Belloy Formation and Stoddart Group Zone Designations: Fort St. John Graben, British Columbia (Twp. 79-86 Rge. 13-25w6)

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Introduction

The Petroleum Lands Branch uses a zone designation to formally type a geological section for the purpose of describing petroleum and natural gas (P&NG) rights held under title by stratigraphic interval. A zone designation is meant to represent a specific related geological interval and be clear enough that no disputes will arise over the ownership of P&NG rights within this interval, even when correlated over large distances.

When first introduced zone designations were recorded on a lease specific basis and most often utilized a geological zone description described by depth in a wellbore located within the title boundary itself. This older system occasionally caused some confusion among government and industry clients especially during the advent of deep rights reversion which was enacted in 1978. In response, the Petroleum Lands Branch (PLA) created a standardized system of geologically based zone designations with type wells that are linked to specific geographic areas. This current system works by providing a standardized stratigraphic framework created by grouping related formations and helps to reduce confusion caused by stratigraphic nomenclature and correlation problems. This system is also regularly updated to ensure accurately referenced stratigraphic title descriptions.

The main purpose of this study is to simplify the zone designations used within the Peace River Block for the Belloy Formation and the Stoddart Group; its goal: to eliminate superfluous descriptions, to streamline the type sections, to eliminate potential confusion and to standardize the P&NG rights industry should expect to retain when discoveries are made within this geological interval.

Regional Setting

Within the study area the Montney Formation, Belloy Formation and the Stoddart Group (Taylor Flat, Kiskatinaw and Golata Formations) represent depositional sequences that occurred from Carboniferous to Triassic time. These sequences infilled and overlaid the Peace River Embayment's Dawson Creek Graben Complex. The Fort St. John Graben is recognized as the predominant graben in the BC portion of the Dawson Creek Graben Complex. (Barclay et al 1990.)

An isopach from the top of Belloy to the top of Debolt records great variation in values moving south from on top of the graben apron (~Twp. 84) towards the centre of the graben. Mapped changes in thickness of the Belloy Fm. and Stoddart Gp. strata ranging from 30-40 metres to over 400-500 metres over a distance of just several kilometres are not uncommon. Maximum recorded values of the Belloy Fm. to the top of the Debolt Fm. isopach are in excess of 1000 metres.

Current Zone Designations

There are presently 19 active zone designations describing various combinations of the Montney, Basal Montney, Belloy, Taylor Flat, Kiskatinaw and Golata Formations within the area of study of this paper. (See Appendix 1.) In addition to these 19 active zone designations there are countless unnumbered zone descriptions which are relics of the old system. A review of these zone descriptions reveals an inherent lack of consistency regarding the stratigraphic intervals that were utilized in the past. This inconsistency is a result of combining the historic record of zone descriptions with new ones which were created for more recent discoveries and the complex geology of the Belloy Fm. and the Stoddart Group in and around the Fort St. John Graben.

Within the study interval, geological theory and correlations are still being debated among the scientific community. As an example: recent work (Henderson et al 1994) has offered a new interpretation regarding the base of the Belloy and the top of the Taylor Flat. Based on biostratigraphic work Henderson has proposed a new member name, Ksituan, for upper parts of the Taylor Flat Fm. And including strata previously included within the Belloy Fm. Henderson also indicates the Ksituan Member may warrant formation status in the future. With this in mind, the zone designation system must be flexible enough so that if future changes to nomenclature standards occur, they can be incorporated into the zone designation system to avoid future confusion.

Refined Zone Designations

The goal of this study is to consolidate the current variation of zone designations into a more condensed and less contentious catalog. One of the aims of the zone designation system is to describe stratigraphic intervals either individually or as a grouping of neighbouring units that are adapted to the local geology in such a way as to eliminate confusion over P&NG rights held. Generally, stratigraphic intervals are grouped where there is potential for communication across formation boundaries or where there is the possibility of differing geological interpretations. On the north side of, and on the edge or flank of, the Fort St. John Graben, as a result of the rapidly thinning Belloy and Stoddart Group isopach, the geology of the region lends itself to single zone designations that include descriptions for all intervals within Belloy Fm. and Stoddart Group strata (Ksituan, Taylor Flat, Kiskatinaw and Golata). This effectively eliminates all concern over potential arguments about whether a particular sand is Belloy, Ksituan, Taylor Flat, Kiskatinaw, or Golata or whether there is vertical communication across any of the formation boundaries.

Within the graben, where a much thicker sequence of Belloy and Stoddart equivalent sediments has accumulated, a correlatable distinction may be made between the Taylor Flat and the Kiskatinaw Formations. The refined zone designations reflect this and are designed to incorporate separate descriptions for the Belloy -Taylor Flat and the Kiskatinaw-Golata zones.

Finally, past zone descriptions which included Montney with the Belloy and Stoddart zones are to be phased out. With the exception of a basal Montney lag, often found to be in production communication with the Belloy in the Eagle and Eagle West Fields, the Montney Fm. will be treated as a stand alone stratigraphic unit and it will have it's own specific zone designations assigned where required.

In order to best fit the diverse geological conditions within and around the north rim of the Fort St. John Graben, zone designations will be utilized based on geographic locale as identified on Figure 1. The east-west division between the formation groupings has been set at the 250m contour of the Belloy to Debolt isopach which has been converted to a survey-based line to aid in application. North of the 250m contour the entire section will be grouped as one zone: Basal Montney lag-Belloy-Stoddart. South of the 250m isopach the Belloy-Stoddart section will be split into two zones; Basal Montney lag-Belloy-Taylor Flat and Kiskatinaw- Golata.

