

**1996 Nancar Trough, Northern Bonaparte Basin
(AC/P16) Airborne Laser Fluorosensor Survey
Interpretation Report
[WGC AC/P16 Survey Number 1248.3]**

**Prepared For
Australian Geological Survey Organisation**

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1. Introduction

The AC/P16 airborne laser fluorosensor (ALF) survey is located in the Northern Bonaparte Basin, Timor Sea (Figure 1). The survey was flown in one sortie on the 2nd December 1996. Sixteen lines were acquired at 700m spacing in an E-W direction at a flying height of 100m. Line length ranged from 23km to 30 km, with a total of 412.9km acquired. Line 20070 was a repeat of line 10070. Data collection was completed after 1.85 hours.

A total of 290,337 spectra were collected at a spacing of about 1.42m. Of these, 111 were interpreted as showing confident oil fluorescence spectra (about 0.04 percent, or 382 fluors per million spectra).

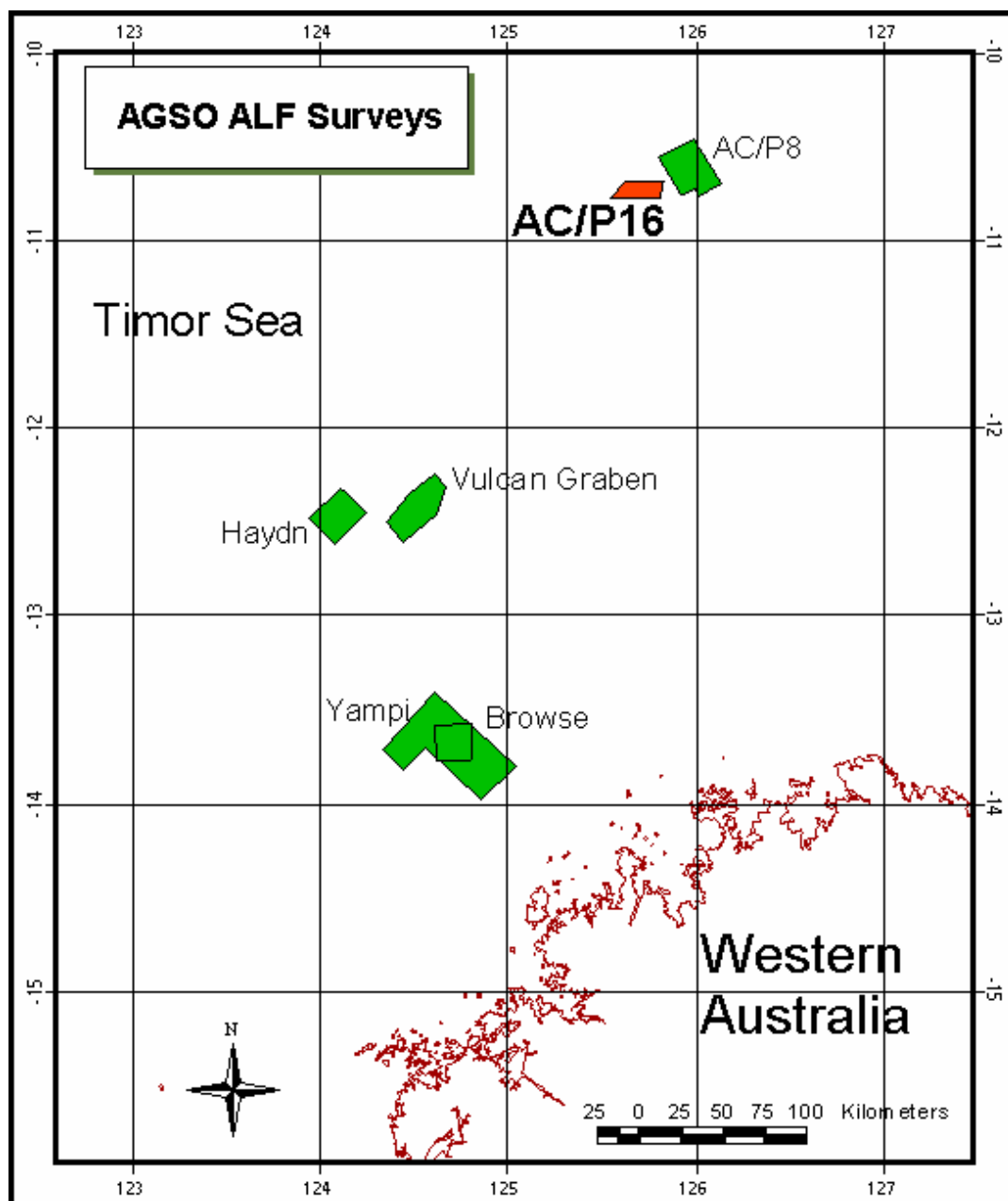


Figure 1. AC/P16 ALF Survey Location Map.

A mapping region 34km wide and 17km high was used for displays. The mapping specifications are listed below.

Mapping Specifications:

Projection: Southern UTM Zone 51 (Central Meridian 123 degrees east)

Min Easting: 777,000

Max Easting: 811,000

Min Northing: 8,807,000

Max Northing: 8,820,000

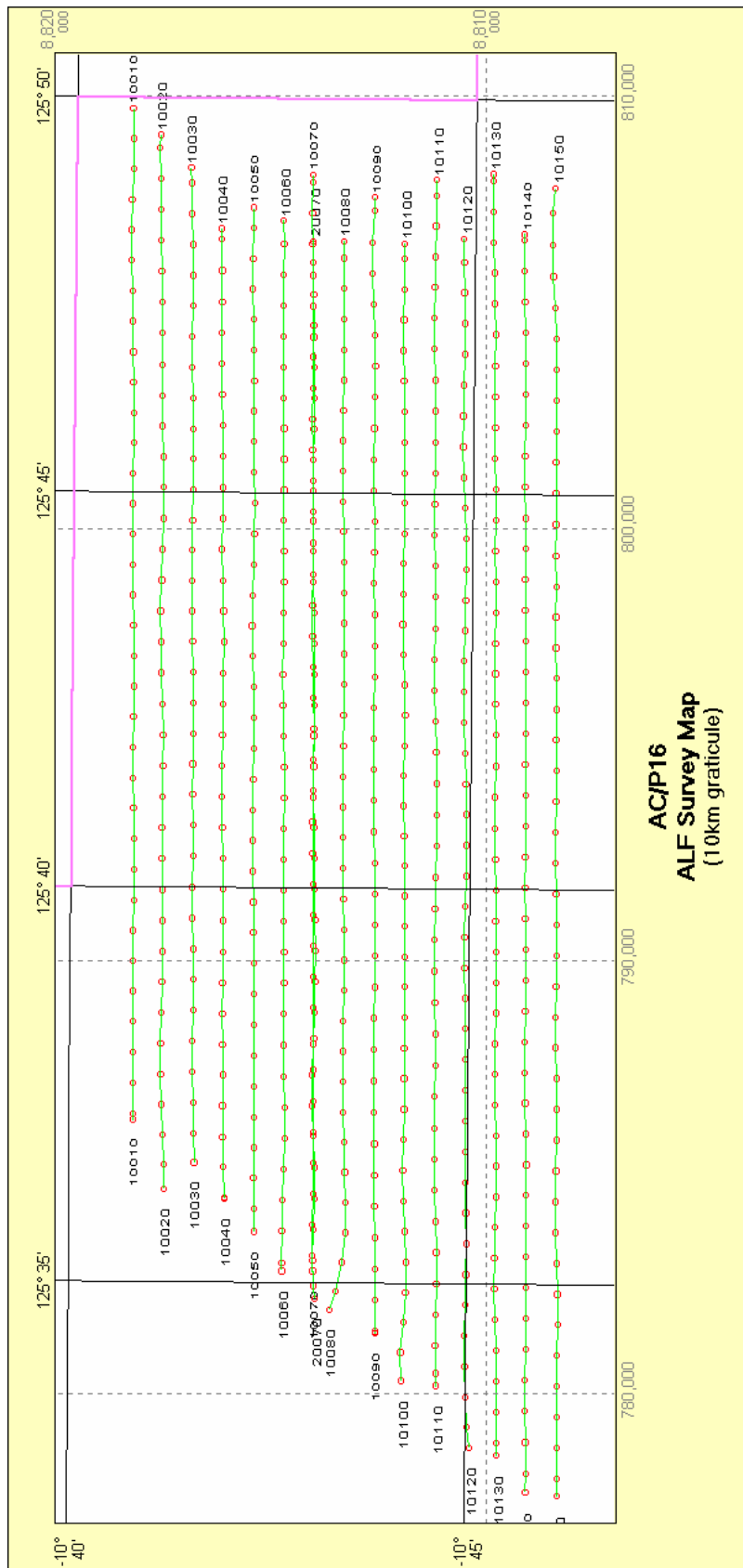


Figure 2. The AC/P16 ALF Survey.

