## Appendix A.

# A System for Providing Sedimentological Analysis by Detailed Graphic Logs

Gordon J. Hughes, Jr., 2 Greenbrier Court, Missoula, MT, 59802, USA
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Revised by Jeffrey L. Mauk
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## Preface

In 1983, while working for Noranda Exploration, Inc., I used Gordon Hughes' system for providing sedimentological analysis by detailed graphic logs. Although it takes some time to learn the system and the notations, I found it to be remarkably efficient, because it provides a means of recording all relevant data in a clear, concise and abbreviated form. Dr. Hughes granted permission to use this system during my study of the Revett Fm in the Coeur d'Alene district. The following report describes his system, including minor modifications that I have made.

Jeff Mauk
06 June 2000

## Introduction

The complete graphic presentation of all sedimentary rocks of a measured and described series is the best method of (a) visualizing the section, (b) finding the characteristic parts, (c) noting repetition of properties, and (d) making correlations between sections. The numerous sedimentary characteristics that are known can be arranged in groups such as (a) bedding-plane structures, (b) structures in layers, (c) lithology, etc. The graphic presentation of these features makes it necessary to use symbols and codes in the graph because excessive terminology would destroy the clearness that should be our aim.

The data that can be obtained from outcrops, mine workings, or drill holes make it possible to give hypothetical explanations for the origin, transport, and sedimentation of certain known facies models. For example, a turbidity current could be followed from its source area via the slump stage, the fluxoturbidite stage, and into the turbidite stage. The sequence of structural intervals and the distribution of the different types of sediment and their variations can be reconstructed using the graphical method. In other words, the graphs would allow us to determine that portion of a basin that was filled from sediment deposited by turbidity currents.

In summary, graphical presentations of data collected from sedimentary rocks can be used for the following purposes.

1. To give all the sedimentary properties of a sequence that act as a standard section for other investigations, such as stratigraphy.

2. To give the characteristic parts of a sedimentary series that is considered the facies model of the series.
3. To compare a number of sediment series.
4. To determine the facies model of an unknown series by comparing its graph with standard graphs from known environments.
5. To provide a meaningful way of defining those sediment series that can be used as mappable units of regional extent.

## Description of the Detailed Graphic Logs

Figure A-1 gives the major headings for the graphic logs along with appropriate subdivisions. These headings and their subdivisions are described in the following pages, and the sediment properties and their symbols are given for each column. In field surveys the use of colors is often advisable in order to speed up the data collecting process. In those cases where it is advisable to use colors for this system, the number of the Verithin color pencil is given.

## Use of the Columns

### *First Column: Thickness/Depth*

The thickness of layers in a section, or their depth, in the case of drill holes, is given in either English or metric units depending on what is currently the practice for any given area. For a detailed graphic log, in which all properties of the sediment profile are represented, scale of about 1”=5’ or 1”=10’ are often the best. Where very detailed analysis is required, sometimes a larger scale of 1”=1’ or 1”=2’ must be used for small but important parts of a section. For somewhat more generalized, semi-detailed descriptions, a scale of 1”=25’ or even 1”=50’ can be applied with good results. However, graphs at these scales should only emphasize the significant characters because they must constitute the comprehensive units (e.g. sequences, cycles, etc.) that can be useful in correlation.

In any regional study and where correlations or comparisons with other sedimentary deposits are being made, it is always advisable to use the same scales.

### *Second Column: Rock Type*

This column is used to provide a simple, rapid designation of the main types of sediments. Examples are given in Figure A-2A, but are not all-inclusive. Divisions are made according to the mineralogic composition. For instance, names such as feldspathic quartzite, argillaceous quartzite, etc. are preferred over arkose, greywacke, etc. The present trend to change the names of sediments from their more lithologic character as used in the past (e.g.

# Coeur d'Alene District Revett Study
## Drill Core Log

Hole Name / No. ______________________
Purpose of Hole ______________________
______________________
______________________

Property ______________________
Coordinates - collar N ______________________
E ______________________
Elevation - collar ______________________
Date logged - start ______________________
Date logged - finish ______________________

Location Map No. ______________________
Bearing at collar ______________________
Inclination at collar ______________________
Length ______________________
Core size ______________________
Logged by ______________________

| Thickness | Rock Type | Dia/meta mins | Color | Bedding Plane Properties | | | Current Dir | Layer Properties | | | Lithology | | | | | | | | | | | | | | | | | | | | | | | | Compaction Deformation Properties | | Notes | % Recovery | No of Layer |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | Pelite | | | | | Sand | | | Gravel | | Carbs % | | | Ox/Hyd % | | | Sulfides % | | | | | | | | | | | |
| | | | | Type | Attitude | Strus | | Planar | Curviplanr | Nonplanar | Chert | Clayey | Silty | Sandy | Very Sandy | Silt | Fine | Medium | Coarse | Fine | Coarse | 50 | 25 | 10 | 25 | 10 | 5 | 25 | 15 | 10 | 8 | 6 | 4 | 2 | Strus | Tex | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Figure A-1. Graphic log, illustrating major headings and appropriate subdivisions.

graywacke, arkose, etc.) to names with a more descriptive mineralogic connotation will provide a better basis for making environmental analysis and correlations.

The column for rock types is also where texturally modified sedimentary rocks and certain structures (other than primary sedimentary structures) such as faults are indicated. The symbols for these types of features are shown in Figure A-2B. Figure A-2C provides the symbols to be used for igneous and metamorphic rocks that may be encountered in certain sedimentary basin analysis programs. Color codes are to be used where practical.

### *Third Column: Diagenetic/Metamorphic Modifications*

This column is used to portray the presence of features that indicate important diagenetic and metamorphic changes that have been imprinted on the sediments. Although much remains to be learned about these processes that affect sediments, it is nonetheless important to note the presence of various minerals or mineral assemblages that show a change in the initial sediment material after its deposition. Many of these changes can be diagnosed in the field, however, diagenetic alteration of clay minerals and certain mineral cements can only be diagnosed in the laboratory. A list of the diagenetic/metamorphic minerals important to most sedimentological analyses (particularly those involving Proterozoic rocks) is given below (Figure A-3). When observed in outcrops or drill cores, they should be noted on the graphic log by their abbreviations, and an estimate of their abundance should be made for quantifying purposes. Any general observations pertaining to the diagenetic/metamorphic features of sediments should also be included in the column for Notes.

### *Fourth Column: Color*

An important factor of sedimentary rocks can be their color. In general, only the color of the fresh rock should be given. However, there are times when certain color modifications occur on weathered surfaces and should be recorded. In these cases the column should be divided into two with the right hand subcolumn used for the fresh rock color (Figure A-4). Not all sediments have to be color-coded, but when a diagnostic color is present, it should be given by an abbreviation in the column. A sharp contact between two colors should be shown by a horizontal line, and a gradual change from one color to another by and inclined line through the interval in which the colors become merged. In a thinly bedded or laminated sequence, the scale may not permit each separate color to be presented. In this case the column is subdivided by a zigzagging line with each of the colors on one side.

### *Fifth Column: Bedding Plane Properties*

During sedimentologic surveys, the bedding planes are very important, not only for the structures that are related to them, but also for their significance as contacts between layers. Likewise, the relative attitudes of bedding planes are important for interpreting unconformable sequences, determining regional trends, and for sorting out structures. Therefore, this column has been subdivided into three subcolumns for showing: (1) the type of bedding plane, (2) the attitude of the bedding plane, and (3) the structures of the bedding plane.