The south end of the Fort St. John Graben is less clearly defined by well control. The Belloy Fm. and the Stoddart Gp. generally thin but they also get much deeper, up to the 3000 - 4000 meter range. At this point in time, there is no requirement to describe any new Zone Designations for either the Basal Montney lag-Belloy-Taylor Flat or the Kiskatinaw- Golata south of the Peace River Block.

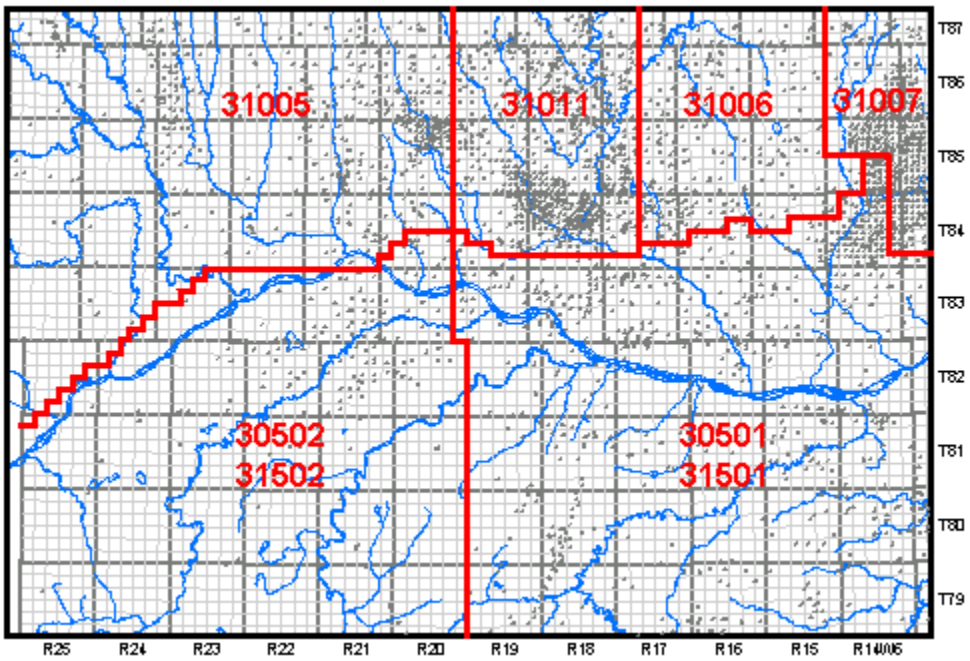

Figure 1: Zone Designation Boundaries

Northern Zone Designations

Four zone designations combine the Basal Montney Lag, Belloy Fm. and Stoddart Gp. into a single zone, effectively incorporating all strata from the base of the Montney to the top of the Debolt. These zone designations are to be used where the Belloy-Stoddart sedimentary package thins to less than 250m.(Figure 1).

ZD# 31005 - Basal Montney Lag-Belloy-Stoddart. See cross-section C-C'
Identified by the interval 6400 - 6598 feet on the Simultaneous Acoustilog of WA#1510 Altair FPC Red Creek 6-14-85-21w6.

ZD# 31006 - Basal Montney Lag-Belloy-Stoddart. See cross-section A-A'
Identified by the interval 1792.5 - 2070.5 metres on the Compensated Neutron-Lithodensity log of WA#7497 Esso et al Flatrock 7-22-84-16w6.

ZD# 31007 - Basal Montney Lag-Belloy-Stoddart.
Identified by the interval 1720.5 - 1988.0 metres on the Neutron Density log of WA# 10627 Newport Boundary 14-24-85-14w6.

ZD#31011 - Basal Montney Lag-Belloy-Stoddart. See cross-section B-B'
Identified by the interval 1811.9 - 1899.0 metres on the BHC Acoustilog of WA#6129 Scurry Cego Eagle 16-10-84-18w6.

Southern Zone Designations

Within the Fort St. John Graben, the Belloy - Stoddart section can reach thicknesses of greater than 1000 metres. Reliable correlations may be made differentiating the Taylor Flat Fm. from the Kiskatinaw Fm. This makes it practical to describe these two intervals as distinct units and to incorporate them into separate zone descriptions. In the past, some conflict has arisen at the base of the Kiskatinaw where productive strata have been named as either Basal Kiskatinaw or Golata sands. To address this situation the Belloy - Stoddart stratigraphic interval is split into two zones: the Basal Montney - Belloy - Taylor Flat and the Kiskatinaw - Golata. The division between these two zones is identified in the following descriptions:

ZD# 31501 - Basal Montney Lag-Belloy-Taylor Flat. See cross-section A-A'
Identified by the interval 7039 - 8053.8 feet on the Sonic - GR log of WA#1355 IOE PAC Parkland 10-26-81-16w6.

ZD# 30501 - Kiskatinaw-Golata. See cross-section A-A'
Identified by the interval 8053.8 - 8599.7 feet on the Sonic - GR log of WA#1355 IOE PAC Parkland 10-26-81-16w6.

ZD# 31502 - Basal Montney Lag-Belloy-Taylor Flat. See cross-section C-C' & D-D'

Identified by the interval 1896.1 - 2455.0 metres on the Sonic - GR log of WA#4878 Czar et al Monias 7-27-82-21w6.