2. ALF Survey Analysis

2.1. Fluor Mapping

Fluorescence anomaly picking was done using an SQL query to select a reduced number of possible fluors from the entire set of spectra, then manually selecting confident fluors from these. The following SQL query was used:

SELECT * FROM [RawAlfData] WHERE [Ch_50] > Ch_27 / 20 ORDER BY [Ch_50] DESC

111 confident fluors were picked and are plotted in Figure 3. Each fluor is plotted as a red circle with size proportional to the fluorescence area / Raman area ratio. The most obvious and confident fluors tend to plot with the largest circles.

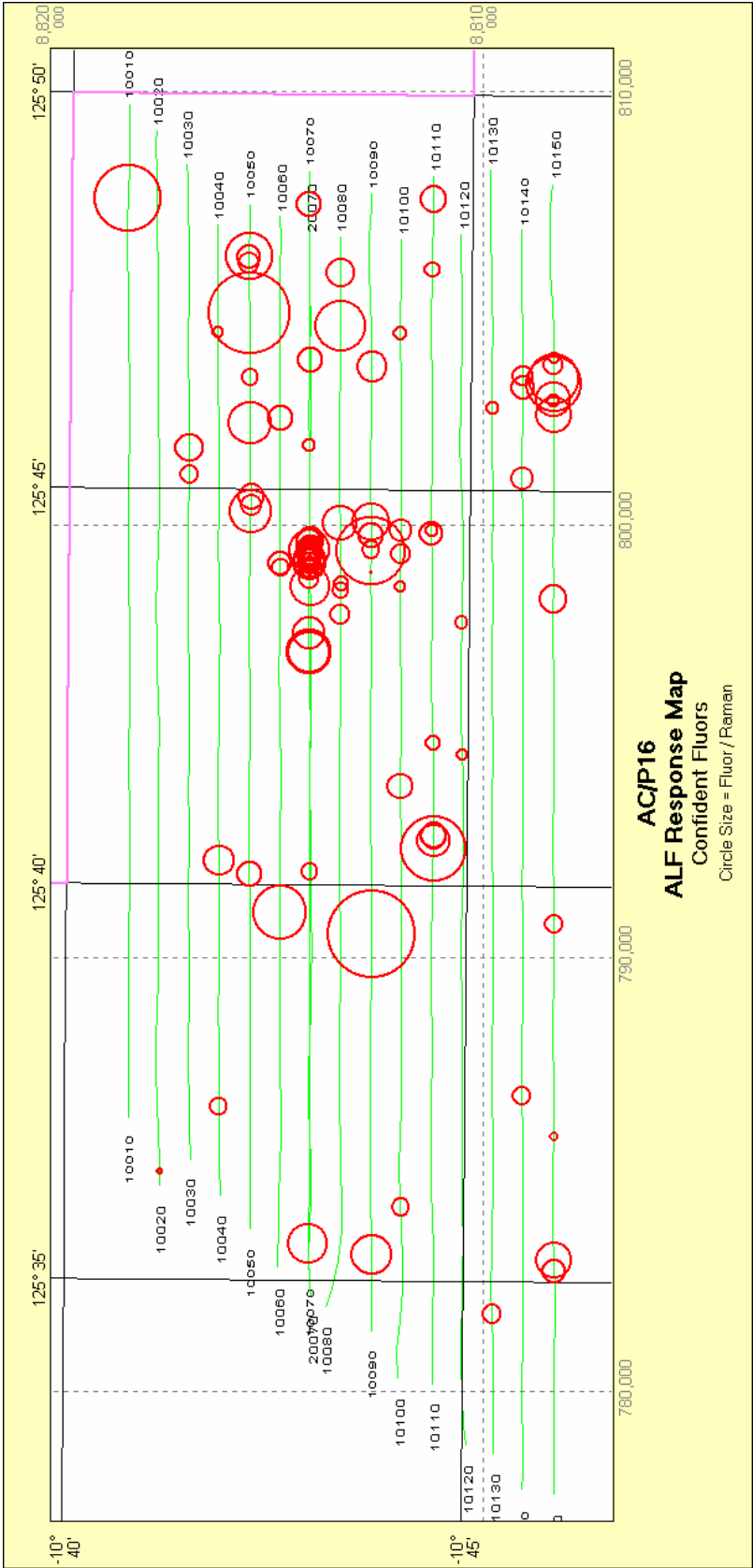


Figure 3. The AC/P16 ALF Survey Confident Fluor Map.

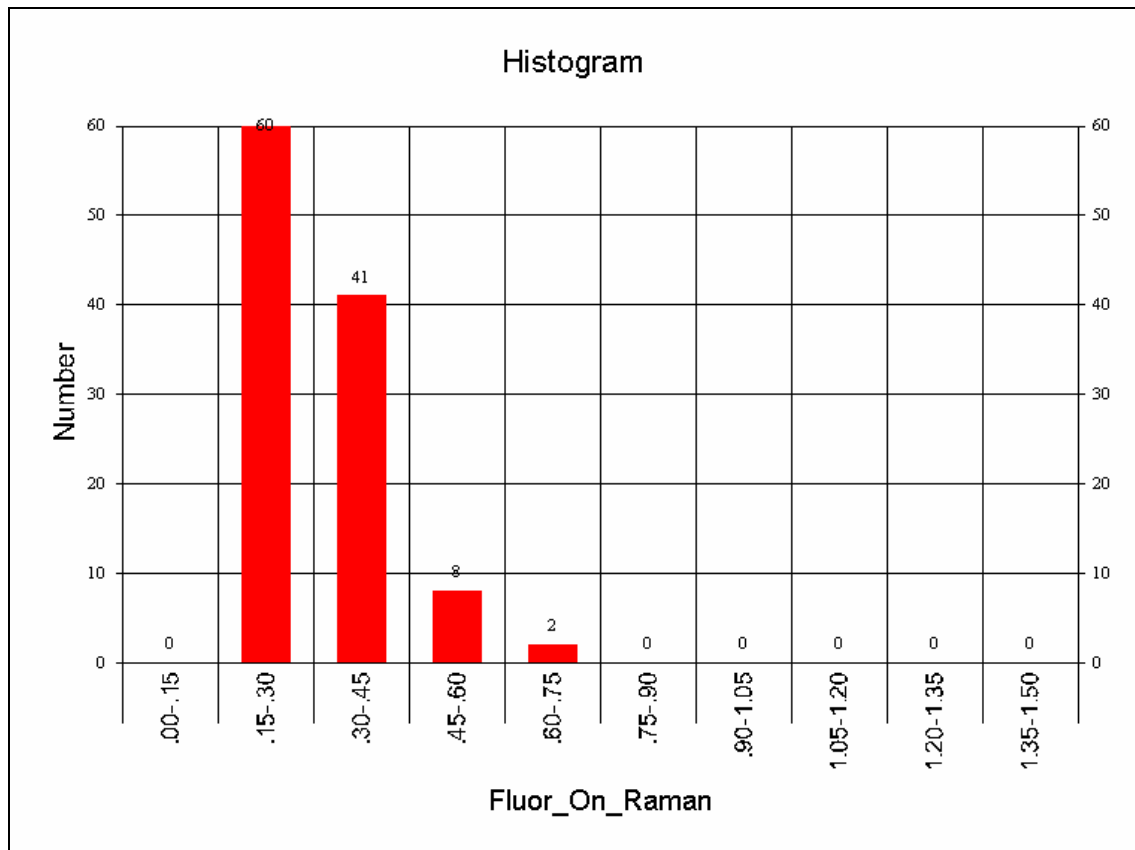
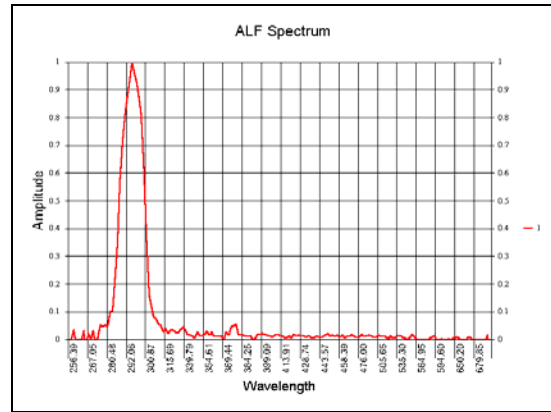
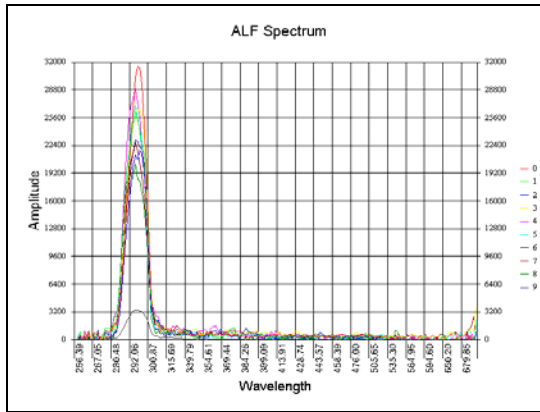