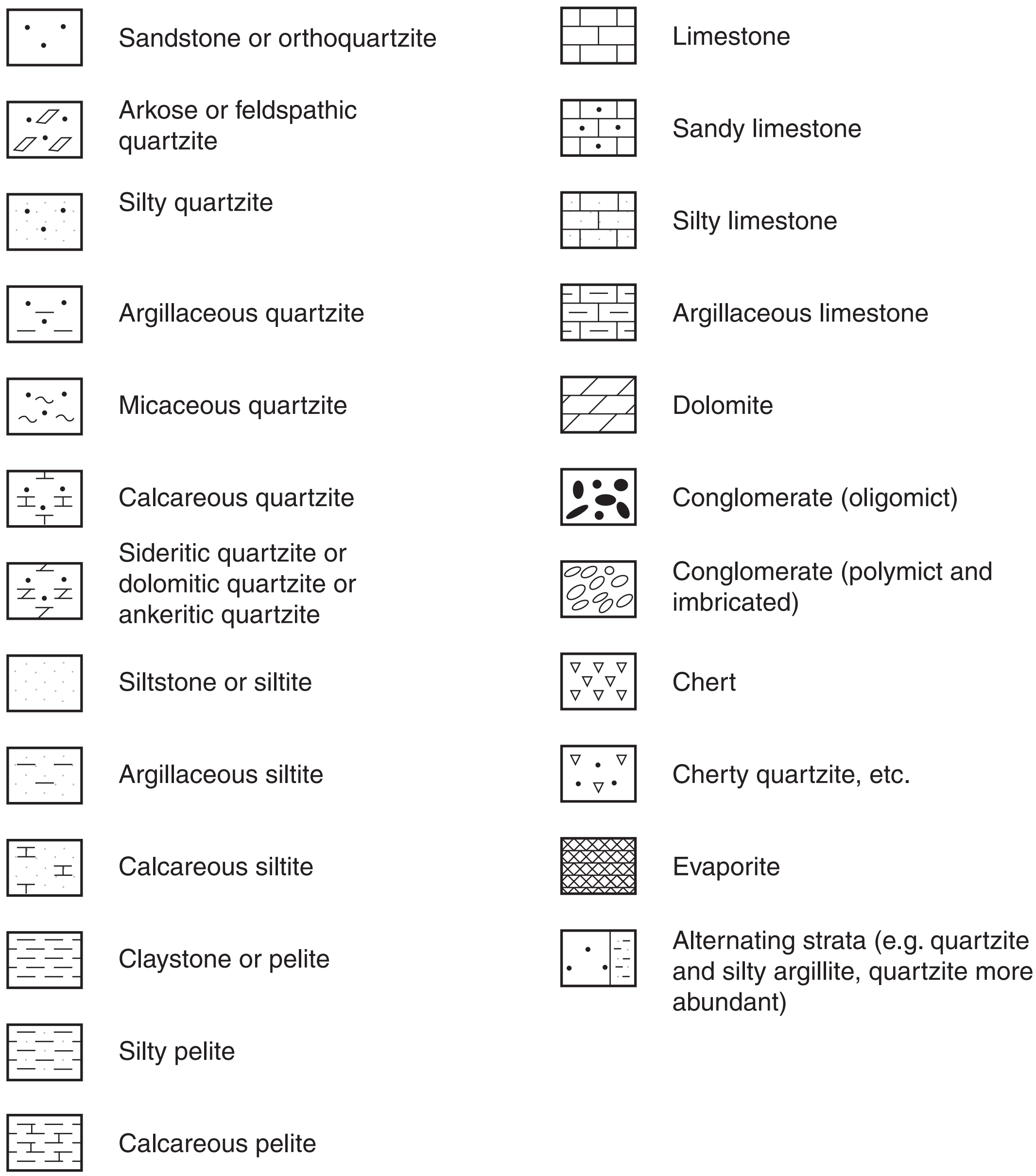



Figure A-2A. Sedimentary rock types.

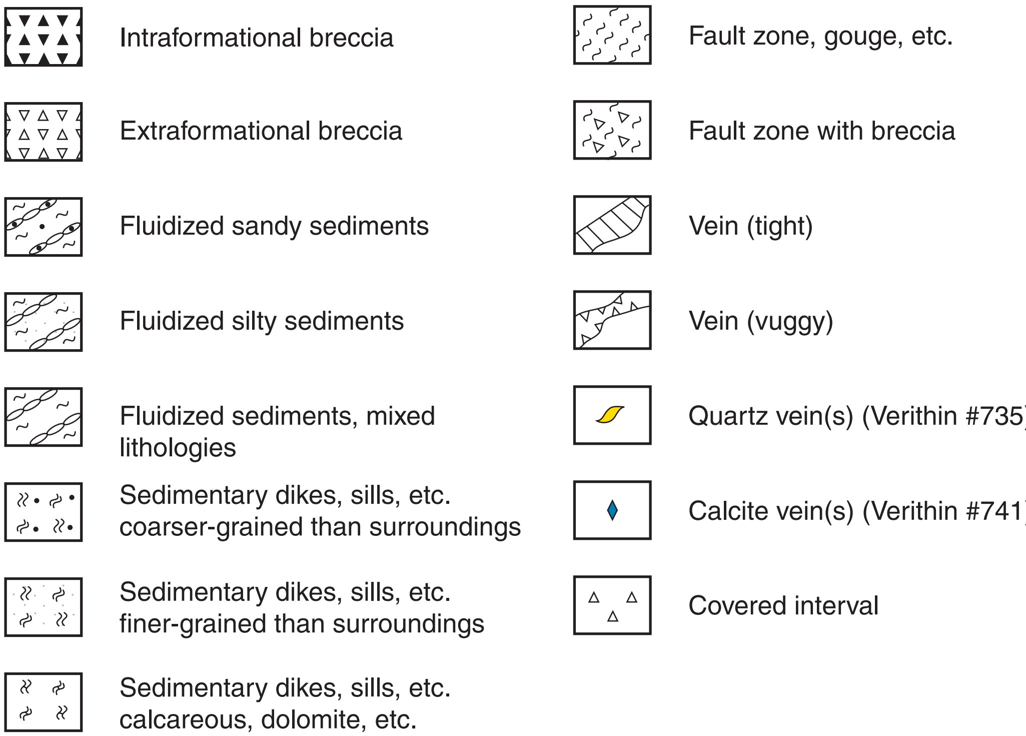



Figure A-2B. Texturally modified sedimentary rocks and post-sedimentation structures.