ZD# 30502 - Kiskatinaw-Golata. See cross-section C-C' & D-D'
As identified by the interval 2455.0 - 2902.5 metres on the Sonic - GR log of WA#4878 Czar et al Monias 7-27-82-21w6.

Correlative Cross Sections

As a companion piece to this paper, a series of 4 correlative cross-sections, (Figure 2), have been constructed. These cross-sections are populated with logs that define many of the vintage zone designations as well as the zone designations now recommended for use. As an illustration they are intended to act as a reference correlation and as a guide to industry in future zone designation related problems.

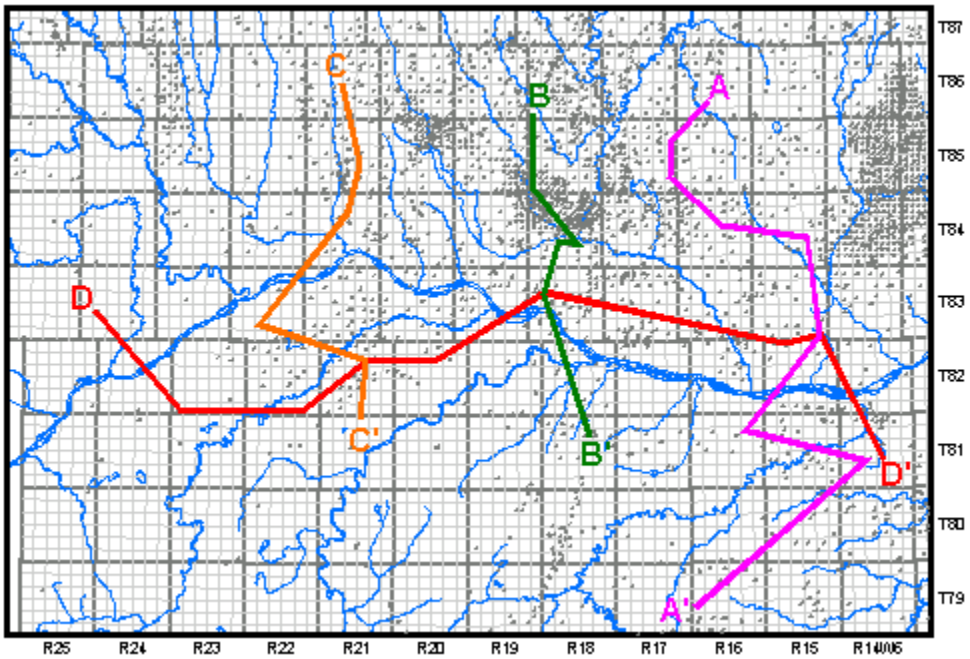

Figure 2: Cross Section Locations

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Barclay, J.E., Krause, F.F., Campbell, R.I., and Utting, J., 1990.: Dynamic Casting and Growth Faulting: Dawson Creek Graben Complex, Carboniferous-Permian Peace River Embayment, Western Canada. Bulletin of Canadian Petroleum Geology, v.38A, p.115-145.

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Richards, B.C., Barclay J. E., Bryan, D., Hartling, A., Henderson, C.M., Hinds, R.C. 1994. Carboniferous Strata of the Western Canada Sedimentary Basin. In Geological Atlas of the Western Canada Sedimentary Basin. G.D. Mossop and I. Shetsen (comps.). Canadian Society of Petroleum Geologists and Alberta Research Council, chpt.14.

Appendix 1.

BC Active Zone Designations for the Belloy and Stoddart Intervals

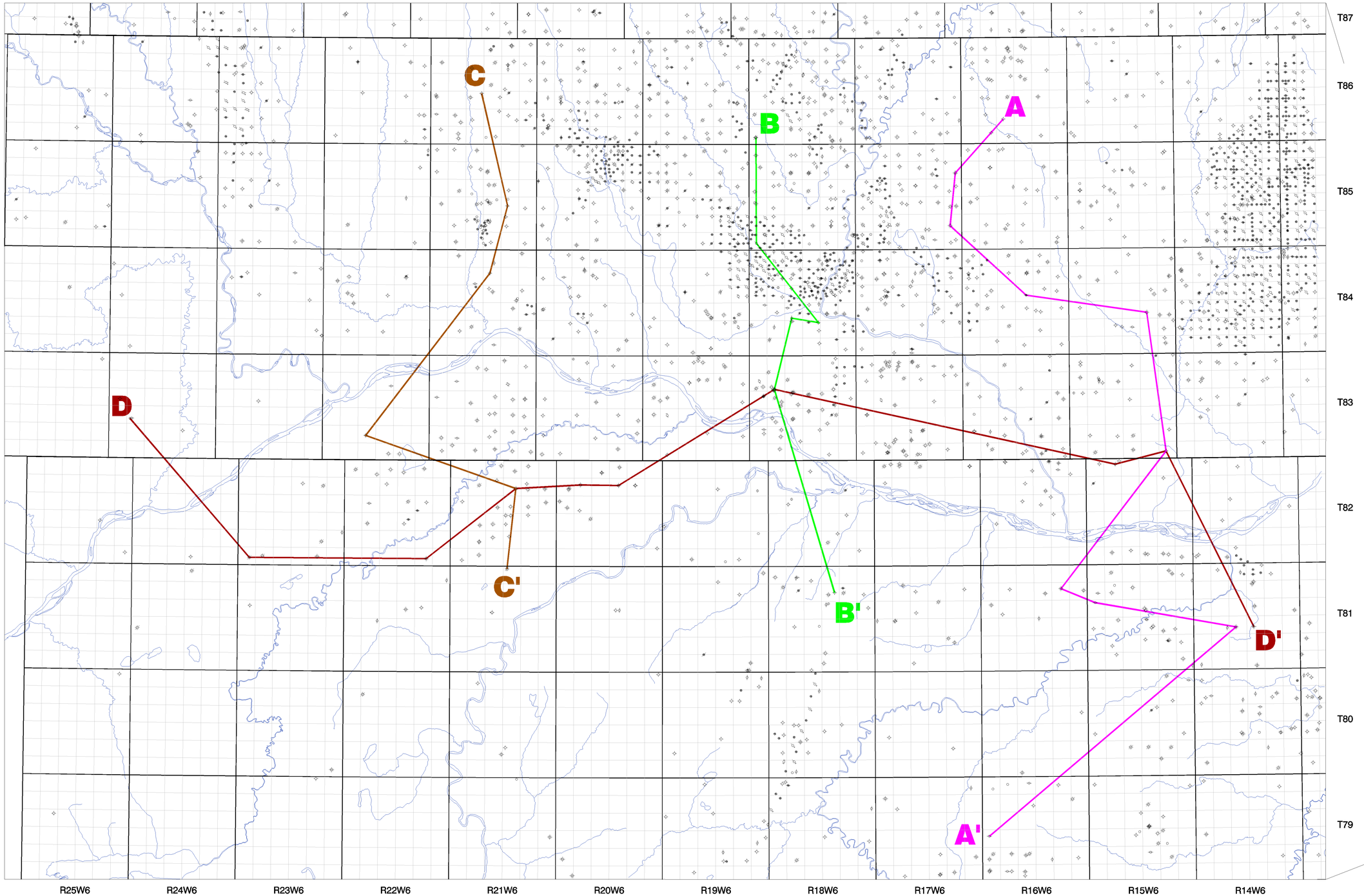
Zone Designation	**Interval**	**Key Well**	**Area**
30303	Bsl Kiskatinaw-Golata	14-19-81-15w6	T81-15
*30501	Kiskatinaw-Golata	10-26-81-16w6	FSJ Graben
30601	Stoddart Group	7-22-84-16w6	T84-16
*31005	Bsl. Montney-Belloy-Golata	6-14-85-21w6	N.rim FSJ Graben
*31006	Belloy-Stoddart	7-22-84-16w6	T84-16
*31007	Belloy-Stoddart	14-24-85-14w6	T85-14
31008	Belloy-Stoddart	d-73-I/94-G-3	Sikanni
31009	Belloy-Stoddart	d-57-G/93-I-9	93-I-9
31010	Belloy-Taylor Flat-Kiskatinaw	6-21-84-18w6	T84-18w6
*31501	Bsl. Montney-Belloy-Taylor Flat	10-26-81-16w6	FSJ Graben
31801	Mowitch-Belcourt	c-69-H/93-I-10	Ojay-Murray R.
32001	Montney-Belloy-Stoddart	d-23-I/94-G-6	94G, 94H
32002	Montney-Belloy-Stoddart	7-6-82-23w6	W/2, N/2 PRB
32003	Montney-Belloy-Stoddart	3-29-83-18w6	SE/4 PRB
32005	Montney-Belloy-Stoddart	14-19-81-15w6	T81-15
32501	Belloy	3-29-83-18w6	
32503	Belloy	6-14-84-15w6	Boundary Lk. Field
32504	Belloy	7-22-84-16w6	T84-16
32505	Belloy	d-94-I/94-B-8	Kobes
NA	Belloy	a-51-H/93-P-5	93-P-5
NA	Belloy	11-29-82-20w6	T82-20
NA	Golata	6-1-83-15w6	T83-15
NA	Kiskatinaw	7-25-85-17w6	T85-17
NA	Kiskatinaw	3-16-84-18w6	T84-18

- Zone Designations which are highlighted are in geographic areas beyond the scope of this paper.

Refined Active Zone Designations for the Belloy and Stoddart Intervals

Zone Designation	**Interval**	**Key Well**	**Area**
*31005	Bsl. Montney Lag-Belloy-Stoddart	6-14-85-21w6	N.rim FSJ Graben
*31006	Bsl. Montney Lag-Belloy-Stoddart	7-22-84-16w6	N.rim FSJ Graben
*31007	Bsl. Montney Lag-Belloy-Stoddart	14-24-85-14w6	N.rim FSJ Graben
31011	Bsl. Montney Lag-Belloy-Stoddart	16-10-84-18w6	N.rim FSJ Graben
*31501	Bsl. Montney-Belloy-Taylor Flat	10-26-81-16w6	FSJ Graben
*30501	Kiskatinaw-Golata	10-26-81-16w6	FSJ Graben
31502	Bsl. Montney-Belloy-Taylor Flat	7-27-82-21w6	FSJ Graben
30502	Kiskatinaw-Golata	7-27-82-21w6	FSJ Graben

* Zone Designations retained within the study area.