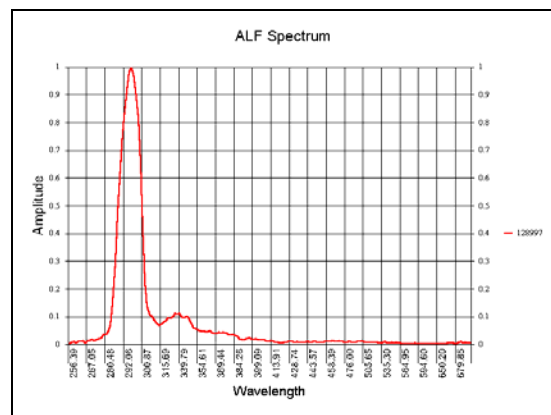
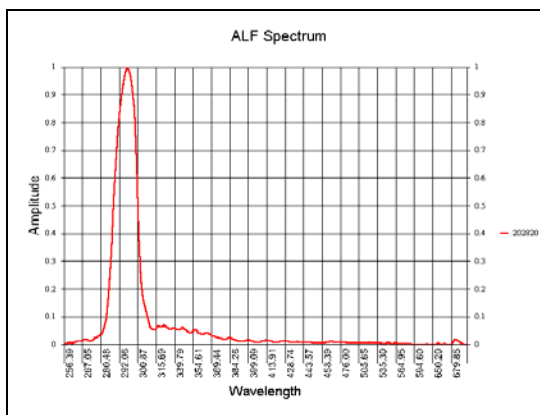
Figure 4. The F/R Ratio Histogram for the Picked Fluors.

Figure 4 shows the fluorescence area / Raman area ratio histogram for the confident fluor picks. (The modified fluorescence region between 319.4nm to 479.7nm was used to calculate the fluorescence area.) All fluors are located in the relatively narrow F/R range between 0.15 and 0.75.

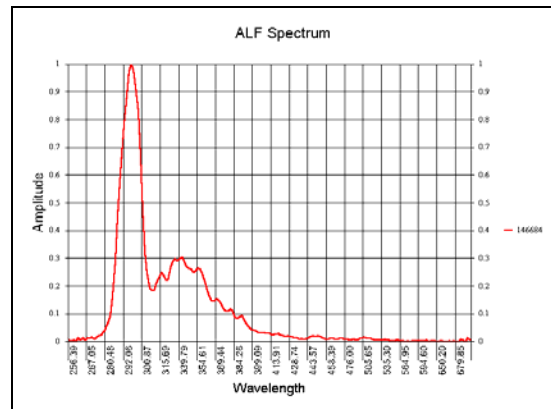
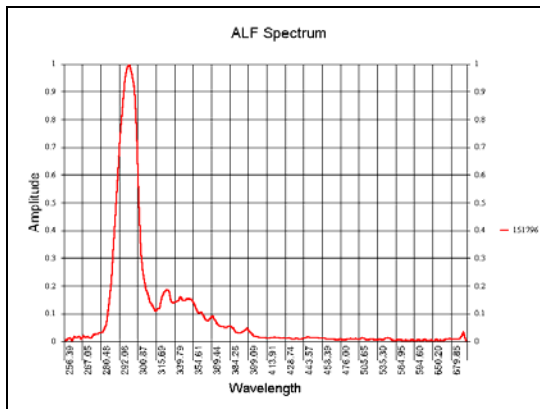
Figure 5 on the next page shows a selection of spectra and fluors from the AC/P16 ALF Survey.



5 a) Line 10010 Ten Adjacent ALF Spectra. 5 b) Line 10010 No Fluor.



5 c) Line 10120 Smallest Fluor. 5 d) Line 10080 Small Fluor.



5 e) Line 10090 Medium Fluor. 5 f) Line 10090 Largest Fluor.

Figure 5. Selected ALF Spectra.

2.2. Adjacent and Near Fluor Detection

No adjacent fluors were picked on the AC/P16 ALF survey.

One pair of close fluors was found on line 10070 (Figure 6), and a group of three fluors was found on line 20070 (Figure 7). The map of these near fluors (Figure 8) shows that they are located very close to each other. The two near fluor groups were acquired 4281 seconds apart (1 hour, 11 minutes and 21 seconds).

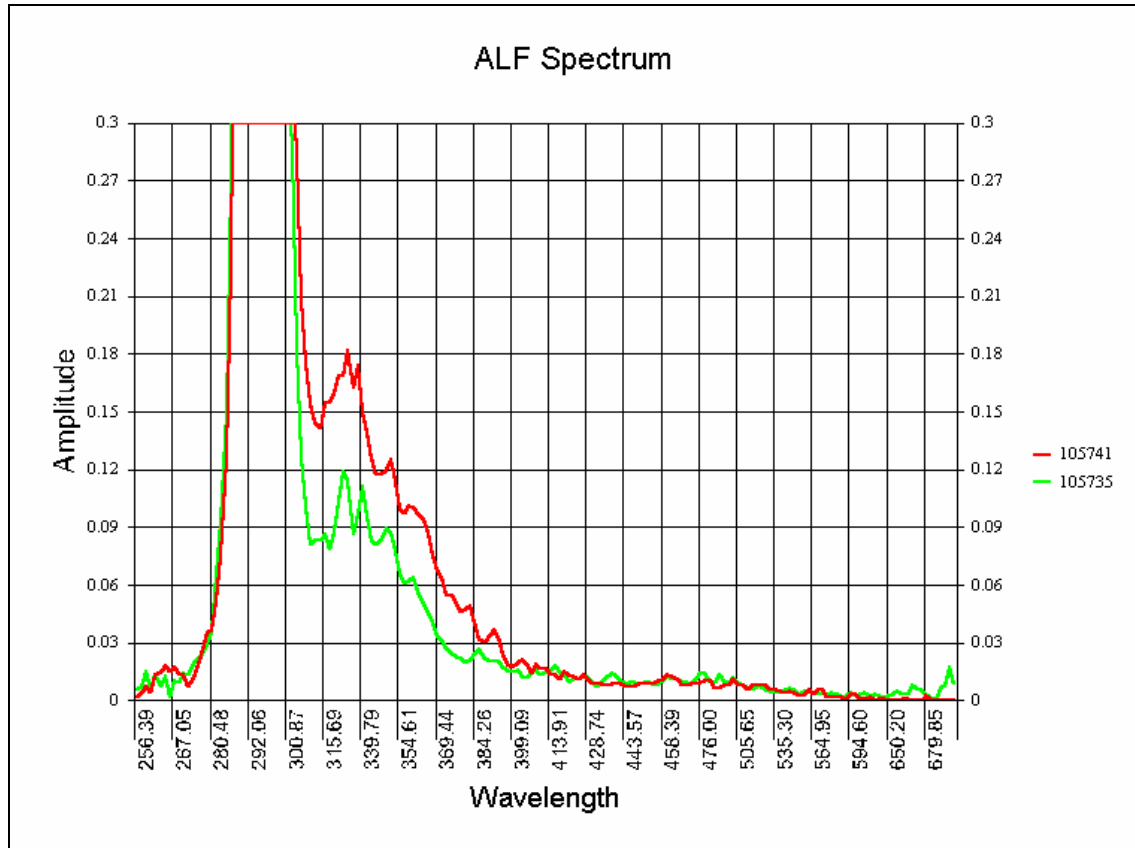


Figure 6. Line 10070 Near Fluors.