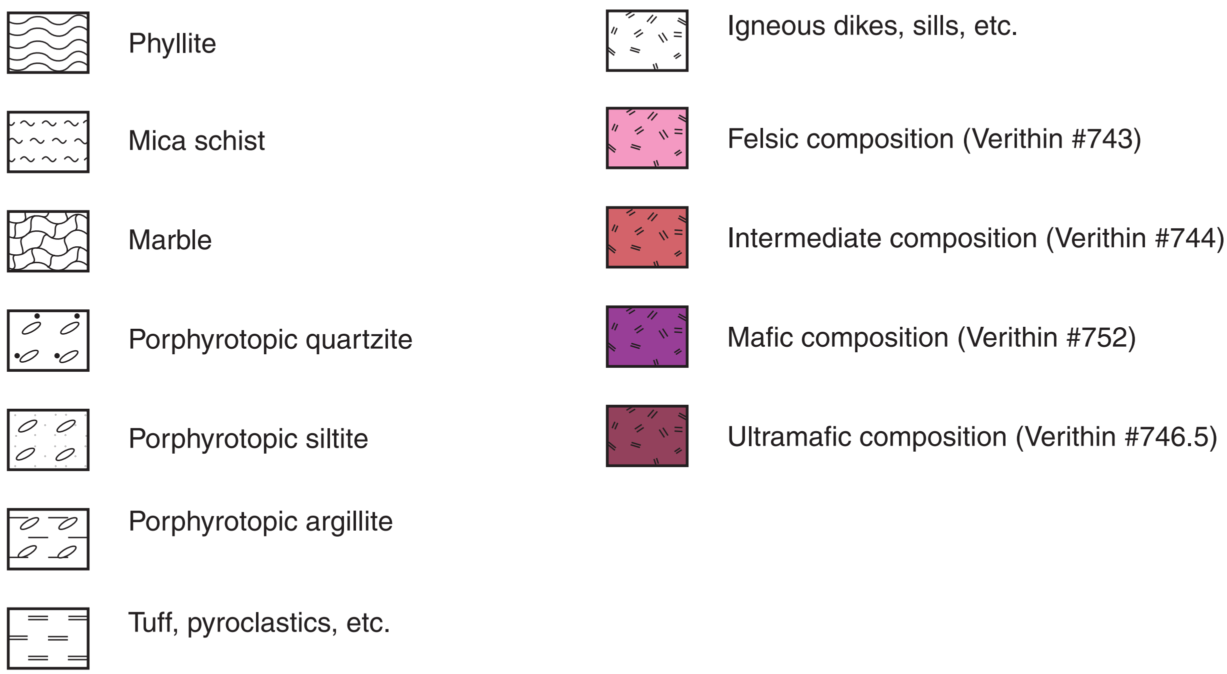
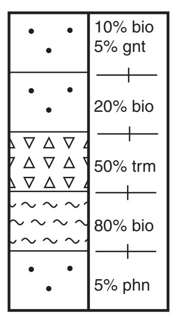



Figure A-2C. Metamorphic and igneous rock types.

| | |
|---|---|
| qtz | Quartz (silicification) |
| akf | Alkali feldspar |
| plg | Plagioclase feldspar |
| fel | Feldspar (either type) |
| pyx | Pyroxene group |
| amp | Amphibole group |
| epd | Epidote group |
| gnt | Garnet group |
| brm | Brittle mica group |
| chl | Chlorite group |
| zlt | Zeolite group |
| phn | Phengite group |
| bio | Biotite |
| mus | Muscovite |
| trm | Tourmaline |
| gph | Graphite |
| slm | Sillimanite |
| crd | Cordierite |
| apt | Apatite |
| scp | Scapolite |
| sph | Sphene |
| ido | Idocrase (vesuvianite) |
| ser | Sericite |

## Example




Quartzite containing 10% biotite and 5% garnet

Quartzite containing 20% biotite

Extraformational breccia with 50% tourmaline

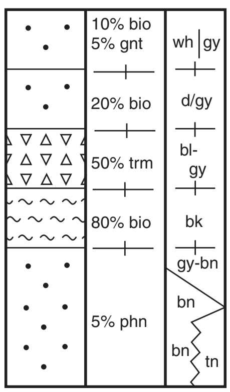
Mica schist that is 80% biotite

Quartzite containing 5% phengite

Figure A-3. Diagenetic and metamorphic minerals.

| | | | | | |
|---|---|---|---|---|---|
| bk | Black | yw | Yellow | d/ | Dark |
| wh | White | gn | Green | m/ | Medium |
| gy | Gray | bl | Blue | l/ | Light |
| bn | Brown | vt | Violet | | |
| tn | Tan | pk | Pink | | |
| rt | Rust | rd | Red | | |
| sv | Silver | lv | Lavender | | |

## Example




Gray quartzite with a white weathered surface containing 10% biotite and 5% garnet

Dark gray quartzite containing 20% biotite

Bluish-gray extraformational breccia with 50% tourmaline

Black mica schist that is 80% biotite

Grayish brown quartzite gradually changing to brown quartzite

Alternating brown and tan quartzite containing 5% phengite

Figure A-4. Abbreviations used for color, and examples.

If a coarse sandstone overlies a shale and a very sharp bedding plane is visible, this boundary indicates that the conditions of deposition changed abruptly. On the other hand, the boundary between a fine gravel and a coarse sand, or between a sandy pelite and a silty pelite is usually vague, indicating a transition in the depositional conditions. Based on changes of these types, the different gradations of the sharpness of bedding planes have been divided into six groups (Figure A-5). Apart from this division, distinction is also made between a flat contact, an undulating contact, and an irregular contact (these have the same divisions into six types of sharpness). It is readily apparent that whether a bedding contact is flat, undulating, or irregular may be difficult, at best, to determine in drill cores.

The attitude of bedding planes is defined by their strike and dip taken from outcrops or underground workings. In drill cores the attitude is monitored by consistently measuring the acute angle between the axis of the core and the bedding plane (Figure A-6).

Bedding plane structures may appear either on top of a bed, or as sole casts or sole markings on the bottom of the underlying bed. Sole markings are generally more common, and they occur almost exclusively in turbidite sequences. The structures commonly related to bedding planes are indicated by symbols (Figure A-7). A semi-quantitative approach is often desirable, and if used, should be as follows: one symbol when the structure is a rare occurrence, two of the same symbol for a common occurrence, and three symbols when the structure is abundant.

## *Sixth Column: Current Direction*

Current directions obtained from sole markings as well as from structures inside the layers are given in this column. The direction is given with reference to north or south, which is taken as being vertical on the graphic log. Unequivocal current directions with known sense of flow, such as those taken from cross beds or current ripples, are designated by an oriented arrow. Current sense obtained from groove casts and striations is not unequivocal and thus only an oriented line is given with a dot to indicate if the direction of pointing is distinct or not (Figure A-8). On maps, the dot should be placed at the point of observation.

## *Seventh Column: Layer Properties*

This column has been subdivided into three subcolumns to accommodate those layer properties that are essentially planar, curviplanar, or nonplanar in habit. When different types of layer structures occur, they are designated within their subcolumn by symbols (Figures A-9A, A9B, A9C). Examples of each type might be parallel laminations which are planar, lenticular laminations which are curviplanar, and concretions that have no planar characteristics. Sometimes the scale of a graphic log does not permit the stratigraphic variations of one or more characters to be placed exactly. In these instances, it is up to the observer to determine and display the property that is the most important, and then refer to the others under the column for notes.

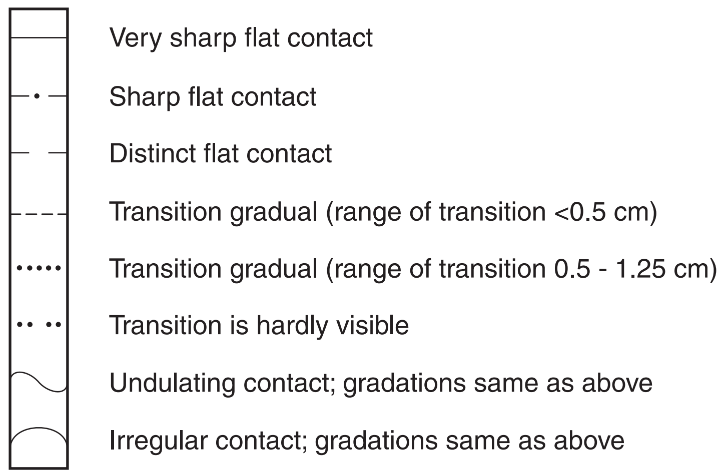
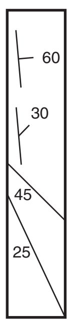



Figure A-5. Types of bedding planes and their gradations.




Strike and dip of bedding in outcrop (e.g. N05W; 60E)

Strike and dip of inclined bedding planes, such as foresets (e.g. N05W; 30E)

Acute angle measured between bedding plane and drill core axis (e.g. 45° and 25°)

Figure A-6. Representation of bedding attitudes.