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FORT ST. JOHN GRABEN
WELL LOCATIONS

by

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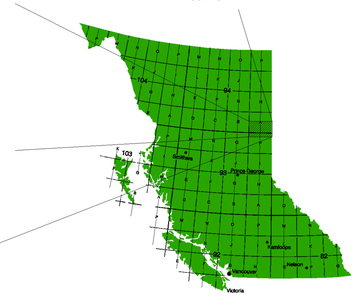
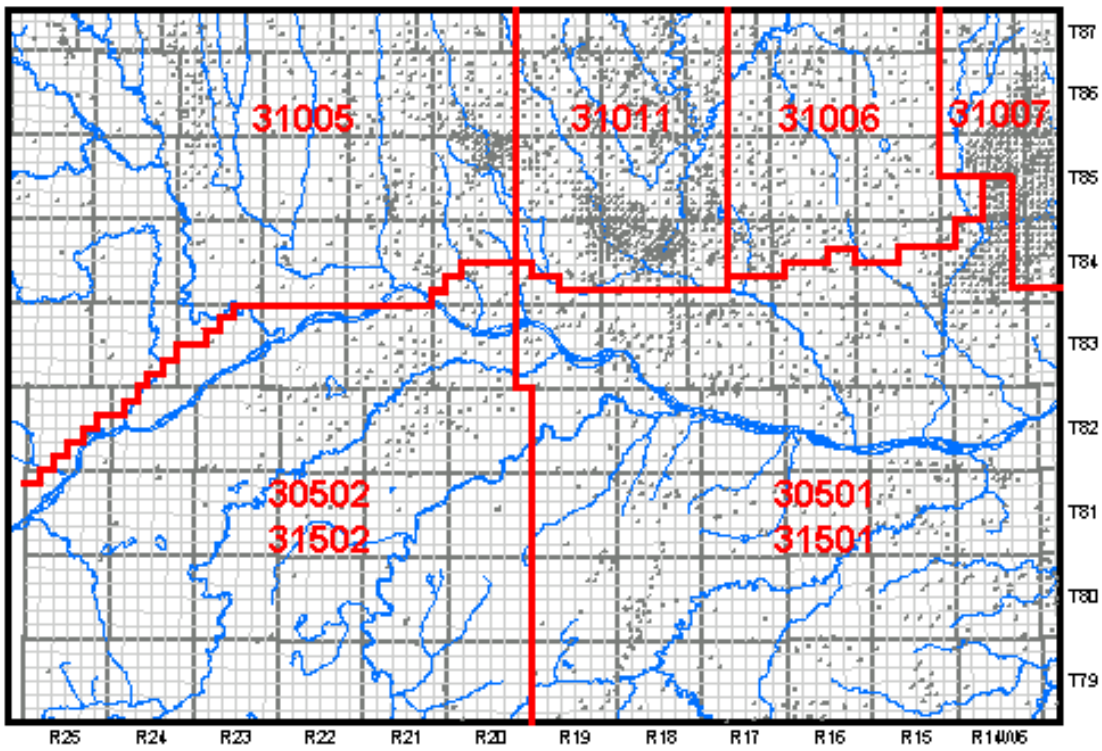
LOCATION MAP

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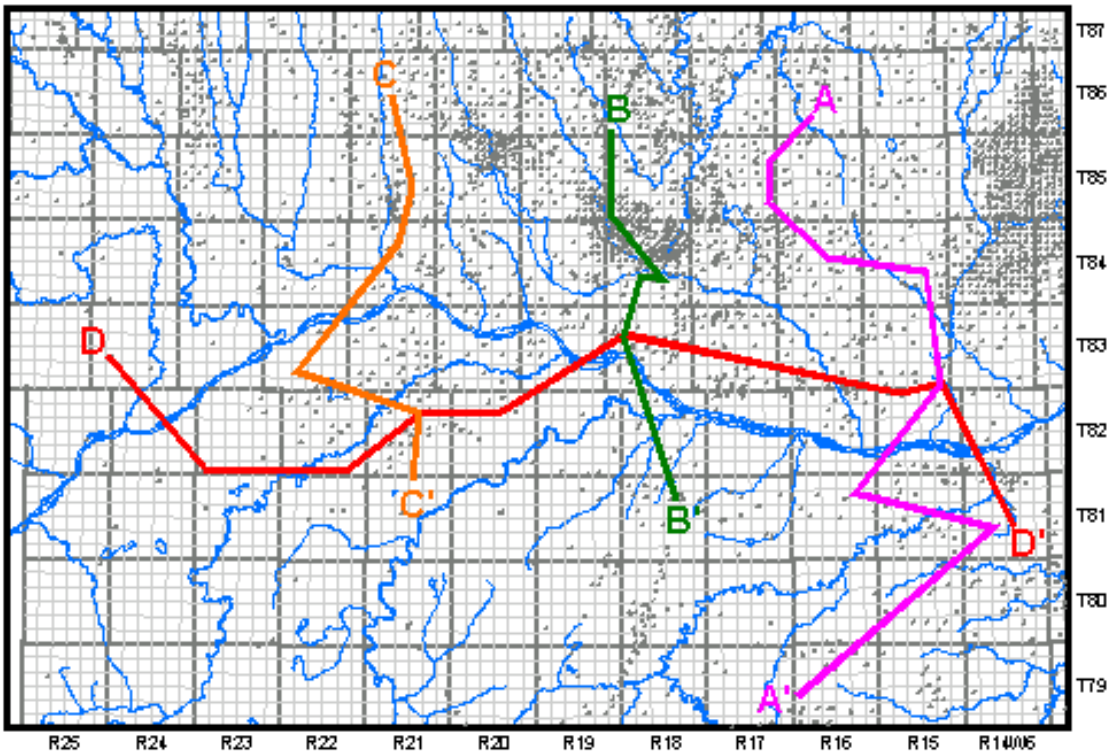
A
A'
B
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C
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D
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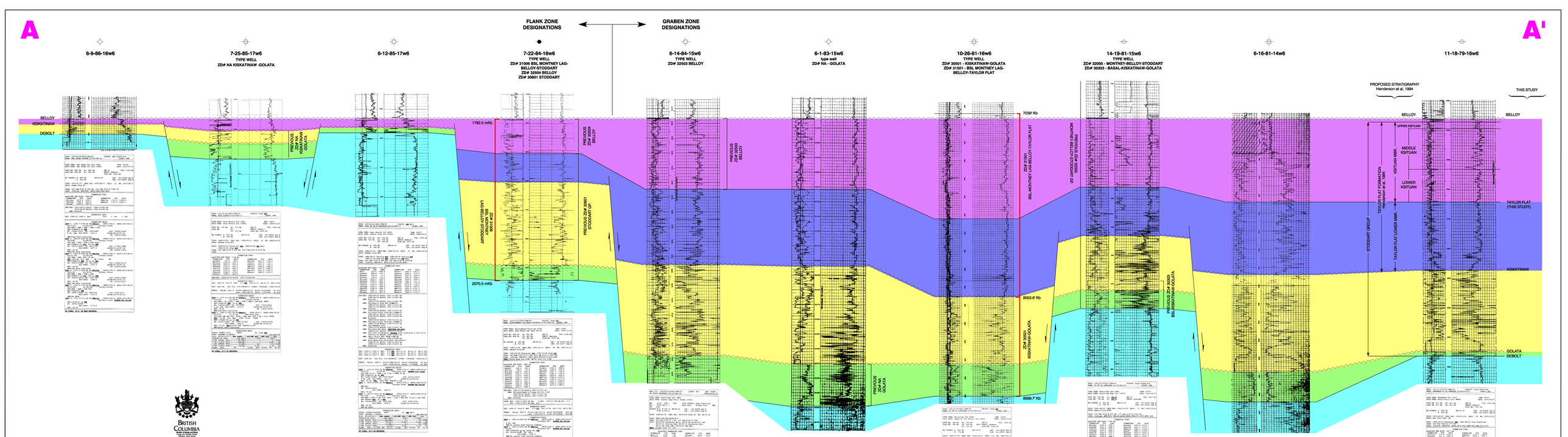

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CROSS SECTION A - A'

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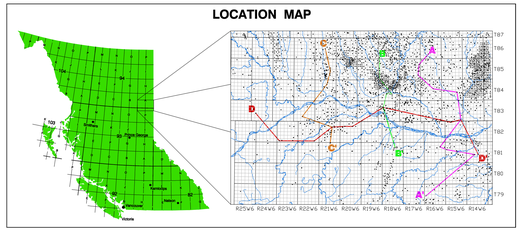
LOCATION MAP



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B — B'

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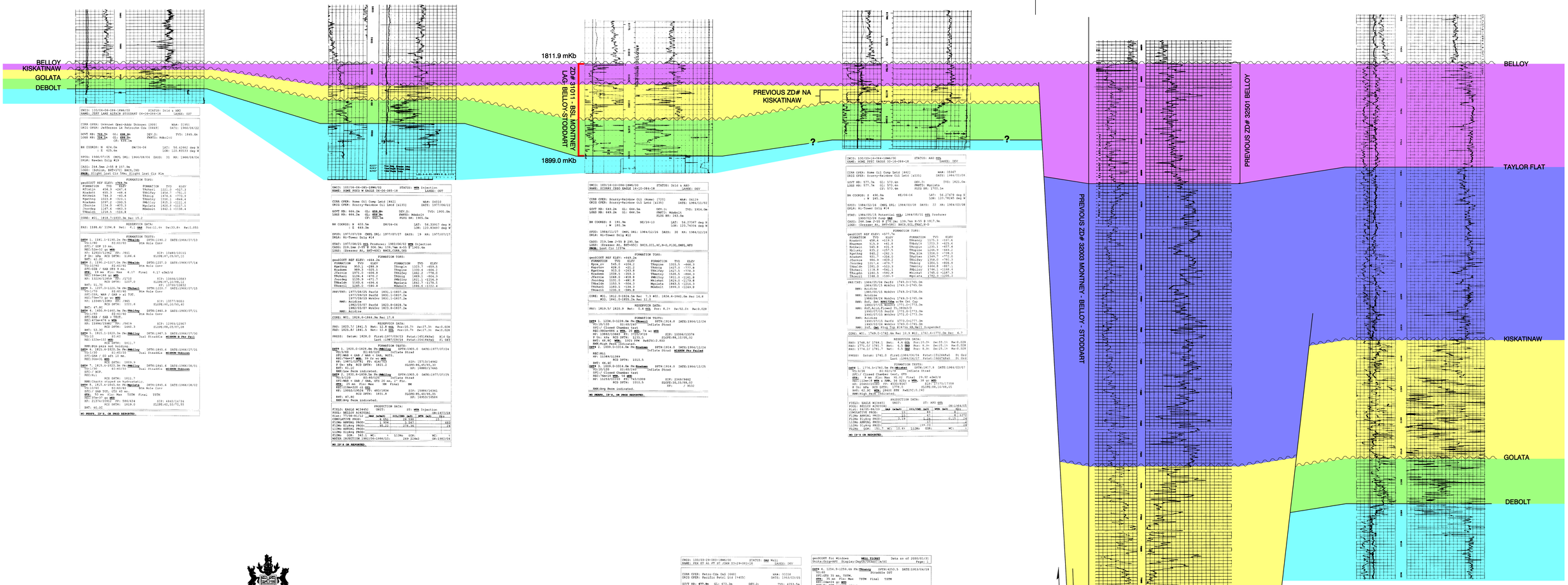