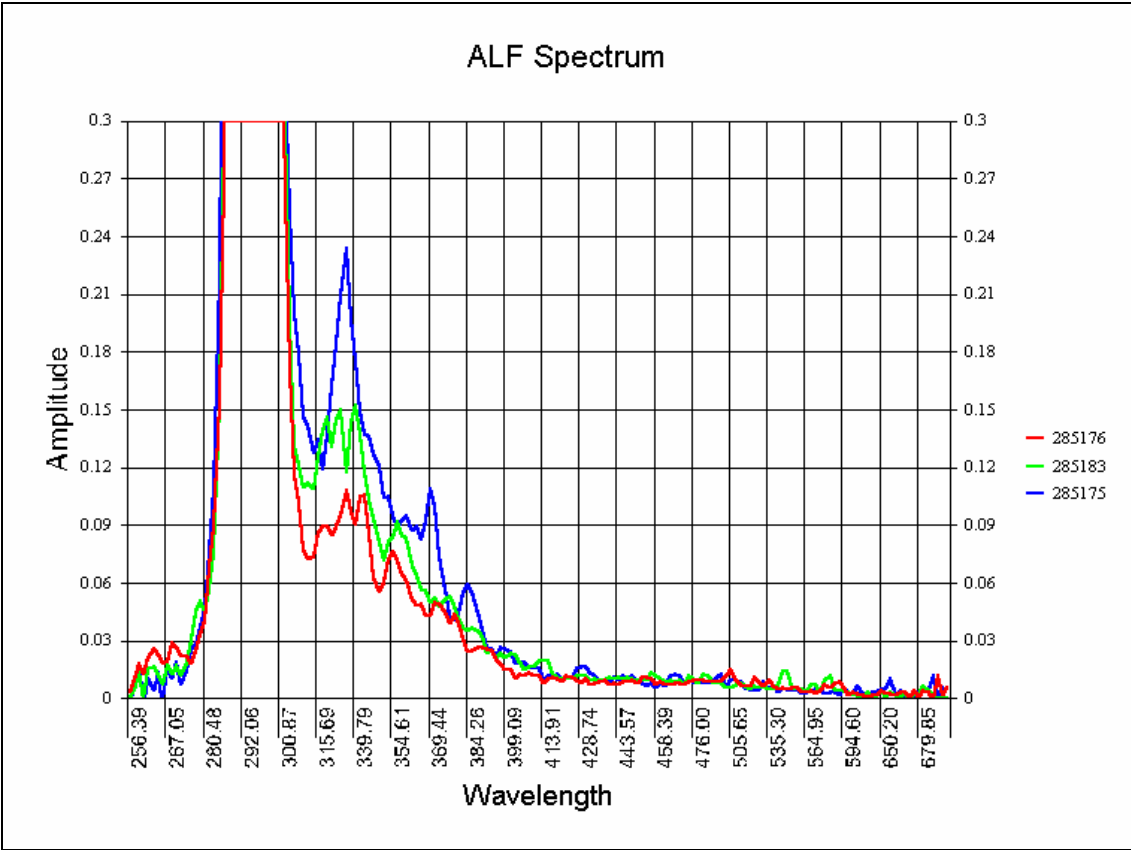


Figure 7. Line 20070 Near Fluors.

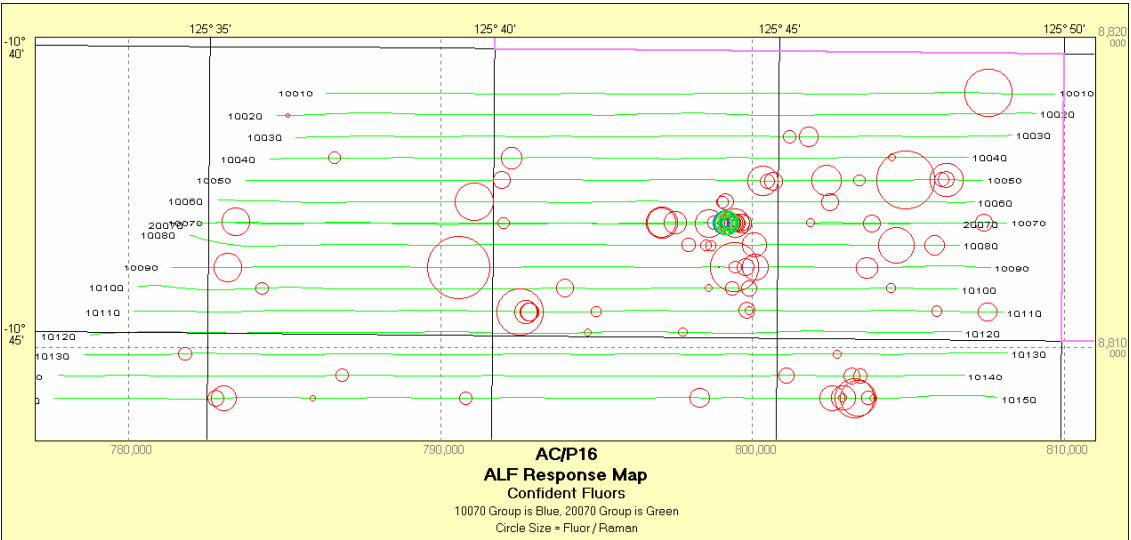


Figure 8. AC/P16 Near Fluor Map.

2.3. Fluorescence Curve Trend Analysis

No obvious fluorescence curve patterns were found in the AC/P16 ALF survey. Four sets of curve plots (Figures 9, 10, 11 & 12) were produced from different fluor clusters over the survey. Each group of selected fluors showed variable curve shapes.

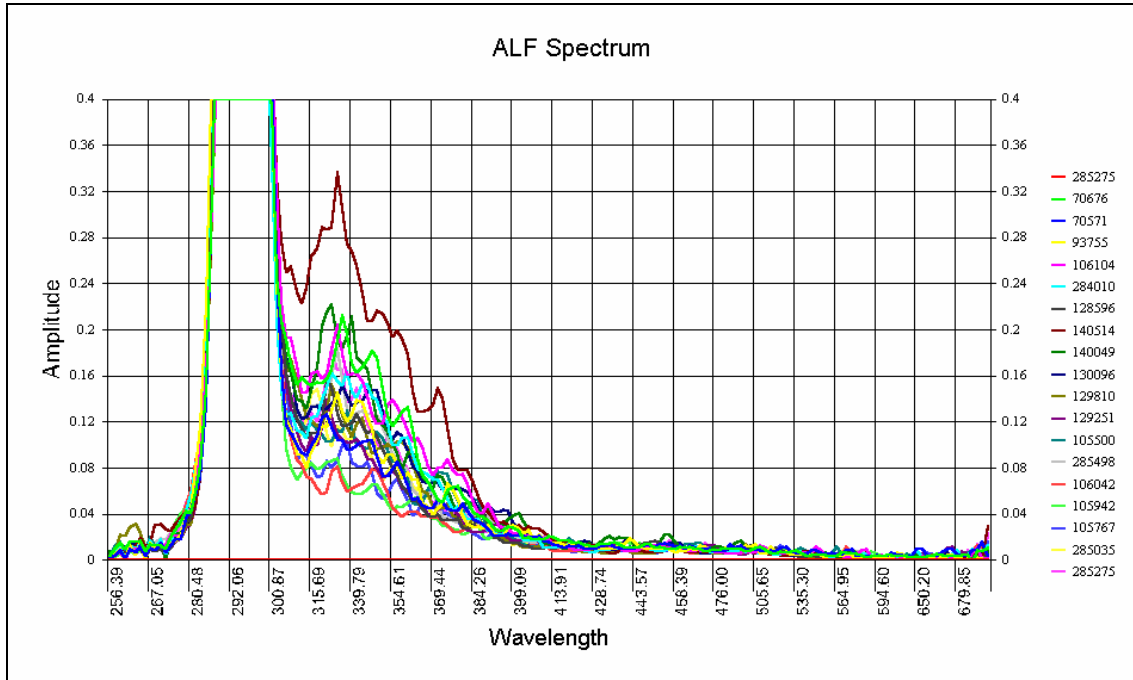


Figure 9. Fluor Group 1 ALF Spectra (Normalised to the Raman Peak).