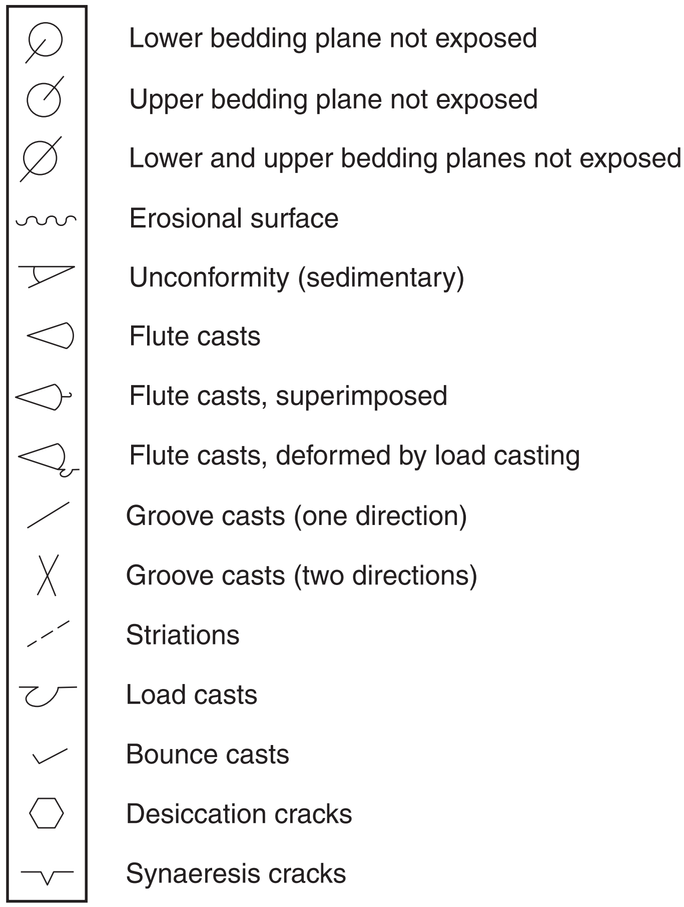
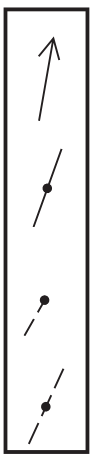



Figure A-7.  Structures found on bedding surfaces.



Unequivocal current direction (e.g. N10E)

Line of flow distinct, pointing doubtful (e.g. NE or SW)

Line of flow indistinct, pointing known (e.g. SW)

Line of flow indistinct, pointing doubtful

Figure A-8.  Symbols used to show paleocurrent directions.

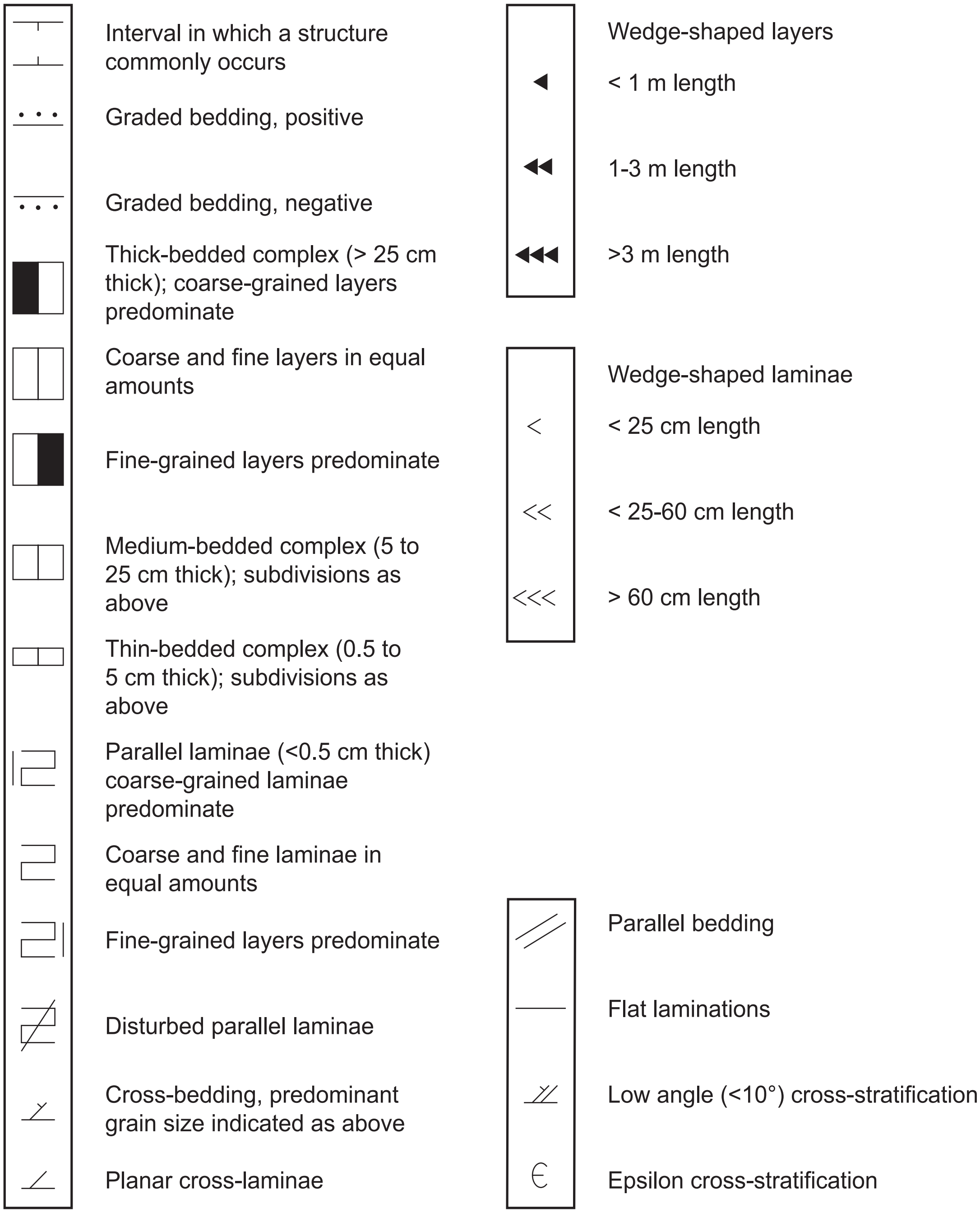
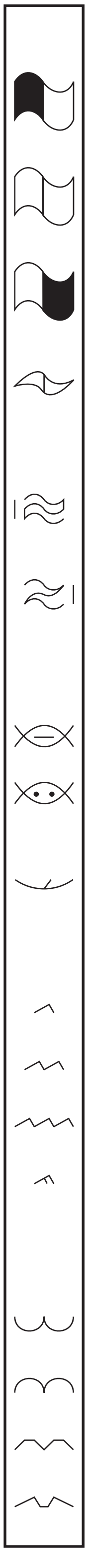



Figure A-9A. Planar layer structures.



**Wavy bedding (0.5-25 cm thick)**

Coarse-grained layers dominate

Coarse- and fine-grained layers in equal amounts

Fine-grained layers dominate

Lenticular bedding (subdivisions same as above)

Wavy lamination (<0.5 cm thick) coarse-grained laminae dominate, etc.

Lenticular lamination; fine-grained laminae dominate, etc.