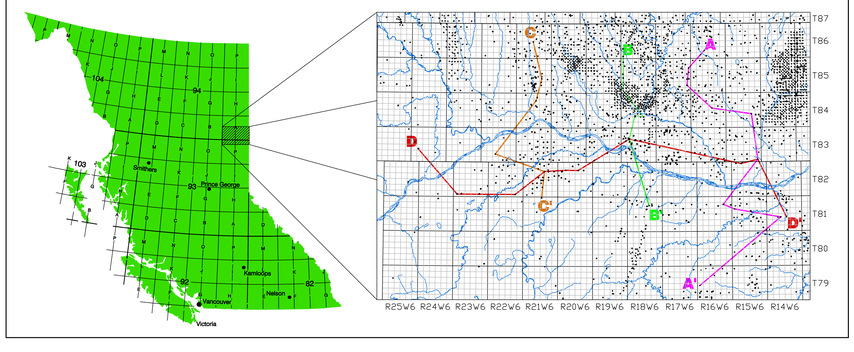

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C — C'

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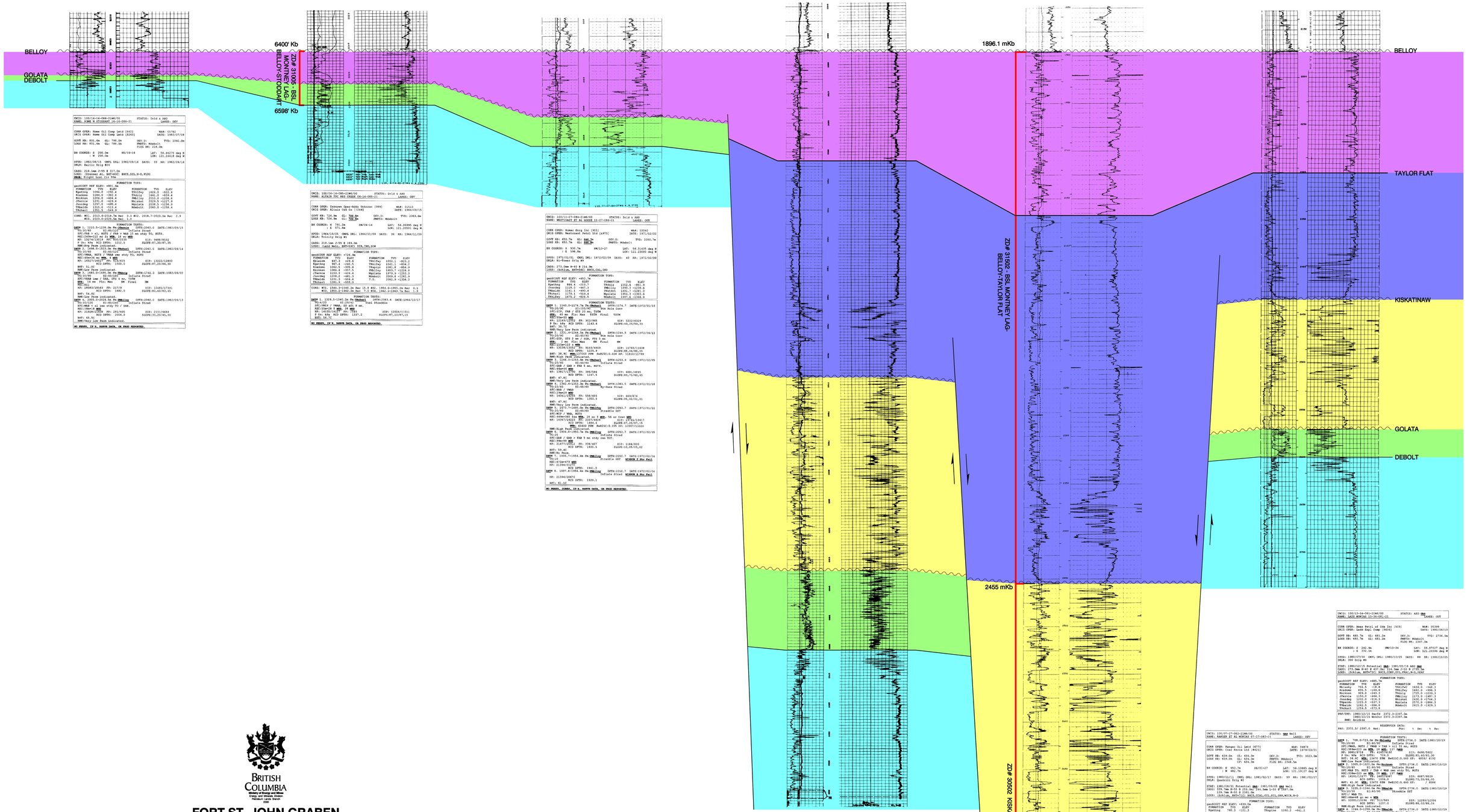
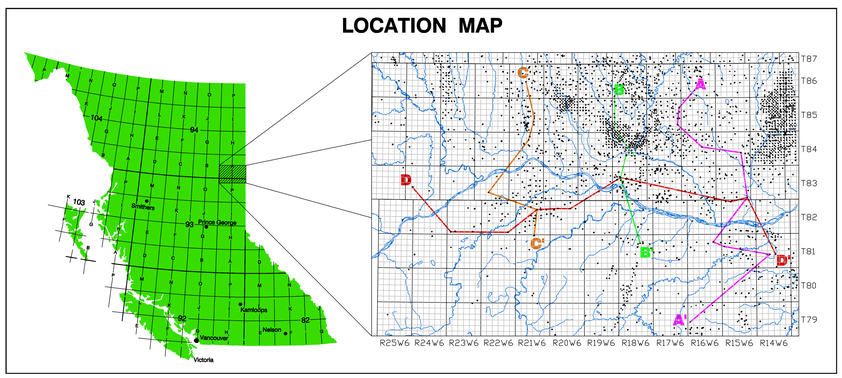
6-14-85-21w6
TYPE WELL
ZD# 31005 - BSL MONTNEY LAG
BELLOY-STODDART