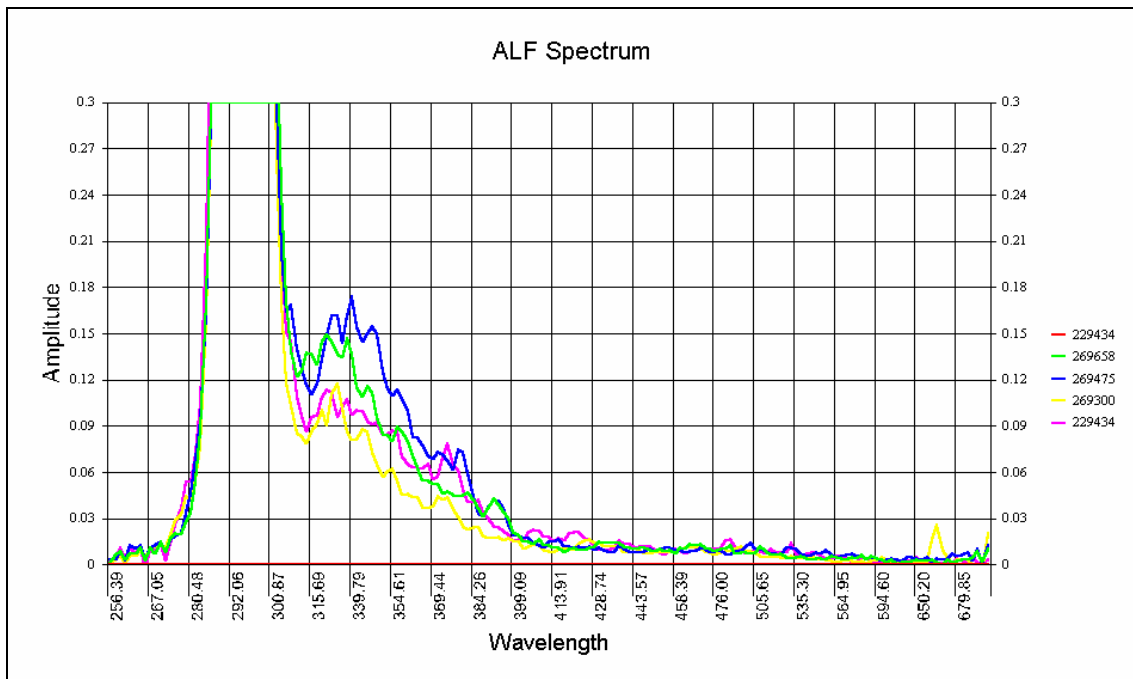


Figure 10. Fluor Group 2 ALF Spectra (Normalised to the Raman Peak).

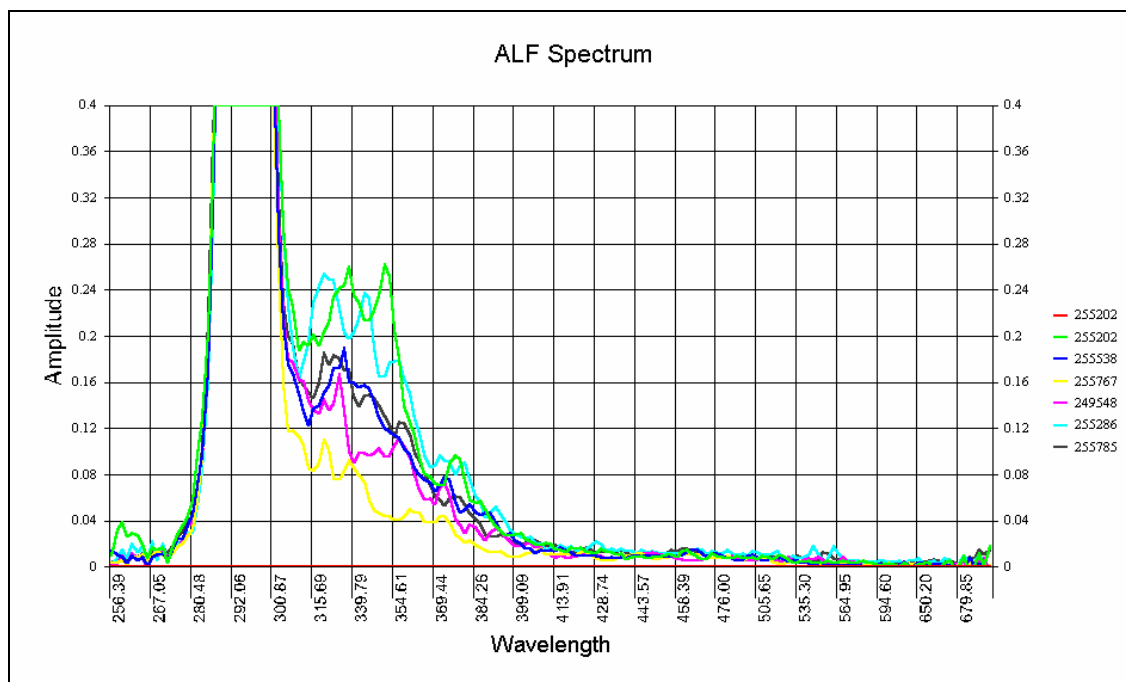


Figure 11. Fluor Group 3 ALF Spectra (Normalised to the Raman Peak).

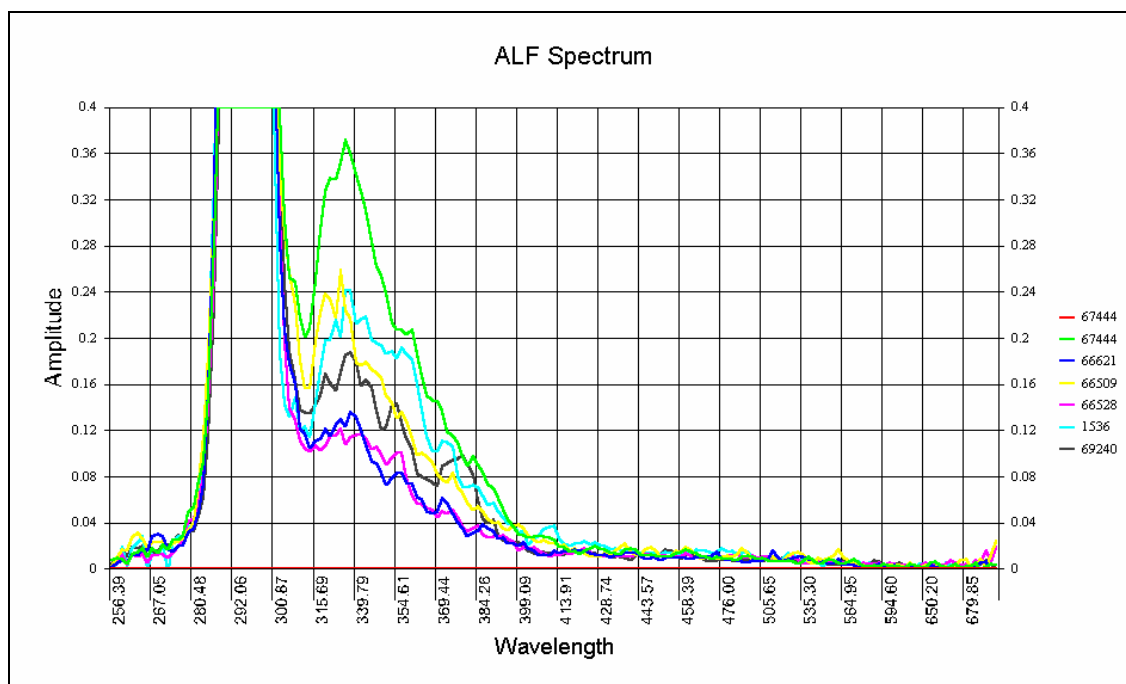


Figure 12. Fluor Group 4 Spectra (Normalised to the Raman Peak).