**Flaser structure**

Sand lenses <0.5 cm

Sand lenses >0.5 cm

Cross-beds or cross laminae in eddy holes

**Current ripples (<5 cm high)**

Wave length <12 cm

Wave length 12-25 cm

Wave length >25 cm

Climbing ripples (subdivisions same as above)

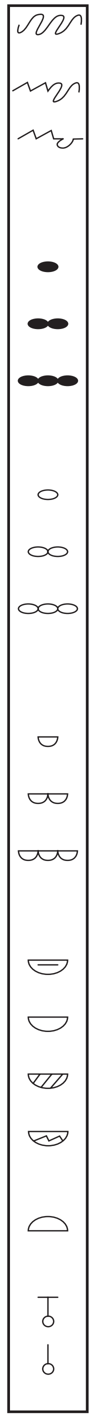
**Wave ripples**

Pointed crests

Rounded crests

Flattened tops

Interference ripples



Convolute laminations

Current ripples, convoluted

Current ripples, deformed by loading

**Lenticular layers (>0.5 cm thick)**

Length < 1 m

Length 1-3 m

Length > 3 m

**Lenticular laminae (<0.5 cm thick)**

Length < 25 cm

Length 25-60 cm

Length > 60 cm

**Units with concave bottoms and flat tops (e.g. channel scours)**

Width < 1 m

Width 1-3 m

Width > 3 m

**As above**

Fill finer than surroundings

Fill same as surroundings

With foresets

With current ripples

Unit with flat bottom and concave top (e.g. sand bars); same subdivisions as above

Internal load casts

Internal, isolated load casts

Figure A-9B. Curviplanar layer structures.

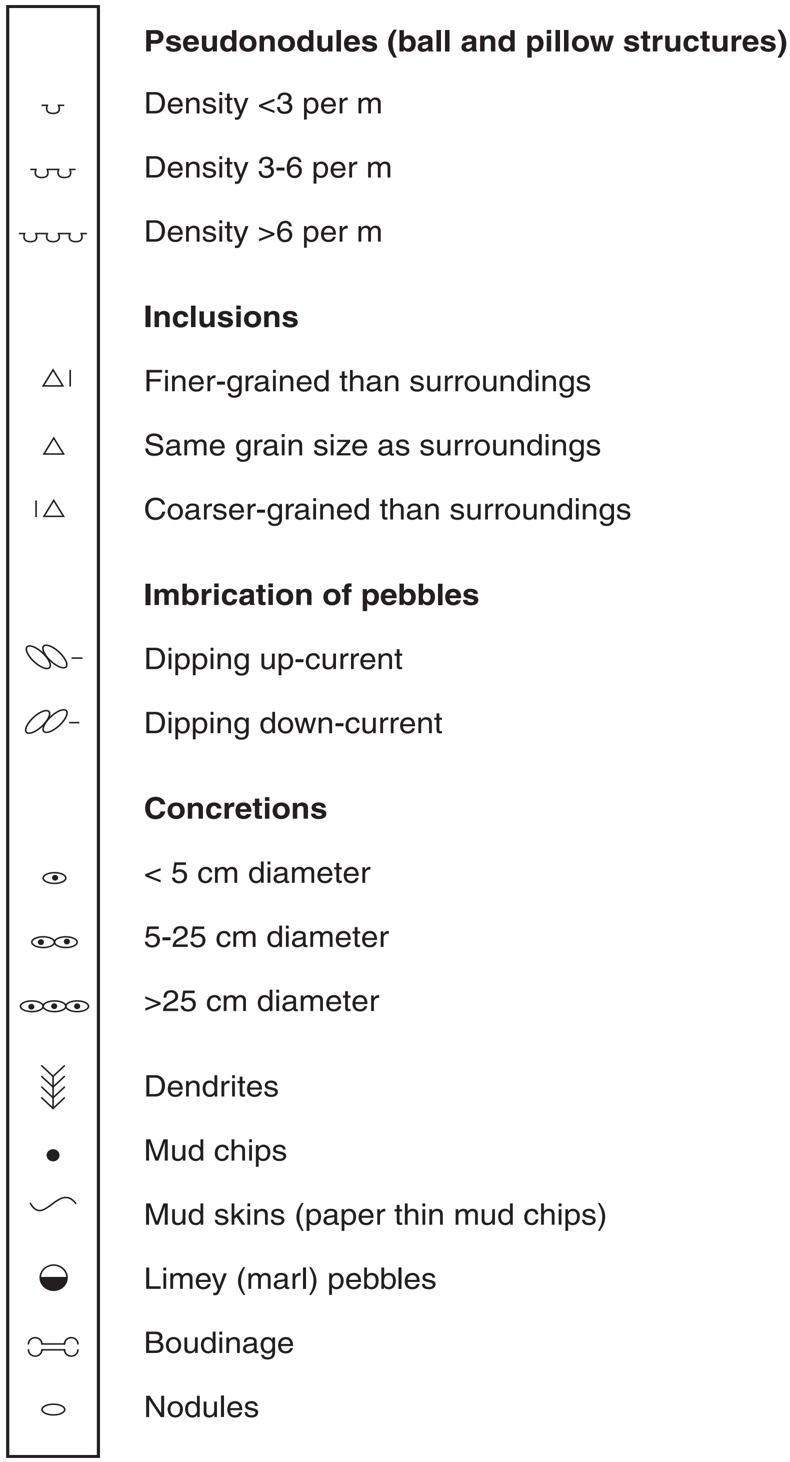



Figure A-9C. Nonplanar layer structures.

## *Eighth Column: Lithology*

Five kinds of data are considered under this heading. They are texture, chert content, carbonate content, oxide/hydroxide content, and sulfide content. All but the column for chert content are divided into a number of subcolumns.

Descriptions under the heading of texture are based on the grain size as it appears in the field. When a sediment is composed of two or more components, any that take up less than 5% of the total sediment are not mentioned. The textural components are distinguished according to the Wentworth scale (Table A-1). One should note the fact that this column does not indicate the size frequency distribution of the sediment, but only the principal component(s).

Table A-1. Grain sizes for sedimentary rocks.

| | | |
|---|---|---|
| Gravel | Coarse<br>Fine | 64-16 mm<br>16-2 mm |
| Sand | Coarse<br>Medium<br>Fine | 2-0.5 mm<br>0.5-0.25 mm<br>0.25-0.0625 mm |
| Silt | | 0.0625-0.004 mm |
| Very sandy pelite*<br>Sandy pelite<br>Silty pelite<br>Clayey pelite | | 30-70% sand<br>5-30% sand<br>>95% pelite, of which 30-70% is silt<br>>95% pelite, less than 30% silt |

* Pelite is the fraction that is less than 0.005 mm (50 microns).

Figure A-10 gives some examples and their representation in the graphic log. They are explained below.

A-10A The lower layer is medium sand, the middle layer is sandy pelite, and the upper layer is fine sand. Grading within the layers is absent. The portion to the left of the name-giving line is shaded gray to make the graphic portrayal more conspicuous. In the Revett study, these units correspond to basal vitreous quartzite, middle thin-bedded argillite, and upper sericitic quartzite.

A-10B In the Revett study, this diagram would show blocky siltite overlain by argillitic siltite that is capped by sericitic quartzite.

A-10C A bedding plane separates two layers consisting of medium sand. Often it is not possible to say what represents the hiatus, but sometimes a clay or mica film is present, and should be stated under the notes column.

A-10D Three distinct layers that show grading (as in turbidites). Note that the middle layer contains some fine gravel near the lower contact that is conspicuous but not important enough to give its name to the sediment. These minor components can be added to the graphic log by a line whose thickness can be used as a semi-quantitative way of indicating the amount of this component.

A-10E Two layers of medium sand between which are found many thin layers of very sandy pelite alternating with silty pelite. These layers are too thin to be drawn separately, but the alternating tendency can be represented as shown.

A-10F An upward coarsening sequence of sands is overlain by a nearly rhythmic sequence of alternating silt and clay-sized sedimentary material.