7-27-82-21w6
TYPE WELL
ZD# 30502 - KISKATINAW-GOLATA
ZD# 31502 - BSL MONTNEY LAG-
BELLOY-TAYLOR FLAT





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Petroleum Geoscience Branch

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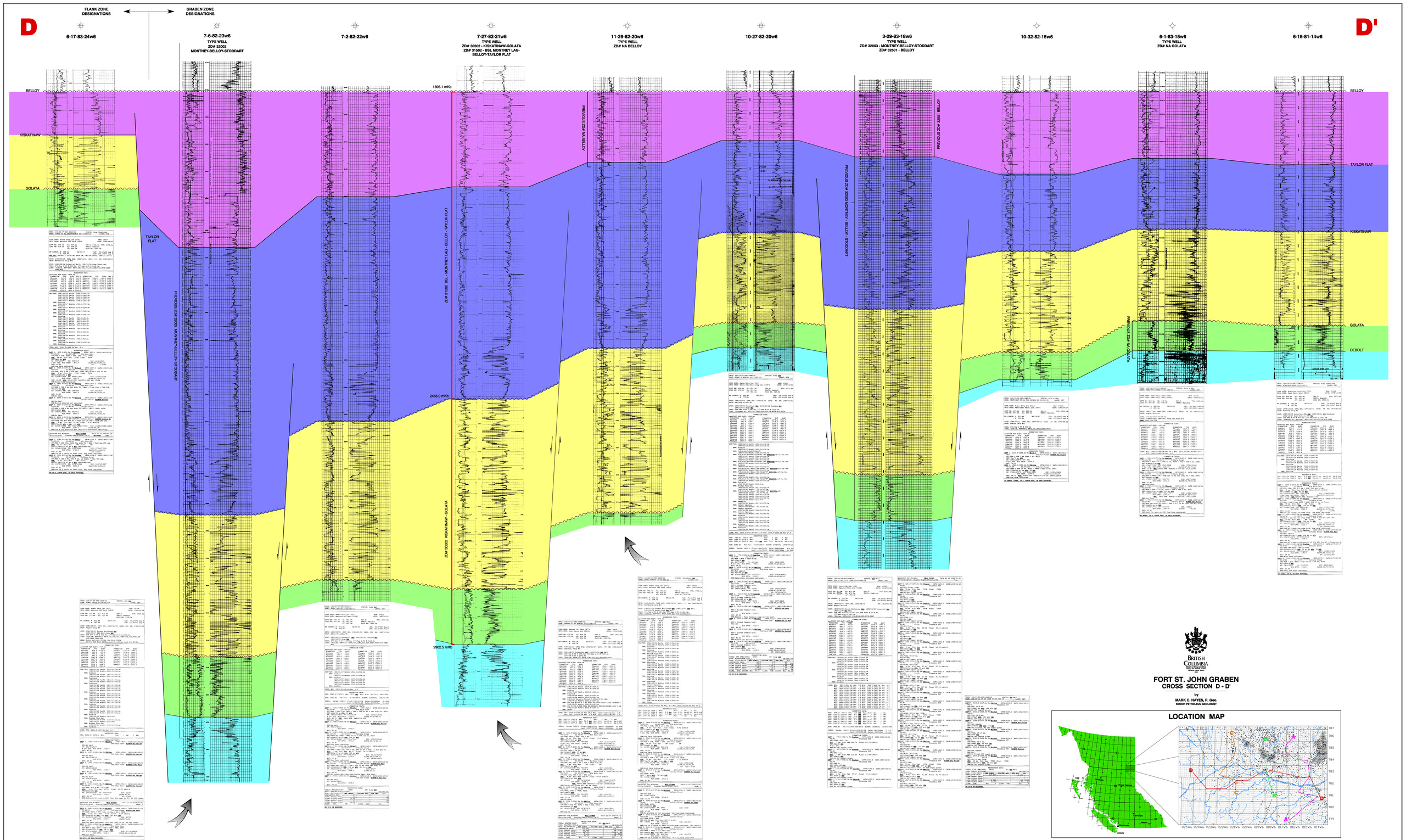

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FORT ST. JOHN GRABEN
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LOCATION MAP

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