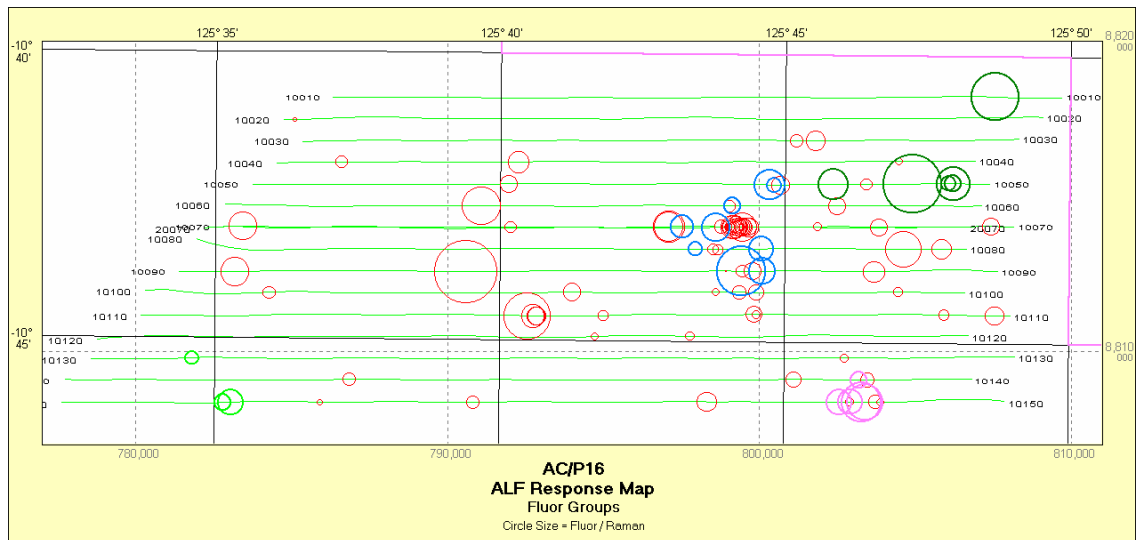


Figure 13. AC/P16 Fluor Group Map.

Figure 13 shows the locations of the fluor groups plotted above. Fluor group 1 is displayed in blue, group 2 is light green, group 3 is pink and group 4 is dark green.

3. Conclusions and Recommendations

The AC/P16 ALF survey was a small survey of 412.9km. 111 confident fluors were picked from the 290,337 spectra, corresponding to an average intensity of 382 fluors per million spectra.

The data was relatively noise free with no serious navigation problems.

Fluors were mostly of small to medium intensity with none having F/R area ratio larger than 0.75.

Most of the fluors were located in the eastern half of the survey in two main clusters. No fluorescence curve trends were noted but the survey area may be too small to show significant trends.

Appendix 1. Data Acquisition QC

Line	Sections	Clipped	Avg Raman Peak	Avg Raman Variance
10010	164	0	6,620	6,239,134
10020	171	0	9,339	7,349,736
10030	161	0	13,523	10,798,730
10040	156	0	12,252	9,555,099
10050	166	0	9,567	9,585,853
10060	169	0	10,356	6,779,426
10070	177	0	13,630	13,509,860
10080	175	0	12,971	11,027,400
10090	182	0	11,682	9,478,215
10100	186	0	11,382	8,890,783
10110	193	0	12,434	10,641,310
10120	196	0	11,784	9,943,943
10130	208	0	12,465	9,359,122
10140	202	0	11,853	8,283,196
10150	211	0	12,777	10,034,970
20070	170	0	12,476	10,030,450

Table 1. AC/P16 Data Acquisition Summary.

Table 1 summarises the data acquisition performance. A few of the lines have low Raman peak or Raman variance averages, which may affect fluor picking.

Line 10010 has a particularly low average Raman peak and variance. This is seen on the acquisition QC curves (Figure 14) and the plot of the Raman peak (Figure 15). The low amplitudes are probably caused by the data acquisition settings.

There is a correlation between the flying altitude (and speed) and the Raman peak and variance.

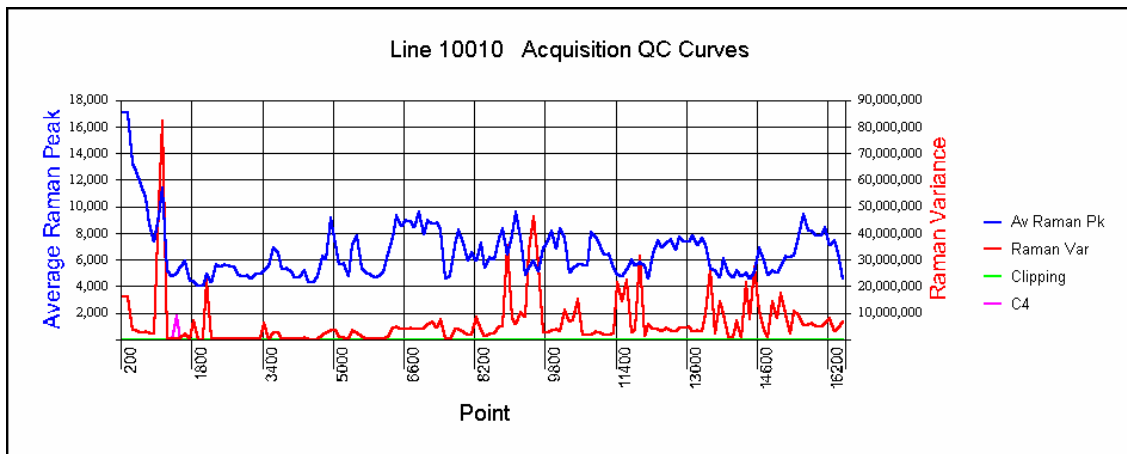


Figure 14. Line 10010 Acquisition QC Curves.

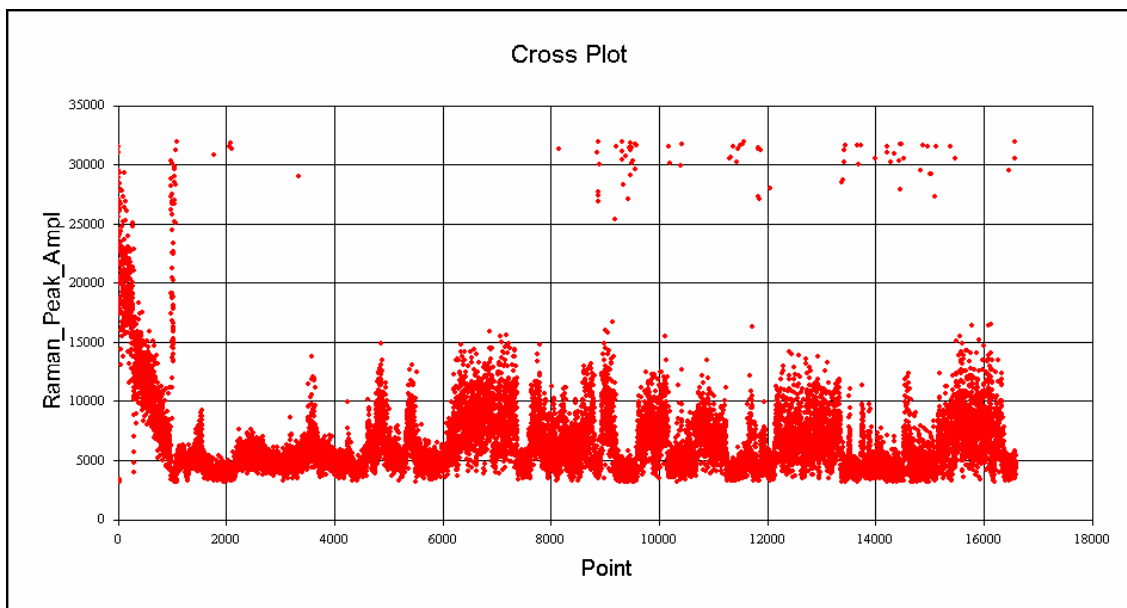


Figure 15. Line 10010 Raman Peak Amplitude Plot.

