listed in the contents.

WASHINGTON DIVISION OF GEOLOGY AND EARTH RESOURCES
Raymond Lasmanis, State Geologist

GEOLOGIC MAP
OF THE
MOUNT ST. HELENS QUADRANGLE, WASHINGTON
AND OREGON

Compiled by
WILLIAM M. PHILLIPS

WASHINGTON DIVISION OF GEOLOGY AND EARTH RESOURCES

OPEN FILE REPORT 87-4

November 1987

This report has not been edited or reviewed for conformity with
Division of Geology and Earth Resources standards and nomenclature.



WASHINGTON STATE DEPARTMENT OF
Natural Resources

Brian Boyle • Commissioner of Public Lands
Ari Stearns • Supervisor

Figure 3. Sample title page for open-file reports

Introduction

Start the first text page with the report title centered, all caps, and bold. Then repeat the author block, centered, caps and lower case.

The first regularly numbered page is Introduction. The Introduction heading is first-order.

There is a standard introduction text for the 1:100,000-scale open file texts. Each quadrant of the state map will require a new introductory text. The introduction lists all open file reports in the series as well as conventions used in things like the time scale, map units, etc.

Acknowledgments

Acknowledgments (note spelling) is a second-order heading. Use acknowledgments to thank outside and DGER reviewers and other professionals who substantially assisted with map compilation.

Description of map units

Use a first-order heading for Description of Map Units. Ideally, the map units are described by age, from youngest to oldest, in the following order (use second-order headings):

1. sedimentary deposits and rocks;
2. volcanic deposits and rocks;
3. intrusive igneous rocks;
4. metamorphic rocks.

In many cases, it may be advantageous to group sedimentary and volcanic deposits and rocks (stratified units). In this case, use the following second-order headings:

1. sedimentary and volcanic deposits and rocks;
2. intrusive igneous rocks;
3. metamorphic rocks.

Third-order headings are used for time breaks within lithology groups. However, if all units within a major lithology group are the same age, or if time control is lacking, third-order headings may be used to group the units into complexes or assemblages.

Fourth-order headings normally consist of lithologic groups or sequences that possess common modes of origin. In some cases, geographic, tectonic, or geochemical groupings may be shown by fourth-order headings.

Unit descriptions are fifth-order headings. Type the unit

symbol flush left. Space one empty line, then give the name of the unit, two hyphens, and text. For example, the first two headings of a unit description might be:

"Sedimentary Deposits

Quaternary Unconsolidated Sedimentary Deposits

Nonglacial Deposits

Qaf

Alluvial fan deposits (Holocene)--Poorly sorted boulder gravel to gravelly sand; forms fans of distinctly steeper gradient than floor of sidestream or trunk-stream valleys"

In this example, semicolons are used to separate sentences and that descriptions are not ended with periods. For long descriptions over one or two paragraphs in length, use regular sentence structure with periods.

Note that specific time assignments, such as "Holocene" in the example above, are given immediately after the unit name and are enclosed in parentheses.

If it is not possible to determine the relative ages of a group of map unit symbols, arrange them in alphabetical order.

If subdivisions of a map unit are required, indent five spaces for the left margin but do not change the right margin. For example:

"Qvd

Dacite (Holocene)--dacite flows and plug domes divided into the three subunits on the basis of mineralogy and relative age assignments

Qvd₁--dacite flows with biotite

Qvd₂--dacite flows and domes with hornblende and biotite; forms numerous small vent complexes on southeast side of the main volcano

Qvd₃--aphyric dacite to high-silica andesite flows"

Structure (optional)

If included in the report, Structure is a first-order heading. Use this section of the report to describe folds, faults, and other deformational structures such as foliation, cleavage, lineations, boudins, or mylonites.

References Cited

Citations must be precisely done in DGER format. Use Connie's bibliographies for stylistic details. Be sure and match text citations with those in References Cited.

"References cited" is a first-order heading. Use "hanging indent" format for the citations. For example:

Ellingson, J. A., 1972, The rocks and structure of the White Pass area, Washington: Northwest Science, v. 46, no. 1, p. 9-24.

In WordPerfect, hanging indents requires two tabs. See page R-72 in the WordPerfect manual for details.

Never break a reference between pages. When doing final pagination, create a page break to keep a reference intact.