To the left of the subdivisions for lithologic textures is a subcolumn for indicating the presence of chert. The column is colored according to a code only when chert is present as a primary chemical sediment (Figure A-11). Chert nodules, replacement rinds, etc. should not be indicated in this column but rather are shown under the column for layer properties.

The carbonate content, especially $CaCO_3$, can be estimated in the field by using a 10% HCl solution. In general, only the $CaCO_3$ content (and to a lesser extent the $CaMg(CO_3)_2$ content) can be estimated in the field with any kind of accuracy, and the other kinds of carbonates sometimes found in sediments must be analyzed in the laboratory. When using HCl it is generally to ascertain, even roughly, the calcium carbonate content because of the influence of grain size, porosity, etc. However, for the purposes of this system, it is suggested that the following semi-quantitative scheme be adopted (Table A-2).

The estimated carbonate percentage is drawn on the graphic log and the portion to the right of the line is hatched or colored according to the type of carbonate (Figure A-12).

Table A-2. Estimation of percent $CaCO_3$ using 10% HCl.

| | |
|---|---|
| 0% $CaCO_3$ | No effervescence |
| 1-10% $CaCO_3$ | Visible effervescence with hand lens or can be heard to fizz |
| 10-25% $CaCO_3$ | Strong effervescence but bubbles do not collect |
| 25-50% $CaCO_3$ | Very strong effervescence, bubbles collect into a froth-like liquid |
| >50% $CaCO_3$ | Instantaneous formation of froth-like liquid and rapid neutralization of HCl |

The next subcolumn under the lithology heading is for representing the presence of common oxide and hydroxide minerals. These can be brought into sedimentary rocks as (a) primary, bedded-type chemical sediment formed in situ (e.g. banded iron formation), (b) ordinary clastic grains (e.g. magnetite, ilmenite, etc.), or (c) secondary minerals formed in the weathered (oxidized) zone (e.g. goethite, jarosite, malachite, etc.). In general, it will only be the first two types that we are concerned with in making regional sedimentological analyses. The last type is usually important when weathered outcrops of mineralized rock are encountered. When logging drill core, it is often important to differentiate the minerals formed in the oxidized zone versus those formed in fresh, unaltered sediments, as shown in Figure A-13. Percentages of various

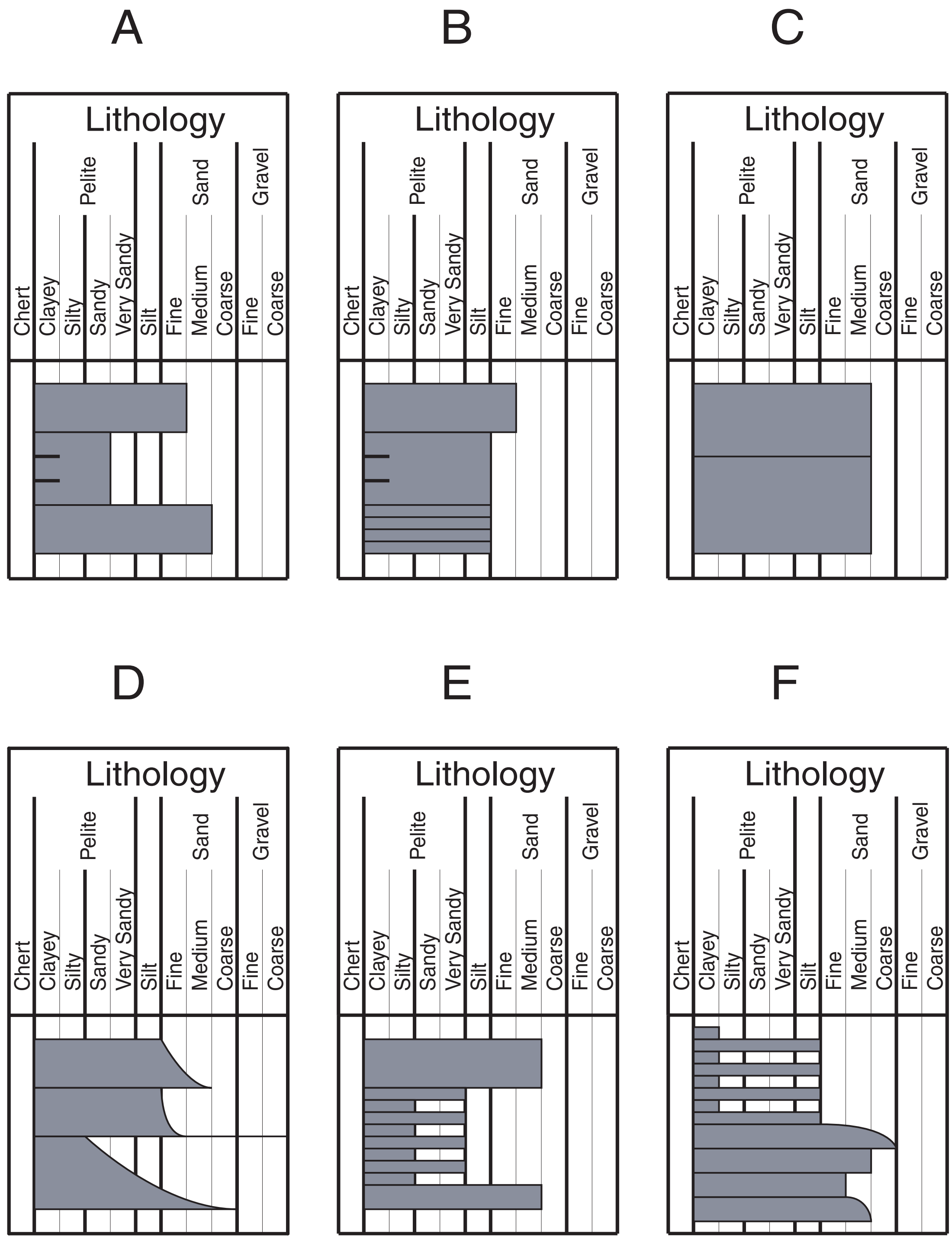



Figure A-10. Examples of graphically displayed lithologic sequences.

**Color**

| | |
|---|---|
| 735 | Chert (~100% $SiO_2$) |
| 760 | Chert with tourmaline |
| 744 | Chert with ferric iron |
| 737.5 | Chert with ferrous iron |

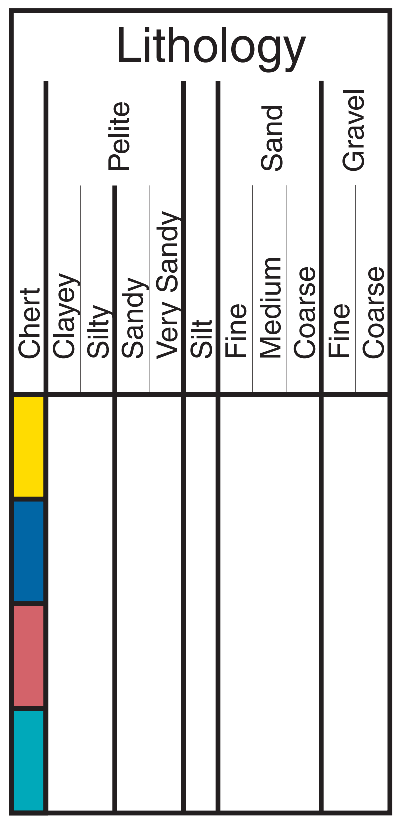
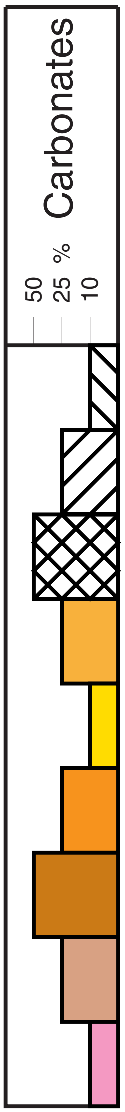



Figure A-11. Notation for showing the presence of chert.




| Mineral | Abbreviation | Color |
|---|---|---|
| Calcite $CaCO_3$ | cal | |
| Iron carbonate: siderite or ankerite | | |
| Calcite and iron carbonate | | |
| Dolomite $MgCa(CO_3)_2$ | dol | 755 |
| Siderite $FeCO_3$ | sid | 736 |
| Ankerite $FeCa(CO_3)_2$ | ank | 737 |
| Magnesite $MgCO_3$ | mgn | 736.5 |
| Ferroan dolomite $(Fe)MgCa(CO_3)_2$ | fedol | 757 |
| Rhodocrosite $MnCO_3$ | rho | 743 |

Figure A-12. Notation for showing carbonate minerals.

oxide-hydroxides are visually estimated and plotted on the graphic log. When they are present as "massive" assemblages, the entire portion of the graph is colored and the estimated percentages of the different minerals are shown under the column for notes. The mineral type is shown by coloring in the portion to the right of the line according to the color scheme in Figure A-13.

The last subcolumn under the main heading of the lithology is for sulfides, or other important metal-bearing minerals. Their presence is portrayed on the graphic log in a manner similar to that for oxides/hydroxides. These minerals are also color-coded according to the scheme shown below (Figure A-14). The colors may be used in conjunction with symbols that indicate in which manner these minerals occur (e.g. disseminated grains, lenses, veins, etc.). If it is desirable, the second column (rock type) can also be used in the manner shown below. Naturally, the column for notes should be used to provide more detailed descriptions of sulfide mineral occurrences.

## *Ninth Column: Compaction/Deformation Properties*

Sediments deposited in most basins are subjected to forces that can alter their initial layer/bedding properties. The structural and textural modification that result are mainly due to (a) dynamic compaction of water-saturated sediments (e.g. clay- and silt-rich units); (b) mass sediment movements (e.g. slumps), and (c) tectonic stresses. These processes usually produce some unique structures (e.g. slump folds, sediment intrusions) and cause the sediments to be retextured (e.g. pseudo-flow foliations, breccias). Noting these features is just as important to interpreting the environment of deposition, as is the type of sediment itself. A list of the common structures and textures and their symbols to be noted on the graphic log are given in Figure A-15.

## *Tenth Column: Assay/Geochemistry*

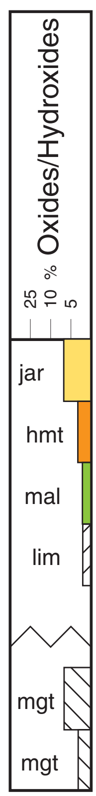
Although not used in the Revett study, Dr Hughes' original logs had a column for showing assays. The column could be used in several manners depending on how many elements are analyzed, and whether or not graphic portrayal or simple numerical representation can be used to achieve the best results (Figure A-16).

## *Eleventh Column: Notes*

Supplementary data such as detailed descriptions of sulfide mineral occurrences, complex metamorphic mineral assemblages, dimensions of structures, mineralogies of veins, etc. can be presented in this column. Any general remarks relating to locations of samples (i.e. for assay, thin sections, etc.), photographs, etc. should also be shown in this column (Figure A-17). If paleocurrent data have been acquired in a section, they can be plotted as a rose diagram and shown in this column.

| Mineral | Abbreviation | Color |
|---|---|---|
| Hematite | hmt | 737 |
| Magnetite | mgt | |
| Limonite | lim | |
| Goethite | gth | 745.5 |
| Jarosite | jar | 735 |
| Malachite | mch | 751 |
| Hydrozincite | hzn | 740.5 |
| Erythrite | ery | 743 |
| Annabergite | anb | 738.5 |
| Arsenates | asn | 758 |
| Leucoxene | leu | 755 |
| Manganese oxides | mnx | 756 |

**Example**




7 volume % jarosite

3 volume % hematite

2 volume % malachite

2 volume % limonite

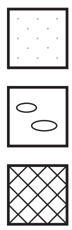
Approximate boundary between oxidized and fresh rocks

7 volume % magnetite

3 volume % magnetite

Figure A-13. Notation for showing oxide and hydroxide minerals.

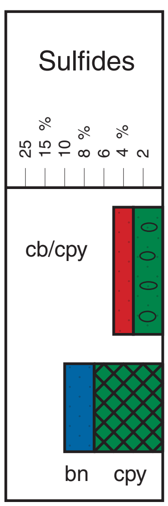
| Mineral | Abbreviation | Color |
|---|---|---|
| Arsenopyrite | apy | 757 |
| Bornite | bn | 740 |
| Chalcocite | cc | 747.5 |
| Chalcopyrite | cpy | 738 |
| Cobaltite | cb | 745 |
| Enargite | en | 756 |
| Galena | gn | 740.5 |
| Marcasite | mc | 735 |
| Pyrite | py | 736 |
| Pyrrhotite | po | 745.5 |
| Sphalerite | sl | 746.5 |
| Stibnite | stb | 738.5 |
| Tetrahedrite | thd | 739.5 |



Disseminated grains

Lenses, boudins, etc.

Veins and stockworks




**Example**

Total of 5 volume percent sulfides; 3 vol% is disseminated grains and lenses of cobaltite, and 2 vol% is disseminated grains of chalcopyrite

Total of 10 volume percent sulfides; 7 vol% is chalcopyrite in veins, and 3 vol% is disseminated grains of bornite

Figure A-14. Notation for showing sulfide minerals.

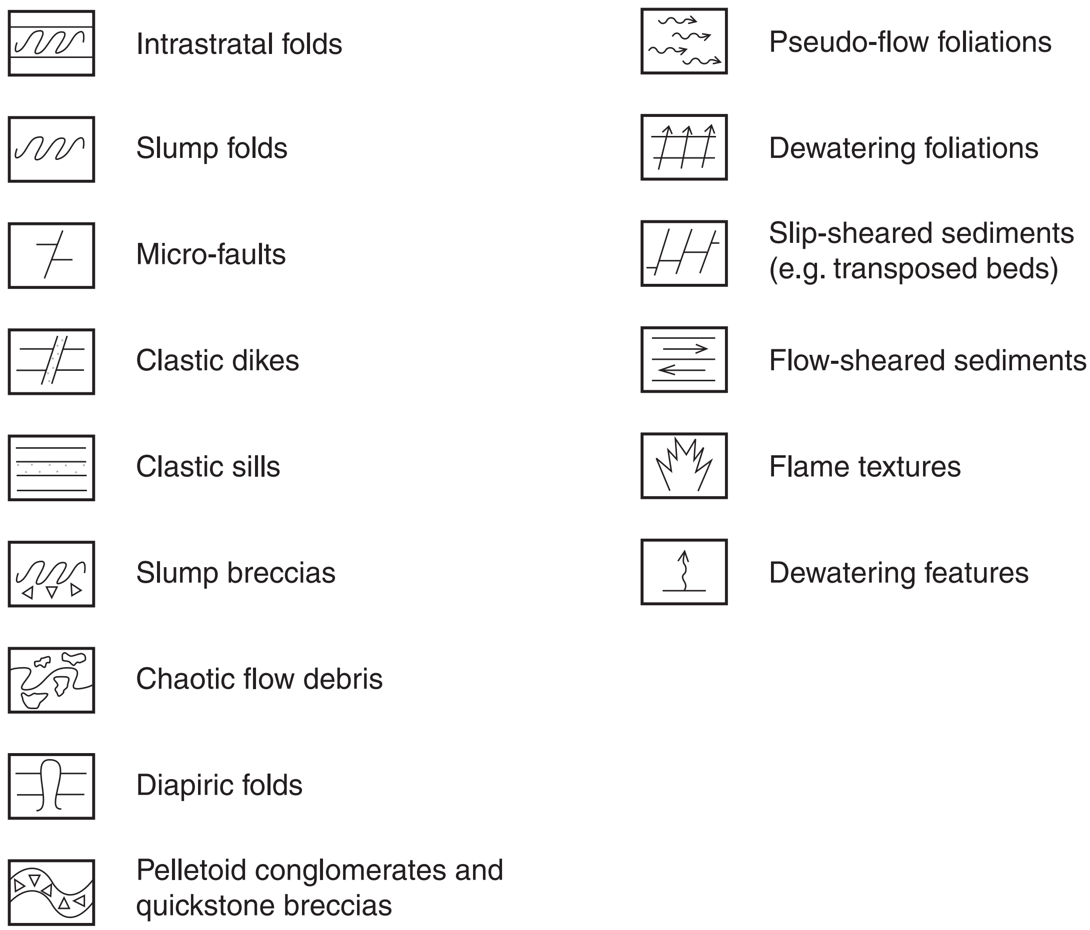



Figure A-15. Structures and textures caused by compaction and deformation.

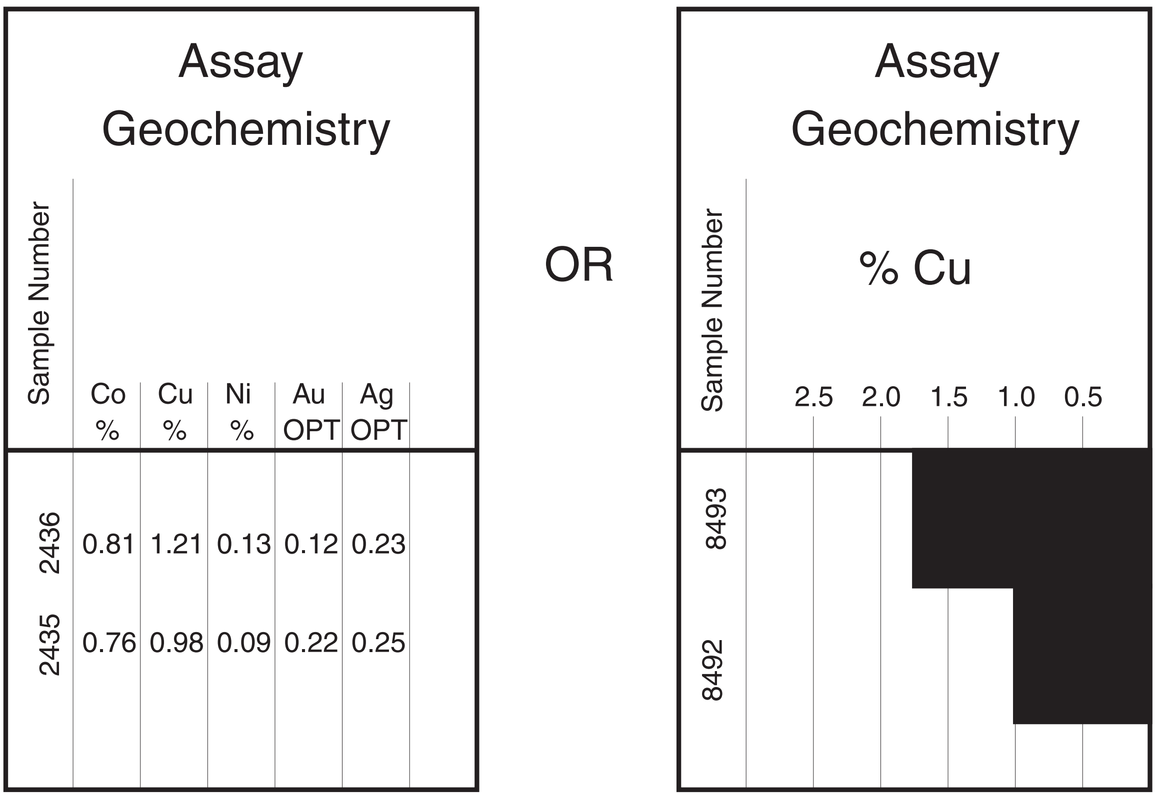
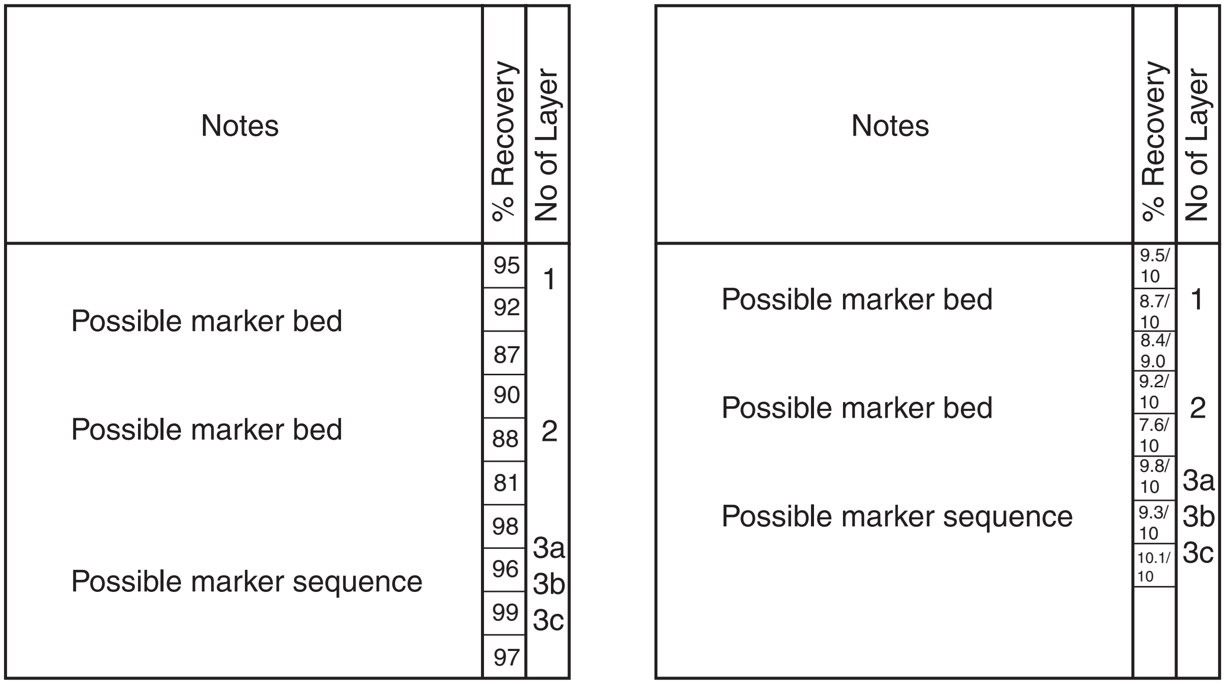



Figure A-16. Notation for showing geochemical results.




Log A

Log B

Figure A-17. Examples showing use of the notes, % recovery, and number of layer columns.

### *Twelfth Column: % Recovery*

This column is used when logging drill core to show what the percentage recovery was over a specific interval (generally 10 feet), as shown in Figure A-17.

### *Thirteenth Column: Number of Layer*

This column is used as an aid for purposes of correlation. For instance, if a unique bed or sequence of beds is recognized as a potential marker, then a number or abbreviation should label it and any diagnostic units both above and below it (Figure A-17). This enables rapid comparisons and correlations to be made among various measured sections.