A review of the acquisition QC curves shows a sudden change in Raman peak and variance on line 10120. This may be caused by a change in the acquisition settings during data recording. The Raman peak and variance QC curves are shown in Figure 16. Figure 17 shows the Raman peak amplitude plot.

No fluors have been picked on the low amplitude part of the line. It may be more difficult to detect fluors where the spectra amplitudes are low.

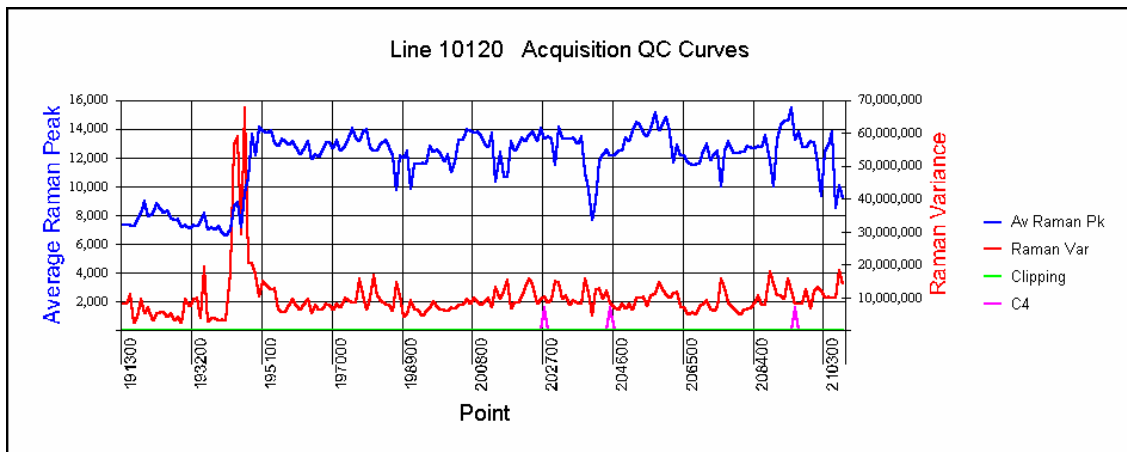


Figure 16. Line 10120 Acquisition QC Curves.

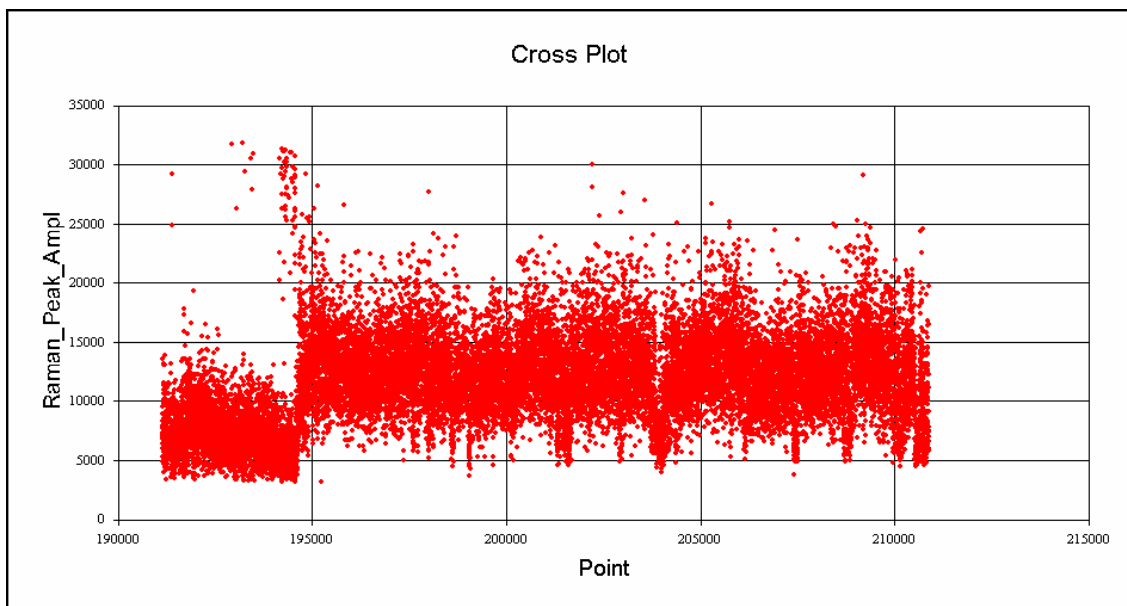


Figure 17. Line 10120 Raman Peak Amplitude Plot.

Line 20070 was a repeat of line 10070. Line 20070 was acquired in an easterly direction (heading 89.92 degrees) while line 10070 was acquired in a westerly direction (heading 270.03 degrees). (The navigation headings for each line are listed in Table 2.) Both lines detect an increased number of fluors in the eastern half of the survey.

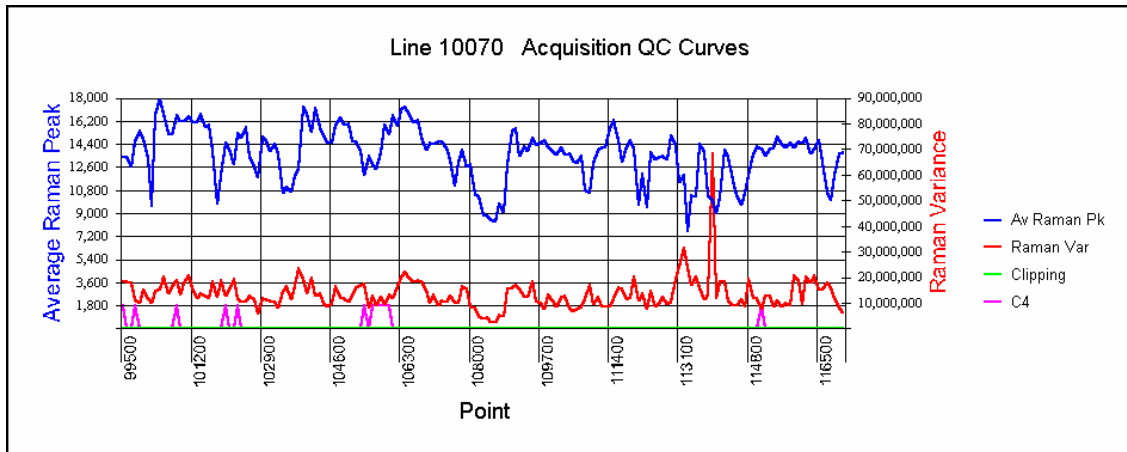


Figure 18. Line 10070 Acquisition QC Curves.