Authors' names are in regular caps and lower case. Use the complete first name if there are not two (or more) initials. For multiple authors, place a semicolon between authors' names. Put a comma before reference date.

Only normally capitalized words get caps in the title of the reference. If in doubt, consult the Division of Geology bibliographies or ask Connie. If there are subtitles, hook them together with "--". Do not use colons or gaps.

If the reference is an abstract, [abstract] follows title and precedes the colon. The title is followed by a colon, which signals that the next element is the publisher.

Use no abbreviations in the publisher except for "U.S." for "United States." The publisher is not named if the same as the author.

Note that volume is abbreviated "v." and number as "no."

Describing the Age of a Unit

The abbreviations Ma for mega-annums (million years) and ka for thousand-annums are used when describing or reporting a specific age assignment. Note that the "M" is capitalized while the "k" is small case. Do not use "m.y.b.p." or "my BP." Radiocarbon (¹⁴C) ages are measured from A.D. 1950. When reporting a ¹⁴C age estimate, use "yr B.P."

Here are some examples:

"The age of the Pomona Member of the Saddle Mountains Basalt is about 12 Ma."

"The unit was deposited between 23 and 27 Ma." [Note that the word "ago" is not used in the sentence.]

When describing a time span, use "my" or "ky." For example, "the volcanic conditions lasted for 6 my" is correct.

When discussing geochronological data, do not use the terms "age-dating" or "age-dates." Use the terms "age estimates" or simply "ages."

Format for Tables and Figures

The caption for a figure ends with a period. The caption for a table has no period. Figure captions are placed below the figure while table captions are above the table.

Type "Table" and "Figure" in bold. Place a period after the table or figure number. Put one space after the period and the beginning of the caption. For example:

"**Figure 3.** Source of geologic map data."

When citing a source in a figure or table caption, do not capitalize "table" or "figure." For example:

"**Table 1.** List of age dates (after Jones, 1978, figure 3)"

However, when a figure or table from the open-file report is referred to in a caption, capitalize the first letter. For example:

"**Figure 1.** Map showing location of age dates listed in Table 2."

Figures and tables are placed on the first succeeding page after being mentioned in the text.

Figures and tables receive a page number just like any other page of text. When typing text, leave blank pages for figures and tables by using hard page breaks (Ctrl-Return in WordPerfect).

Be sure and check spelling and grammar in figure or table captions.

Sources of data map(s)

All geologic maps used to compile the map must be shown on a page size source of data map or maps. The cartographers may prepare a special reduced figure showing major drainages of the quadrangle for use as a base map. As a minimum, use major

drainages and a town or two as landmarks on the source map. Label the latitude and longitude of map corners. Do not include topography, geology, or roads. Clearly outline the boundary of each map. Use leadered numbers and different line styles to identify each map. Map citations can be listed below the map or on a separate page.

Original mapping that you or other DGER staff conducted for the state map program can be indicated using cross-hatching.

Table of Geochemical Analyses

All Division of Geology geochemical analyses are placed into a computerized database by the lab technician. A computer program generates two standard geochemical tables, a major and minor oxide table (Table 1) and a trace element table (Table 2). Contact Bill Phillips for details on running this program.

Be sure and leave a place for tables in the report by using page breaks in your WordPerfect file.

Table of Age Estimates

All analytical data needed to calculate the age estimate or to evaluate the validity of the age estimate should be placed in this table. This includes any analytical constants used in the calculations. Also, clearly indicate the reference from which the data were acquired.

If source references do not report analytical data, compilers should contact the authors of source reports and attempt to acquire the data.

Table 3 is an example of a K-Ar age estimate table.

Correlation chart

The correlation chart illustrates map units organized by time and lithology. In some quads, it also may be useful to group units by "terrane" or "assemblage." The chart is very helpful for creating Sheet 2 of the 1:250,000-scale map product. The durations of units are shown by the length of the box containing unit symbols. Uncertain unit duration is shown by queried box tops or bottoms. Be sure that the time scale is the official DGER scale (COSUNA with specific modifications).

Table 1 • Sample trace-element geochemical table for open-file reports

SAMPLE NO.	UNIT	SiO ₂	Al ₂ O ₅	TiO ₂	Fe ₂ O ₃	FeO	MnO	CaO	MgO	K ₂ O	Na ₂ O	P ₂ O ₅	QSEC	SEC	TWP	RGE
BP0604853	TG0 ₂	59.59	16.05	1.17	4.09	4.68	0.15	6.46	3.36	1.20	2.96	0.27	SW/4 NW/4	15	10N	O2E
BP0227851	TG0 ₂	55.57	16.90	1.60	4.66	5.34	0.15	7.82	3.73	0.72	3.24	0.27	NE/4 SE/4	21	08N	O1W
BP0402855	TG0 ₂	52.17	15.53	1.83	5.98	6.85	0.22	9.03	4.43	0.95	2.74	0.26	SE/4 SE/4	08	07N	O1W
BP1004841	TG0 ₂	52.25	15.69	1.98	6.05	6.93	0.20	8.46	4.00	0.58	3.59	0.28	SE/4	36	10N	O2W
BP0802841	TG0 ₂	54.56	17.13	1.20	4.07	4.66	0.13	9.27	5.01	0.50	3.20	0.27	CENTER	32	07N	O1W
BP0711847	TG0 ₂	53.19	16.66	1.52	4.24	4.86	0.15	9.93	5.18	0.60	3.23	0.43	NW/4 NW/4	30	07N	O1W
KK628855	TG0 ₂	60.42	16.34	1.08	3.45	3.95	0.14	6.67	3.40	1.26	3.05	0.25	SW/4 NW/4	4	11N	O4E
BP0227853	TG0 ₂	55.31	17.60	1.34	4.13	4.73	0.16	8.44	4.35	0.55	3.12	0.28	CENTER	15	08N	O1W
BP0710846A	TG0 ₂	54.78	16.09	2.18	4.57	5.23	0.18	8.21	3.86	0.70	3.70	0.48	N/2	25	11N	O2W
BP0402851	TG0 ₂	54.64	15.90	2.08	5.44	6.23	0.18	7.55	3.37	0.76	3.51	0.33	SE/4 NW/4	18	07N	O1W
BP1004842	TG0 ₂	59.10	16.18	1.12	3.68	4.21	0.14	6.93	3.62	1.40	3.42	0.22	SW/4 SE/4	10	10N	O1W
BP0402852	TG0 ₂	55.84	17.59	1.50	4.19	4.80	0.16	8.31	3.44	0.74	3.15	0.28	SW/4 NE/4	18	07N	O1W
BP0610851	TG0 ₂	51.90	17.86	1.19	4.41	5.05	0.12	10.07	6.19	0.26	2.76	0.19	SW/4 SE/3	15	07N	O2W
BP1003842	TG0 ₂	49.75	16.48	1.49	4.99	5.72	0.21	10.45	7.66	0.40	2.60	0.25	CENTER	35	10N	O1E
BP0712842	TG0 ₂	53.77	16.06	1.72	4.72	5.41	0.16	9.02	4.95	0.57	3.09	0.52	NW/4 SW/4	30	07N	O1W
BP0815851	TG0 ₂	59.39	16.76	1.08	3.56	4.08	0.14	7.05	3.80	1.06	2.83	0.24	SE/4	15	08N	O3E
KK628851	TG0 ₂	58.72	17.07	1.14	3.49	4.00	0.17	7.27	3.85	1.04	3.01	0.24	SE/4 SE/4	1	11N	O3E
BP0814852	TG0 ₂	58.02	15.85	2.12	4.54	5.20	0.19	6.48	2.97	0.82	3.30	0.51	SW/4	15	08N	O3E
BP0117855A	TG0 ₂	49.51	16.41	1.86	5.42	6.21	0.17	12.12	5.23	0.18	2.68	0.20	SW/4	13	09N	O2W
BP0814851	TG0 ₂	55.74	16.44	1.57	4.50	5.16	0.15	8.41	4.06	0.50	3.16	0.31	NW/4 SW/4	16	07N	O4E
BP0706845	TG0 ₂	57.38	17.73	1.40	2.00	5.75	0.16	7.12	3.57	1.29	3.34	0.26	NE/4	11	10N	O1E
BP0117854	TG0 ₂	52.72	17.61	1.08	4.31	4.94	0.15	10.79	5.23	0.23	2.78	0.15	NE/4 SW/4	13	09N	O2W
BP0802845	TG0 ₂	56.64	17.27	1.52	4.23	4.84	0.17	7.57	3.22	0.71	3.64	0.19	SW/4 SE/4	35	07N	O1W
BP0404851	TG0 ₂	56.21	16.90	1.90	4.70	5.38	0.15	7.17	2.85	0.83	3.57	0.34	CEN. NW/4	06	07N	O1W
BP0802846	TG0 ₂	55.88	16.93	1.67	4.64	5.31	0.16	7.46	3.11	0.86	3.70	0.29	SW/4	06	06N	O1E
KKD19	TG0 ₂	54.50	16.93	1.27	4.41	5.05	0.15	9.16	4.89	0.58	2.83	0.23	NE/4 SW/4	12	06N	O1W
BP0404852	TG0 ₂	51.25	16.52	1.15	4.48	5.14	0.15	9.87	8.29	0.15	2.80	0.20	SE/4 NE/4	19	07N	O1W
BP0712844A	TG0 ₂	52.88	18.39	0.96	4.01	4.59	0.16	10.73	4.56	0.43	3.14	0.15	E/2 SE/4	07	06N	O1W
BP0706842A	TG0 ₂	52.68	16.65	1.69	2.00	7.37	0.17	9.36	6.90	0.39	2.52	0.28	NE/4 SE/4	13	08N	O1W
KK73852	TG0 ₂	57.26	17.34	1.22	3.82	4.38	0.12	7.46	4.14	1.12	2.85	0.27	NE/4 NE/4	8	11N	O4E
KKD110	TG0 ₂	55.18	17.37	1.03	3.86	4.42	0.14	8.89	5.36	0.81	2.72	0.21	NE/4 SW/4	12	06N	O1W
BP0117855C	TG0 ₂	53.44	17.65	1.02	3.98	4.56	0.15	11.11	5.10	0.14	2.64	0.18	SW/4	13	09N	O2W
BP0712845	TG0 ₂	55.81	16.84	1.11	4.39	5.03	0.13	8.76	3.90	0.59	3.26	0.18	SW/4 SW/4	08	06N	O1W
KK627852A	TG0 ₂	58.68	17.01	1.42	4.00	4.59	0.15	6.68	2.67	1.11	3.39	0.30	SE/4 SE/4	1	11N	O3E
KK628851	TG0 ₂	60.55	16.02	1.44	3.91	4.47	0.14	5.61	3.05	1.97	2.56	0.28	NW/4 NW/4	9	11N	O3E
KK8589	TG0 ₂	60.82	16.16	1.14	3.53	4.05	0.11	6.41	3.31	1.36	2.92	0.20	SE/4	4	09N	O2E
BP0610852	TG0 ₂	57.22	16.34	1.31	4.05	4.64	0.15	7.82	4.11	0.77	3.17	0.40	SW/4 NE/4	26	07N	O2W
BP0221851	TGR	54.62	15.58	2.12	2.00	8.46	0.25	8.43	4.61	1.16	2.48	0.29	SW/4 SW/4	06	11N	O2W
BP0221852	TGR	54.01	14.96	2.03	2.00	10.05	0.21	8.23	4.77	1.12	2.32	0.30	CENTER	06	11N	O2W
BP0710841	TGV	50.72	14.64	3.79	2.00	11.12	0.19	9.07	4.60	0.74	2.67	0.47	NE/4 NW/4	21	10N	O2W
BP0710843	TGV	50.75	14.61	3.37	2.00	10.66	0.19	9.42	5.32	0.54	2.55	0.59	NE/4 NW/4	16	10N	O2W
BP0115851	TGV	51.79	14.93	3.44	5.08	5.82	0.15	9.91	4.63	0.68	2.89	0.66	CENTER	07	10N	O2W
BP1205841	TGV	50.57	13.82	3.48	6.20	7.10	0.19	9.00	5.76	0.71	2.68	0.48	NW/4	09	10N	O2W
BP0115853	TGV	49.14	14.82	2.71	5.69	6.51	0.18	11.37	6.20	0.45	2.58	0.35	NE/4	30	10N	O2W
BP0116851	TGV	49.48	13.21	3.21	6.18	7.08	0.19	9.97	6.70	0.69	2.65	0.65	NW/4	09	10N	O2W
BP0425851	TGV	49.50	14.42	3.24	5.96	6.82	0.20	10.56	5.23	0.66	2.90	0.51	SW/4 SE/4	19	09N	O2W
BP0604851	TGV	50.30	13.94	3.78	6.48	7.42	0.20	9.30	4.75	0.49	2.84	0.50	NE/4 SE/4	27	10N	O2W
BP0131851	TGV	50.08	13.77	3.43	6.60	7.56	0.20	9.17	4.85	0.85	2.85	0.64	NW/4 NW/4	17	07N	O2W
BP0115852	TGV	49.67	15.20	3.49	5.86	6.72	0.18	10.26	4.60	0.87	2.65	0.50	NW/4	30	10N	O2W
BP0710842	TGV	50.68	14.61	3.66	2.00	11.09	0.19	8.84	5.18	0.69	2.62	0.43	CENTER	16	10N	O2W
BP0710844	TGV	49.46	14.22	3.43	2.00	11.40	0.23	10.27	5.28	0.50	2.66	0.56	CENTER	09	11N	O2W
BP0226854	TIA	58.50	16.44	1.35	4.38	5.02	0.15	7.81	2.18	0.85	3.06	0.27	NW/4 NW/4	30	08N	O1W
BP0222852	TIA	60.44	16.04	1.65	3.90	4.47	0.16	5.74	2.42	0.97	3.73	0.48	SW/4	25	09N	O2W
BP0117856	TIB	53.40	16.25	1.88	4.99	5.71	0.17	8.98	4.47	0.58	3.29	0.28	NW/4	14	09N	O2W
BP0814856	TVA ₁	53.38	16.84	1.08	4.50	5.15	0.14	9.49	6.44	0.24	2.57	0.16	SE/4 NE/4	07	08N	O4E
BP0814854	TVA ₁	58.11	15.93	1.22	3.99	4.57	0.16	7.52	4.26	1.06	2.92	0.25	NW/4	24	08N	O3E
BP0619851	TVA ₁	55.03	16.07	1.06	4.05	4.64	0.15	9.12	6.42	0.86	2.43	0.18	CENTER	10	10N	O4E
BP0516851	TVB ₃	53.86	17.56	1.50	4.40	5.04	0.16	9.23	4.60	0.42	2.96	0.27	CEN. NE/4	33	12N	O5E

Analyses by XRF, Department of Geology, Washington State University
 All analyses normalized to 100% on a volatile-free basis.

Samples with Fe₂O₃=2.00% analyzed with Columbia River Basalt Group standards and a single-fusion sample preparation method.

All other samples analyzed with international standards and a double-fusion sample preparation method. Fe₂O₃/FeO set at 0.87 for these samples.

Table 2 • Sample trace-element geochemical table for open-file reports

SAMPLE	UNIT	SC	Y	BA	RB	SR	ZR	Y	NB	GA	CU	ZN	NI	CR
BP0610851	TGO ₂	28	201	94	3	403	111	19	9	17	135	108	109	173
BP1004842	TGO ₂	23	177	286	32	379	207	25	13	16	230	156	43	62
BP0712844A	TGO ₂	30	218	100	10	390	88	17	5	20	389	231	53	116
BP0710844	TGV	28	305	176	12	470	227	37	35	25	35	114	30	59
BP0710842	TGV	31	321	228	14	467	234	35	37	22	27	121	24	51
BP0131851	TGV	30	339	250	22	458	284	41	48	24	61	150	32	43
BP0116851	TGV	26	328	193	10	423	239	36	40	20	57	139	110	180
BP0710841	TGV	29	305	209	16	530	248	38	38	26	16	129	9	33
BP1205841	TGV	23	320	185	14	431	230	36	35	23	38	125	62	95
BP0604851	TGV	28	311	193	13	468	245	36	38	25	77	168	14	25
BP0115852	TGV	28	367	251	20	539	264	36	44	26	55	125	59	77
BP0516851	TVB ₃	26	237	177	8	318	178	30	12	20	165	88	75	131

Analyses by XRF, Department of Geology, Washington State University
 All analyses in parts per million (ppm)

Table 3 Sample K-Ar age estimate table for open-file reports

Locality Number	Sample Number	Map Unit Dated	Latitude North	Longitude West	Material Dated	K ₂ O Analysis Rad. Ar (mol/gn)				% Rad. Ar		Age (my)	Std. Dev.	REF	LAB
						First	Second	First	Second	First	Second				
K-AR 1	BP0604851	TGV	46°19'10"	122°54'34"	wr,hf,nit	0.643	0.671	3.643E-11	3.485E-11	46.6	44.1	37.3	2.2	1	1
K-AR 2	BP1004842	TGO ₂	46°21'03"	122°48'42"	plag,hf	0.243		1.219E-11		63.2		34.5	0.5	1	3
K-AR 3		TGO ₂	46°04'36"	122°48'42"	plag,hf	0.180		1.118E-11		27.2		42.8	1.2	2	3
K-AR 4	4338	TGO ₂	46°02'10"	122°51'18"								37.4	0.7	3	4
K-AR 5A	77-37B	TGO ₂	46°10'12"	122°45'	wr							45.0	1.4	4	3
K-AR 5B	77-37B	TGO ₂	46°10'12"	122°45'								41.4	1.3	4	3
K-AR 6A	77-07B	TGO ₂	46°22'48"	122°37'48"								32.2	0.3	4	3
K-AR 6B	77-07B	TGO ₂	46°22'48"	122°37'48"								35.9	0.4	4	3
K-AR 7	MK8589	TVA ₁	46°17'21"	122°33'11"	wr,hf,nit	1.324	1.329	6.195E-11	6.845E-11	65.1	70.1	33.9	1.7	1	1
K-AR 8	BP0814851	TGO ₂	46°10'17"	122°25'00"	wr,hf,nit	0.646	0.648	3.050E-11	3.505E-11	49.3	23.1	36.3	2.2	1	1
K-AR 9	BP0814856	TVA ₁	46°11'36"	122°21'12"	wr,hf,nit	0.380	0.380	1.740E-11	1.883E-11	29.7	47.7	32.9	2.6	1	1
K-AR 10	BP0619851	TVA ₁	46°21'44"	122°17'31"	wr,hf,nit	0.989		5.130E-11		93.8		35.7	1.6	1	3
K-AR 11	S81-A5-R48	TVA ₂	46°16'11"	122°13'44"	plag	0.201	0.202	8.103E-12		3.3		27.7	3.7	7	2
K-AR 12	MK8586	TVA ₂	46°02'30"	122°02'03"	wr,hf,nit	0.756	0.729	3.073E-11	3.063E-11	54.3	56	28.5	1.8	1	1
K-AR 13	S78-A1-E209A	TVC ₂	46°27'02"	122°13'21"	hbl	0.270	0.256	1.040E-11		10		27.1	2.0	7	2
K-AR 14A	S82-A3-E32	TYB ₂	46°23'44"	122°14'22"	plag	0.274	0.279	1.406E-11		13		35.0	2.0	7	2
K-AR 14B	S82-A3-E32	TYB ₂	46°23'44"	122°14'22"	plag	0.274	0.279	1.144E-11		11		28.5	1.1	7	2
K-AR 15	S80-A1-S0 ₂	TVC ₂	46°27'56"	122°13'26"	plag	0.306	0.307	1.268E-11		14		28.5	0.9	7	2
K-AR 16	S78-B2-E49A	TVA ₃	46°24'45"	122°09'20"	plag	0.253	0.256	9.117E-12		2.8		24.7	3.5	7	2
K-AR 17A	S82-D1-E106	TYB ₃	46°28'31"	122°00'08"	plag	0.529	0.533	1.819E-11		46°		23.6	1.2	7	2

- REFERENCES: 1. Phillips and others (1986)
 2. K. McElwee, written communication (1985)
 3. Armentrout and others (1980)
 4. Beck and Burr (1979)
 5. Engels and others (1976)
 6. Hammond and Korosec (1983)
 7. Everts and others (1987)
 8. Armstrong and others (1978)
 9. Armentrout and others (1983)

CONSTANTS: $\lambda_{\beta} = 4.962 \times 10^{-10} \text{ yr}^{-1}$, $\lambda_{\epsilon} = 0.581 \times 10^{-10} \text{ yr}^{-1}$
 $^{40}\text{K}/\text{K}_{\text{total}} = 1.167 \times 10^{-4} \text{ atom percent}$

TREATMENTS: hf=hydrofluoric acid
 nit=nitric acid

MATERIALS: wr=whole rock
 biot=biotite
 hbl=hornblende
 plag=plagioclase

- LABS: 1. Geochron
 2. U. S. Geological Survey, Menlo Park
 3. Oregon State University
 4. Mobil Research Laboratories
 5. University of British Columbia
 6. Teledyne

* Earl porphyry copper deposit within the Spirit Lake pluton

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