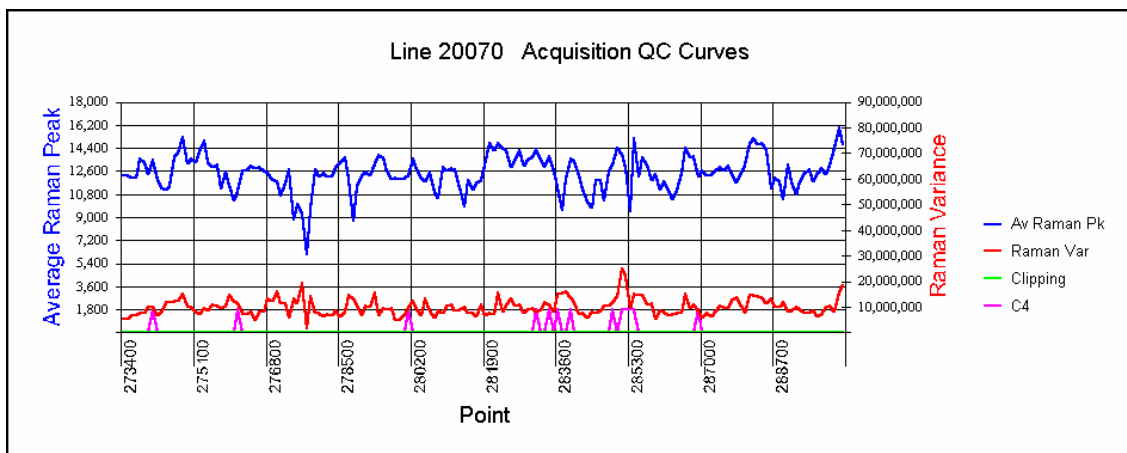
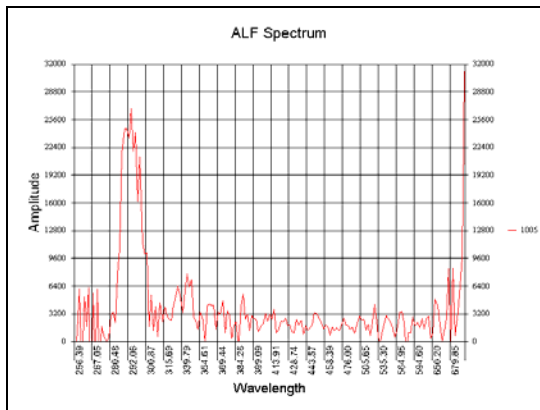
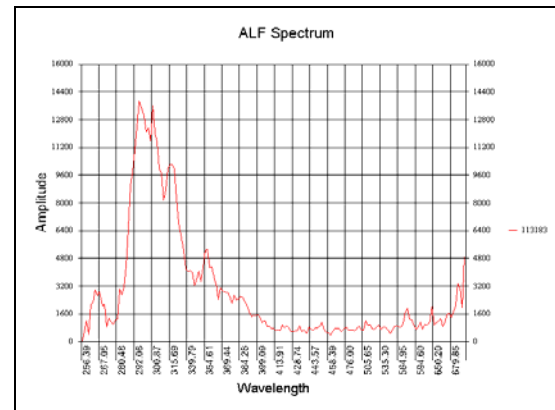


Figure 19. Line 20070 Acquisition QC Curves.

The noise levels for the survey were relatively low. Figure 20 shows some of the noisy records found during fluor picking.



a). Line 10010 Noisy Record



b). Line 10070 Noisy Record

Figure 20. Noisy Spectra Examples.

Appendix 2. Data Navigation QC

Line	Heading (deg)	Straight Line Dist (m)	Acquisition Time (seconds)	Avg Straight Line Vel (km/hr)	Number of Points	Flight Distance (m)	Avg Flying Vel (km/hr)	Avg Point Spacing (m)
10010	270.04	23,372.39	330.47	254.61	16,598	23,376.50	254.65	1.41
10020	89.85	24,358.27	340.48	257.55	17,162	24,364.91	257.62	1.42
10030	269.85	22,981.75	322.49	256.55	16,217	22,985.39	256.59	1.42
10040	89.86	22,416.52	311.99	258.66	15,693	22,419.33	258.69	1.43
10050	270.02	23,657.70	331.99	256.54	16,702	23,661.13	256.58	1.42
10060	90.13	24,270.39	337.98	258.52	17,006	24,273.56	258.55	1.43
10070	270.03	25,331.85	353.49	257.99	17,788	25,337.20	258.04	1.42
10080	90.77	24,696.72	350.00	254.02	17,614	24,739.86	254.47	1.40
10090	270.04	26,245.58	362.49	260.65	18,244	26,251.84	260.72	1.44
10100	90.22	26,279.61	371.96	254.35	18,723	26,289.67	254.44	1.40
10110	270.06	27,858.44	385.49	260.16	19,405	27,863.81	260.21	1.44
10120	89.79	27,935.84	391.97	256.57	19,733	27,946.15	256.67	1.42
10130	269.89	29,615.16	413.50	257.83	20,818	29,619.60	257.87	1.42
10140	89.99	29,059.06	404.98	258.32	20,391	29,061.78	258.34	1.43
10150	269.95	30,228.06	420.98	258.50	21,198	30,235.84	258.56	1.43
20070	89.92	24,433.00	338.48	259.86	17,045	24,438.43	259.92	1.43
Total		412,740.34	5,768.74		290,337	412,865.00		

Table 2. AC/P16 Line Navigation Summary.

Table 2 summarises the data navigation parameters. A more detailed assessment can be made by reviewing the navigation QC curves using the *ALF Tools* software.

Average flying speed was consistent for all lines resulting in average point spacing in the narrow range from 1.40m to 1.43m.

The deviation of each line from a straight path was generally less than +/- 100m but line 10080 deviated by much more than this near the western end.

Figure 21 shows a typical navigation curve plot for line 10070. The flying height deviated by less than $\pm 10\text{m}$ about the nominal 100m height. Flying speed was close to 260 km/hr for the line. The flight path deviated from a straight line by less than 60m.

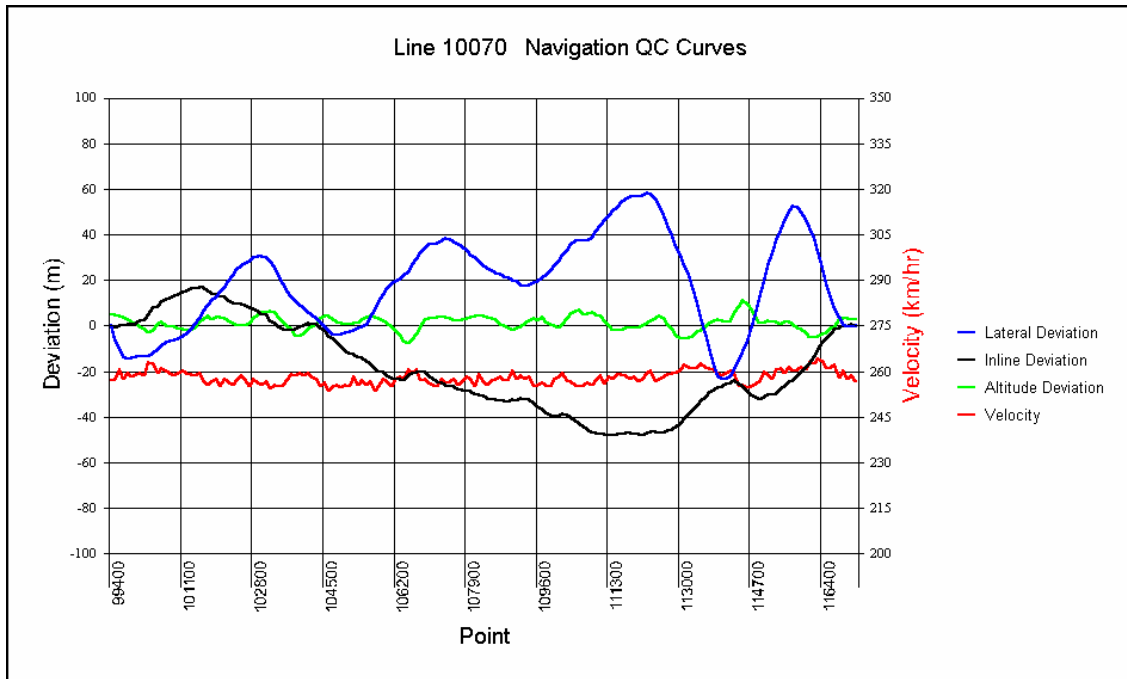


Figure 21. Line 10070 Navigation QC Curves.

Appendix 3. CD Contents

A CD containing ALF analysis data is included in the back of this report. The CD contains the following files:

ACP16 ALF Survey Interp Report.doc

The AC/P16 ALF survey interpretation report.

ACP16 Survey Summary.xls

Survey summary spreadsheet.

Acp16.mdb

ALF Explorer project database containing interpretation results.

ALF Power.map

ALF Explorer map definition file for the ALF power map.

ALF Survey.map

ALF Explorer map definition file for the ALF survey map.

ALFAnalysis.dat

ALF Explorer project data file. (This file together with the Acp16.mdb file forms the ALF Explorer project data.)

Confident Fluors.dat

ASCII data file of the confident fluors picked during the interpretation.

Fluor and ALF Power.map

ALF Explorer map definition file for the ALF fluor and power map.

Interp 2 ALF Response.map

ALF Explorer map definition file for the refined ALF fluor map.

Line 10070 Near Fluors.dat

ASCII data file of the group of fluors on line 10070 separated by 10 samples or less.

Line 20070 Near Fluors.dat

ASCII data file of the group of fluors on line 20070 separated by 10 samples or less.

Figures

Directory containing figures used in the interpretation report: