

Side Scan Sonar Paths & Interesting Features

In August 2005, Parks Australia North Cocos (Keeling) Islands (PANCKI), (courtesy of Robert Thorn) provided Geoscience Australia (GA) with sidescan sonar video footage taken from the shipping channel from the north-eastern lagoon entrance through to the blue hole or the oil-tanker moorings. The video footage was supplied on CD-Rom viewable with accompanying software (Imagenex Model 881 Sportscan Digital Sidescan Sonar V1.20).

The video footage was taken over eight days (20-23/11/2002; 4/12/2002; 5/3/2003; 11/3/2003 & 17/3/2003) by Don Shepherd, subcontracted by GHD Pty Ltd and funded by DoTaRS. The purpose of this survey was to confirm the shipping channel and was the final survey before the shipping channel could be opened. It was conducted to ensure that previous contractors had adequately removed obstructions such as coral bombies and placed markers appropriately. Positional accuracy of the sidescan sonar has not yet been received by GA. The instrument trails



Figure 1: IMAGENEX Sportscan Digital Sidescan Sonar device

the shipping vessel on a cable of variable length. Errors are introduced depending on the length of this cable, and also depending on currents within the water-body. GA is as yet to receive information regarding the cable length used or whether corrections have been made to the sidescan sonar data. GA has tested various locations along the sidescan sonar paths for accuracy. This was done by correlating the path with features observed in the 1987 Orthophotography. From these test locations, GA believes errors to be within +/- 10m. An example of these test locations can be seen in Figure 5 below.

Shapefiles have been built from this data to show the paths taken by the sidescan sonar vessel. These were created using the longitude and latitude displayed from the beginning and end of the image paths. It should be noted however that this method assumes the vessel to be moving in a straight line throughout the footage. As the lines have been compiled with only the beginning and end point data it is possible that the vessel did not maintain this straight path and therefore errors may be evident due to this assumption. A coverage of lines was built and projected into UTM Zone 47S (WGS84).

A second shapefile has also been created which shows anomalies noticed by GA within the sidescan sonar footage that may be of interest, such as that in Figure 2 below. The shapefile was produced using the latitude and longitude of the particular point of interest, and was then projected to UTM Zone 47S (WGS84). These two shapefiles are shown below overlayed on the 2003 satellite imagery.

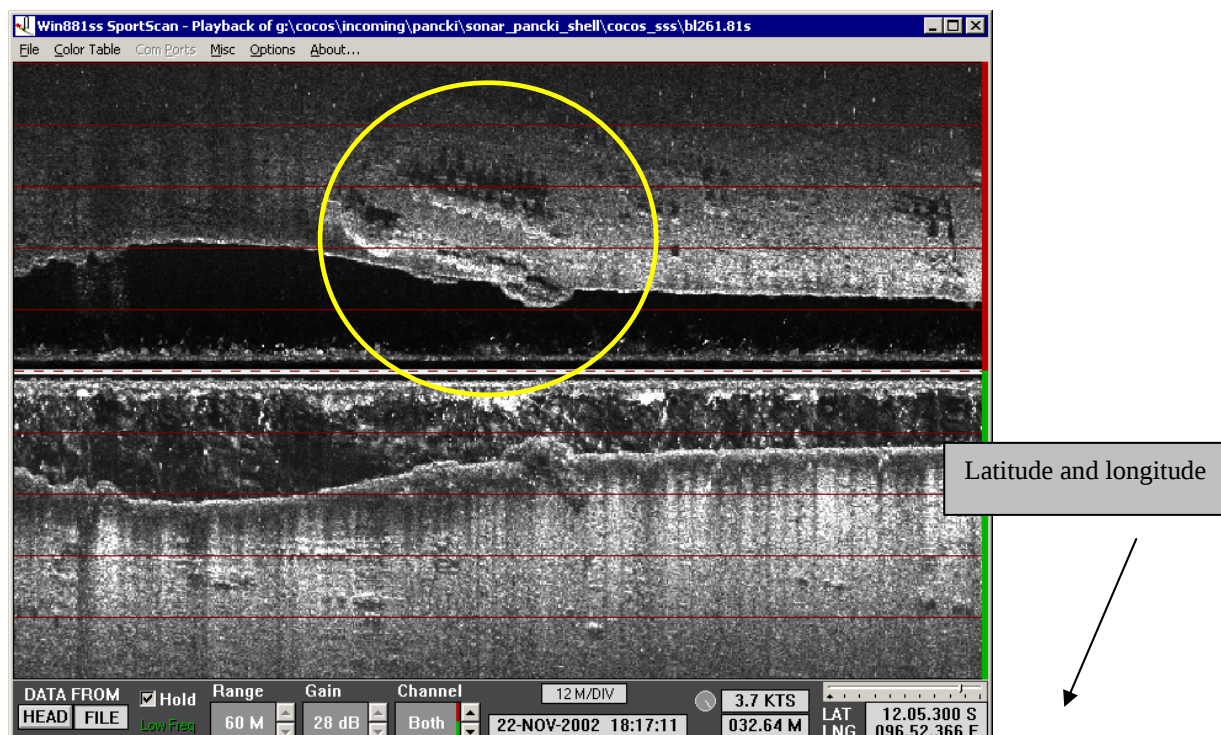


Figure 2. An anomaly within the Side Scan Sonar footage.

GA is as yet unable to provide an explanation of what these anomalies are. Evidence suggests they could be a combination of natural features such as coral bombies or rock strata, or anthropogenic features such as foundations of past or present navigation markers or perhaps a sunken vessel or war wreckage. Screen captures of these areas have been included on the adjoining pages.

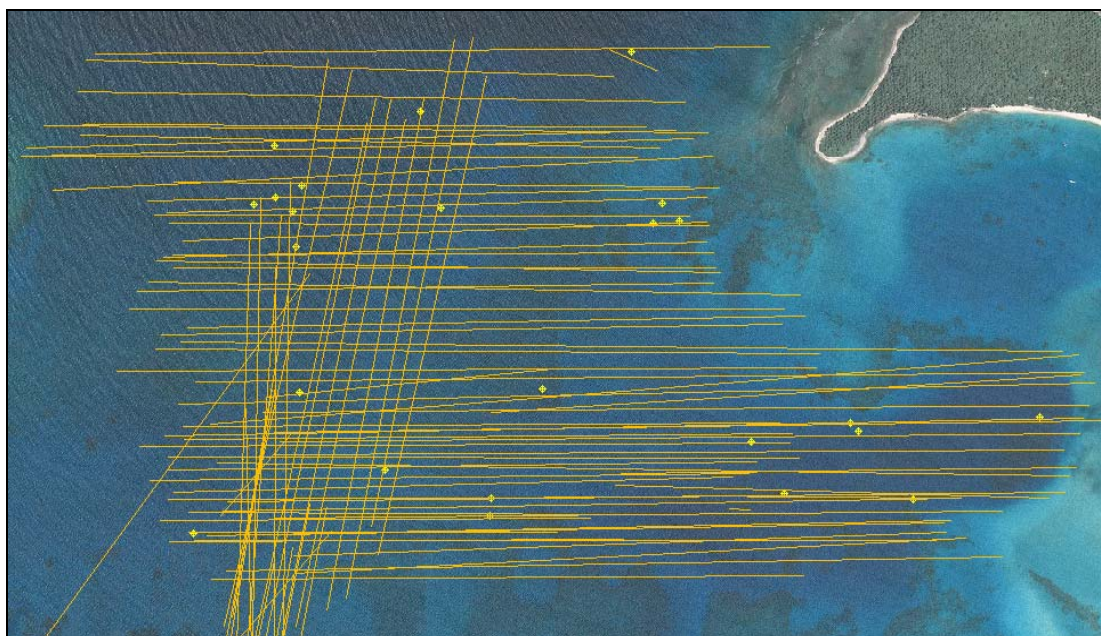


Figure 3 – Side Scan Sonar paths and interesting points overlaid onto the 2003 satellite imagery.

By overlaying these shapefiles with the 2003 satellite imagery and, where available, the 1987 orthophotography, correlation is evident between rock and coral covered patches of the sea-floor and that data footage captured by the sidescan sonar. This can be seen by comparing the following sidescan sonar image and the 1987 orthophotography of the same area.

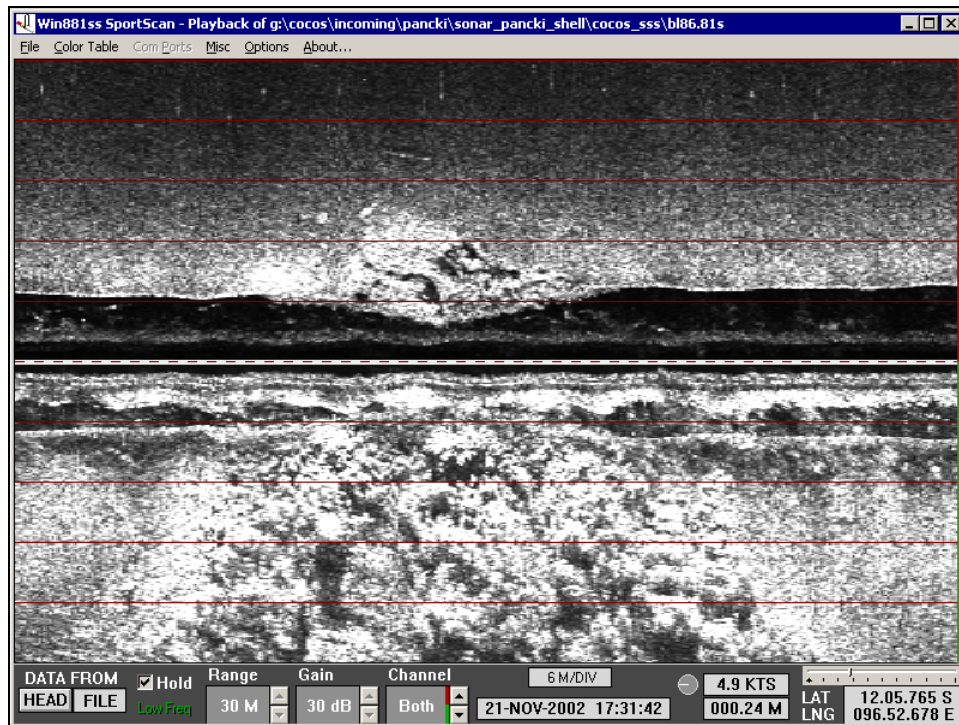


Figure 4: Sidescan sonar image of an area near the Blue Hole. Correlation can be seen between the sonar footage and the satellite image shown below.



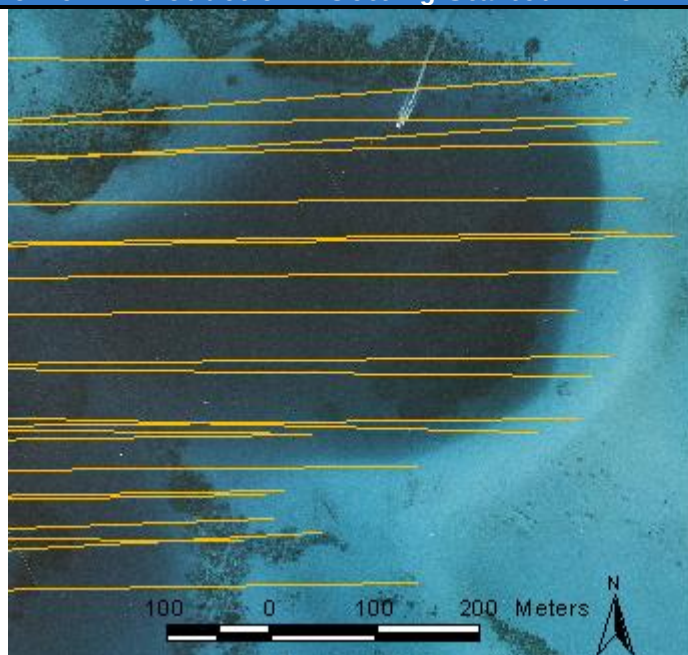
Figure 5: 1987 Orthophotography of the area captured in the sonar footage displayed in Figure 4. Correlation can be seen between the two images (note that the vessel was travelling from east to west). Yellow crosses indicate the edge of the coral patch as seen in the sidescan sonar video footage. Errors are evident between this video footage and the Orthophotography.

GA understands the dark band in the middle of the sidescan sonar footage to represent the wake of the boat. Due to the sonar equipment needing to drop 3-4 meters below the boat, it was necessary for water depth to be at least 5 meters. Paths are attributed with the video footage filename. (e.g. bl96.81s, where bl=blue hole and .81s refers to the equipment model. Other prefixes are ch=channel, cl=clearance area, tr, newcl, and south). PANCKI have expressed an interest in investigating some of these anomalies by diving the areas.

Cocos (Keeling) Islands GIS

Sidescan Sonar Paths

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Sidescan Sonar

— Sonar Paths



Dataset	
Title	Sidescan Sonar Paths
Custodian	Geoscience Australia
Jurisdiction	Australia
Description	
Abstract	This dataset shows paths taken by a vessel holding a Sidescan Sonar instrument within the waters of the Cocos (Keeling) Islands used by cargo ships.
Search Word(s)	SONAR Marine
Geographic Extent Name(s)	Cocos (Keeling) Islands
Data Currency	
Beginning Date	20NOV2002
Ending Date	17MAR2003
Dataset Status	
Progress	Complete
Maintenance and Update Frequency	not planned
Access	
Stored Data Format	DIGITAL - ESRI Shapefile
Available Format Type	DIGITAL - ESRI Shapefile

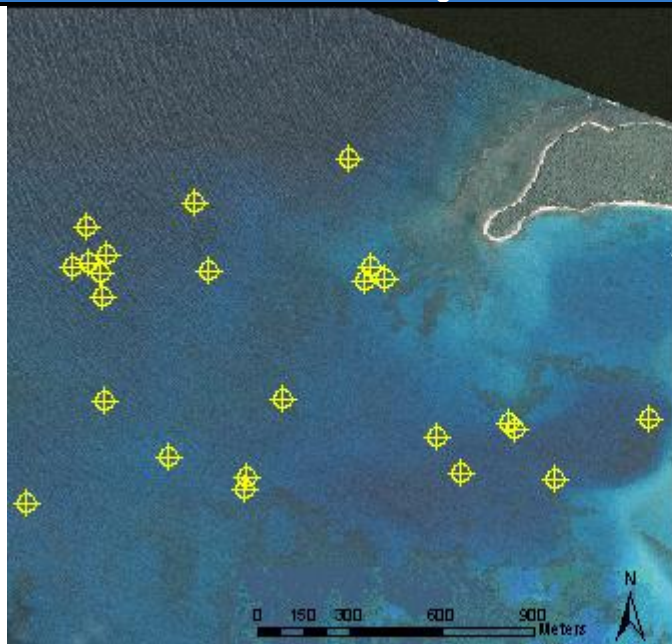
Access Constraint	See contact details below.
Data Quality	
Lineage	This data was originally provided as sonar video footage on CD-Rom, viewable with accompanying software (Imagenex Model 881 Sportscan Digital Sidescan Sonar V1.20). Using the latitude and longitude displayed at the beginning and end of the paths, the shapefile was made to represent the paths of the Sidescan Sonar. The shapefile represents the paths assuming travel was in a straight line from beginning to end. It is possible that the vessel wavered from this path. The data was projected to UTM (WGS84) zone 47S using ArcView.
Positional Accuracy	GA received little information regarding the positional accuracy of the sonar video footage. The cable length from the shipping vessel to the sidescan instrument is unknown and may cause errors in the data. It is also unknown whether corrections were performed to allow for movement of the instrument due to water currents. GA however believes errors to be within +/- 10m. Latitude and Longitude were both given to a hundredth of a minute.
Attribute Accuracy	The table attributes describe the path number.
Logical Consistency	The themes are used to describe the Sidescan Sonar paths.
Completeness	Is complete for the Sidescan Sonar footage which was provided by PANCKI.
Contact Information	
Contact Organisation	Geoscience Australia (GA)
Contact Position	
Mail Address	Cnr Jerrabomberra Ave and Hindmarsh Drive
Locality	SYMONSTON
State	A.C.T
Country	Australia
Postcode	2609
Telephone	(02) 6249 9479
Facsimile	(02) 6249 9983

Electronic Mail Address	keith.porrittzzz@zzzga.gov.au (Anti-spam method - remove the two 'zzz' to use this email)
Metadata Date	12-12-2005
Additional Metadata	
Projection	UTM (WGS84) zone 47S.

Cocos (Keeling) Islands GIS

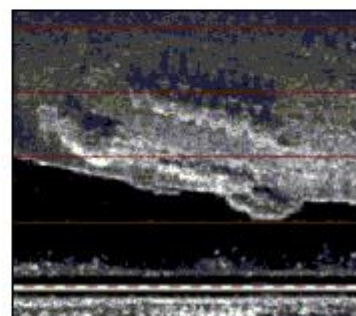
Sidescan Sonar Interesting Features

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Sidescan Sonar

 Interesting Features

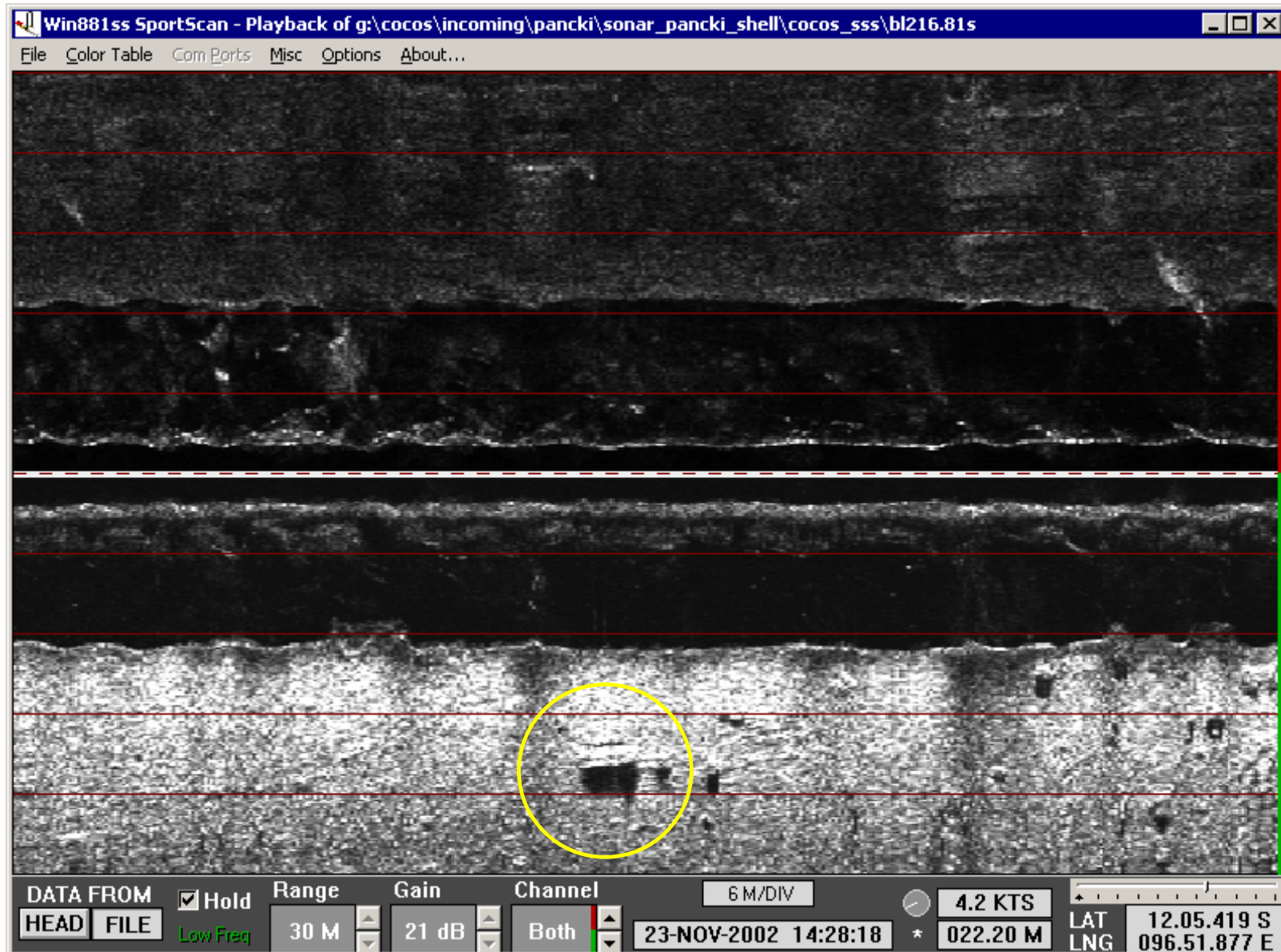


Dataset	
Title	Sidescan Sonar Interesting Features
Custodian	Geoscience Australia
Jurisdiction	Australia
Description	
Abstract	This dataset shows features of particular interest within the Sidescan Sonar video footage. The features have not yet been defined as being natural or unnatural.
Search Word(s)	SONAR Marine SONAR Features
Geographic Extent Name(s)	Cocos (Keeling) Islands
Data Currency	
Beginning Date	20NOV2002
Ending Date	17MAR2003
Dataset Status	
Progress	Complete
Maintenance and Update Frequency	not planned
Access	

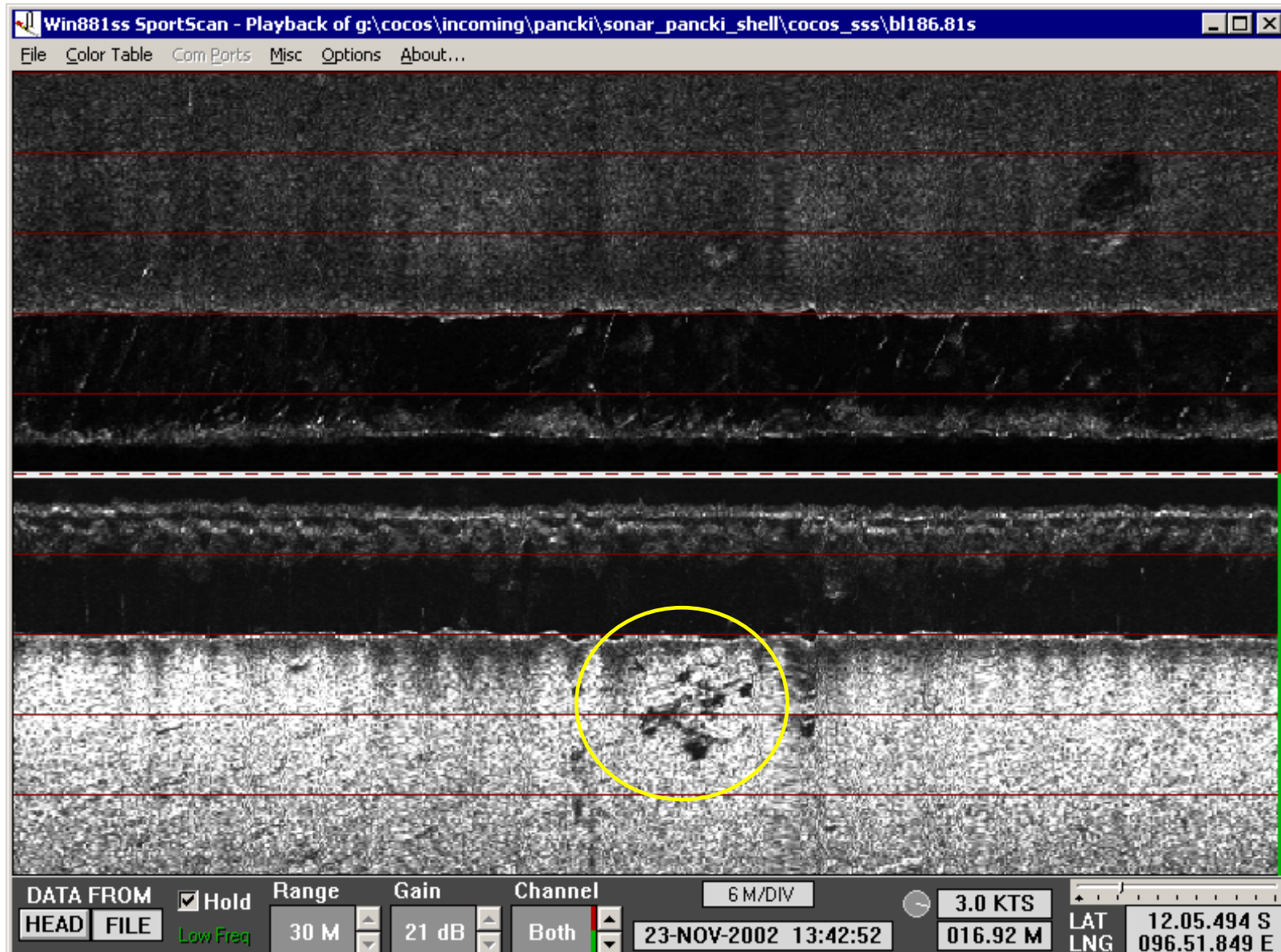
Stored Data Format	DIGITAL - ESRI Shapefile
Available Format Type	DIGITAL - ESRI Shapefile
Access Constraint	See contact details below.
Data Quality	
Lineage	This data was originally provided as sonar video footage on CD-Rom, viewable with accompanying software (Imagenex Model 881 Sportscan Digital Sidescan Sonar V1.20). Using the latitude and longitude displayed at the beginning and end of the paths, the shapefile was made to represent the paths of the Sidescan Sonar. The shapefile represents the paths assuming travel was in a straight line from beginning to end. It is possible that the vessel wavered from this path. The data was projected to UTM (WGS84) zone 47S using ArcView.
Positional Accuracy	GA received little information regarding the positional accuracy of the sonar video footage. The cable length from the shipping vessel to the sidescan instrument is unknown and may cause errors in the data. It is also unknown whether corrections were performed to allow for movement of the instrument due to water currents. GA however believes errors to be within +/- 10m. Latitude and Longitude were both given to a hundredth of a minute.
Attribute Accuracy	The table attributes describe the path number from which the features were seen.
Logical Consistency	The themes are used to describe interesting features in the Sidescan Sonar footage.
Completeness	Is complete for the Sidescan Sonar footage which was provided by PANCKI.
Contact Information	
Contact Organisation	Geoscience Australia (GA)
Contact Position	
Mail Address	Cnr Jerrabomberra Ave and Hindmarsh Drive
Locality	SYMONSTON
State	A.C.T
Country	Australia
Postcode	2609

Telephone	(02) 6249 9479
Facsimile	(02) 6249 9983
Electronic Mail Address	keith.porrittzzz@zzzga.gov.au (Anti-spam method - remove the two 'zzz' to use this email)
Metadata Date	12-12-2005
Additional Metadata	
Projection	UTM (WGS84) zone 47S.

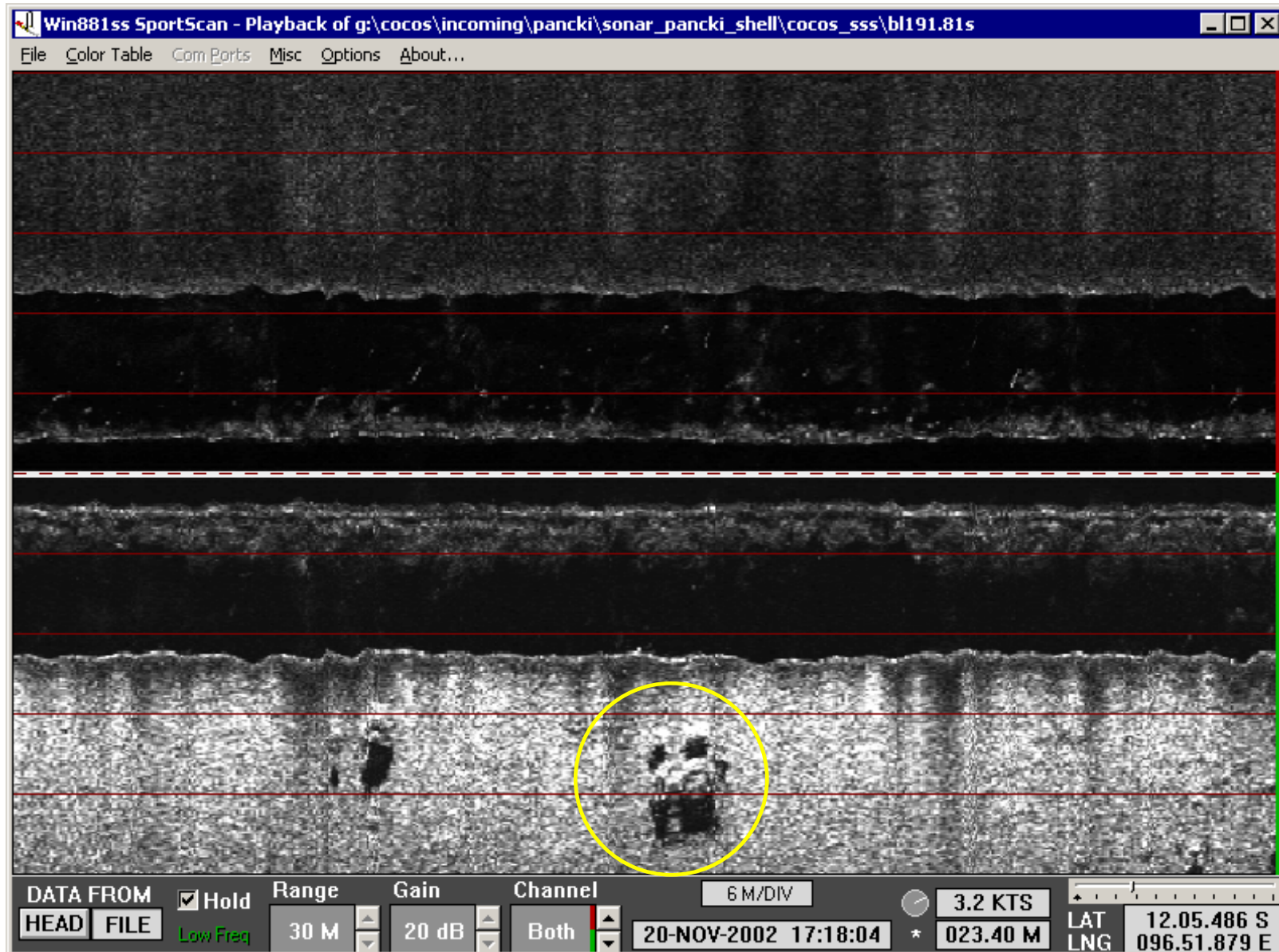
Point 1 – bl216



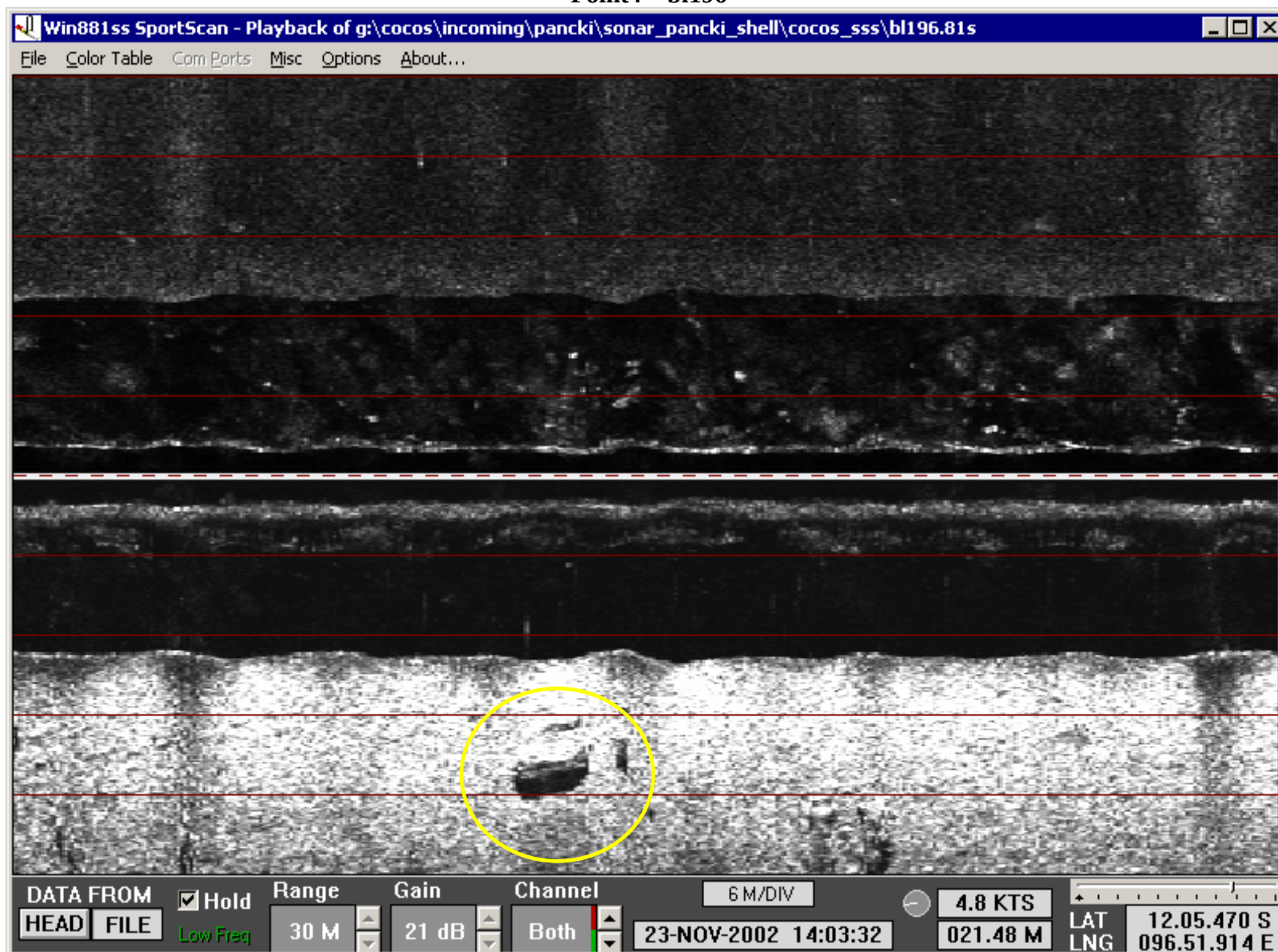
Point 2 – bl186



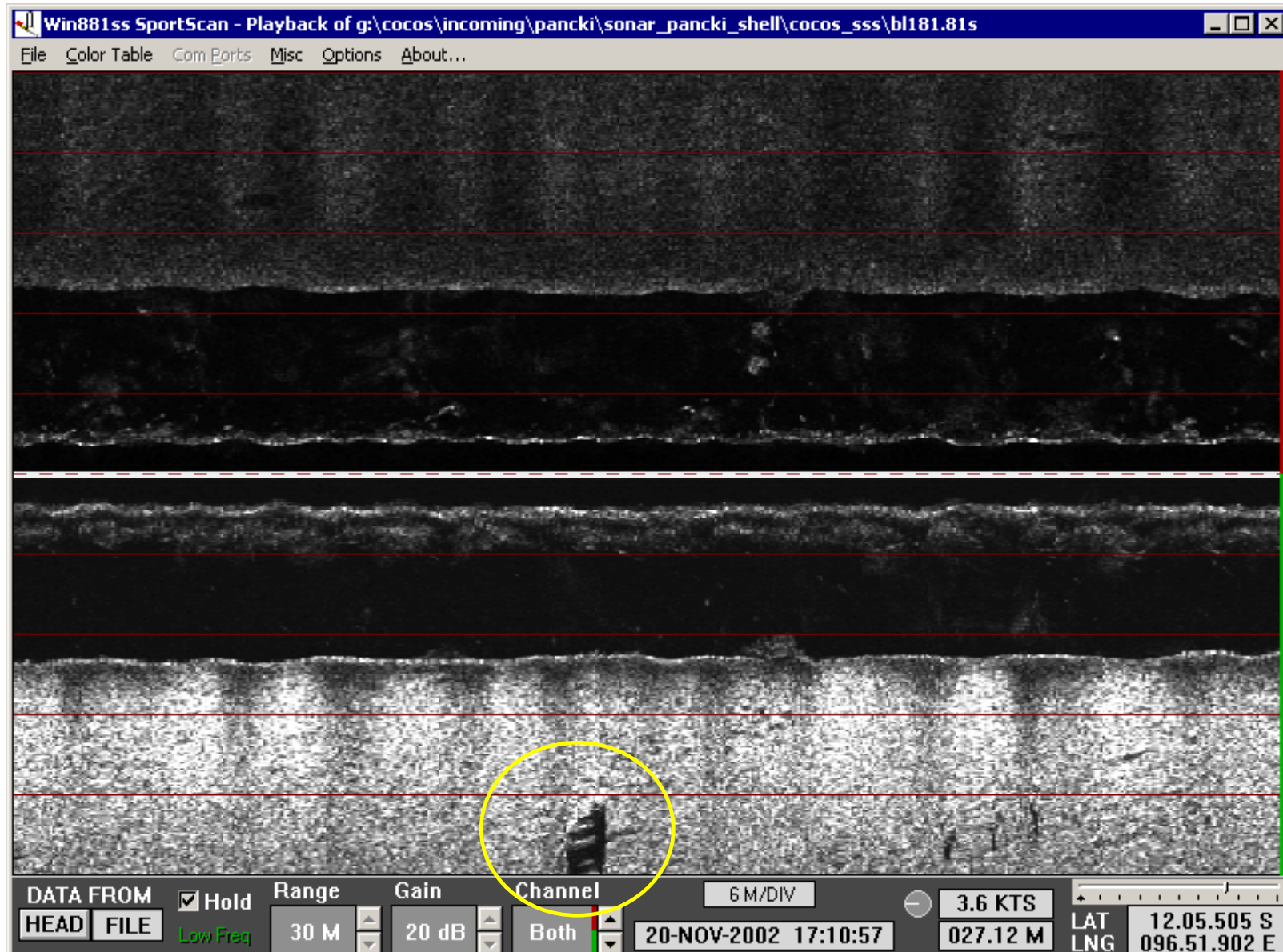
Point 3 – bl191



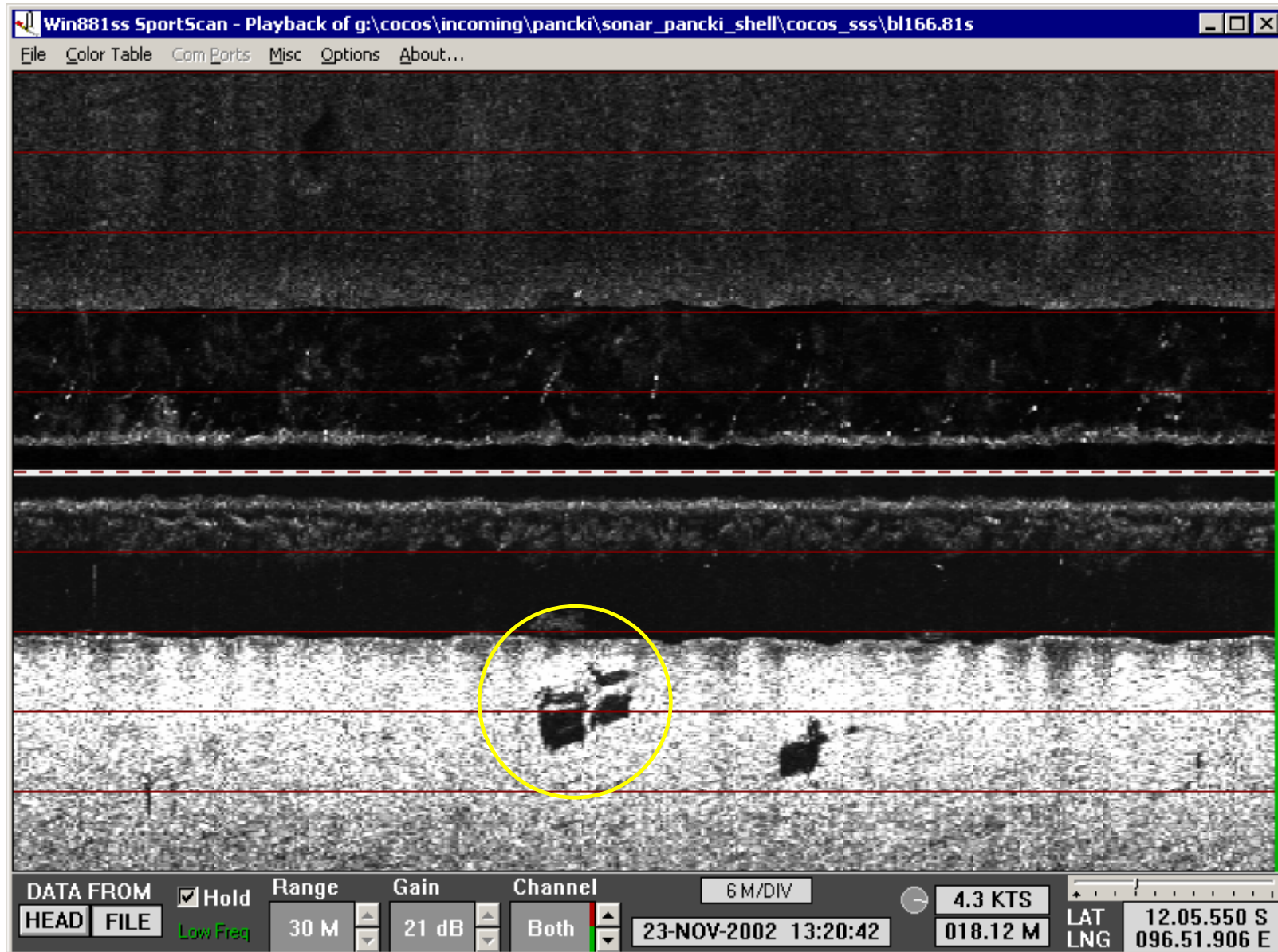
Point4 – bl196



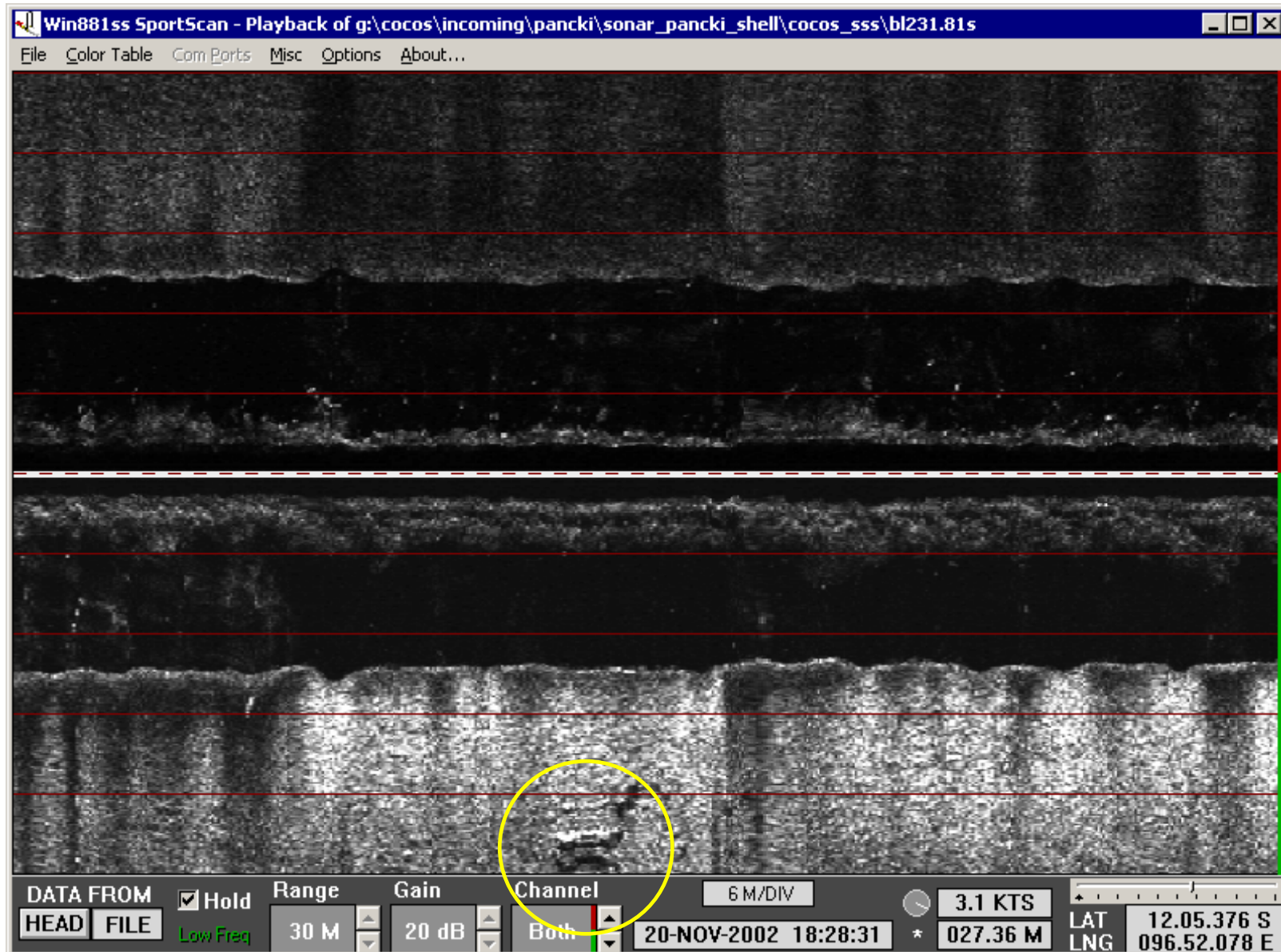
Point 5 – bl181



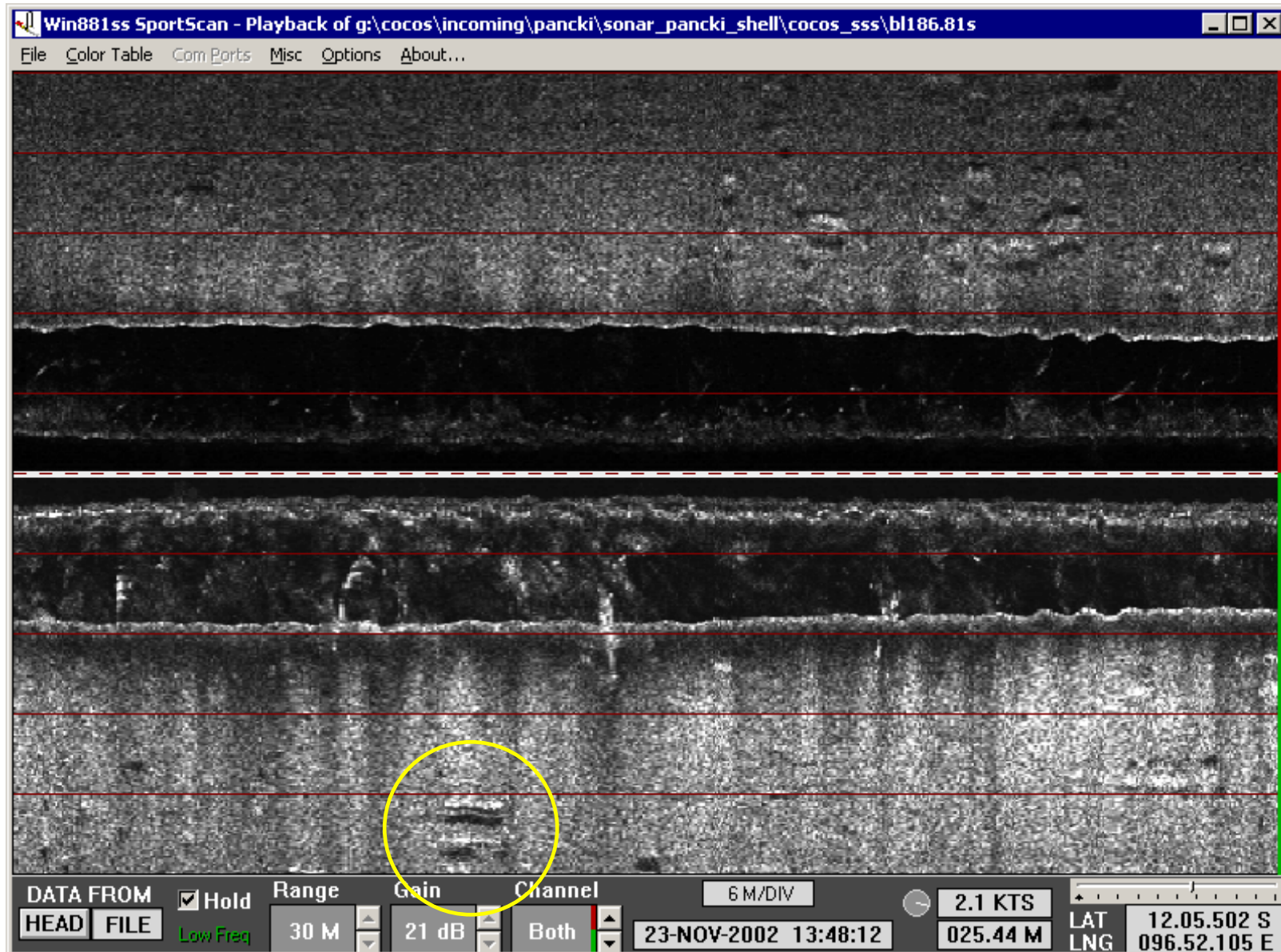
Point 6 – bl166



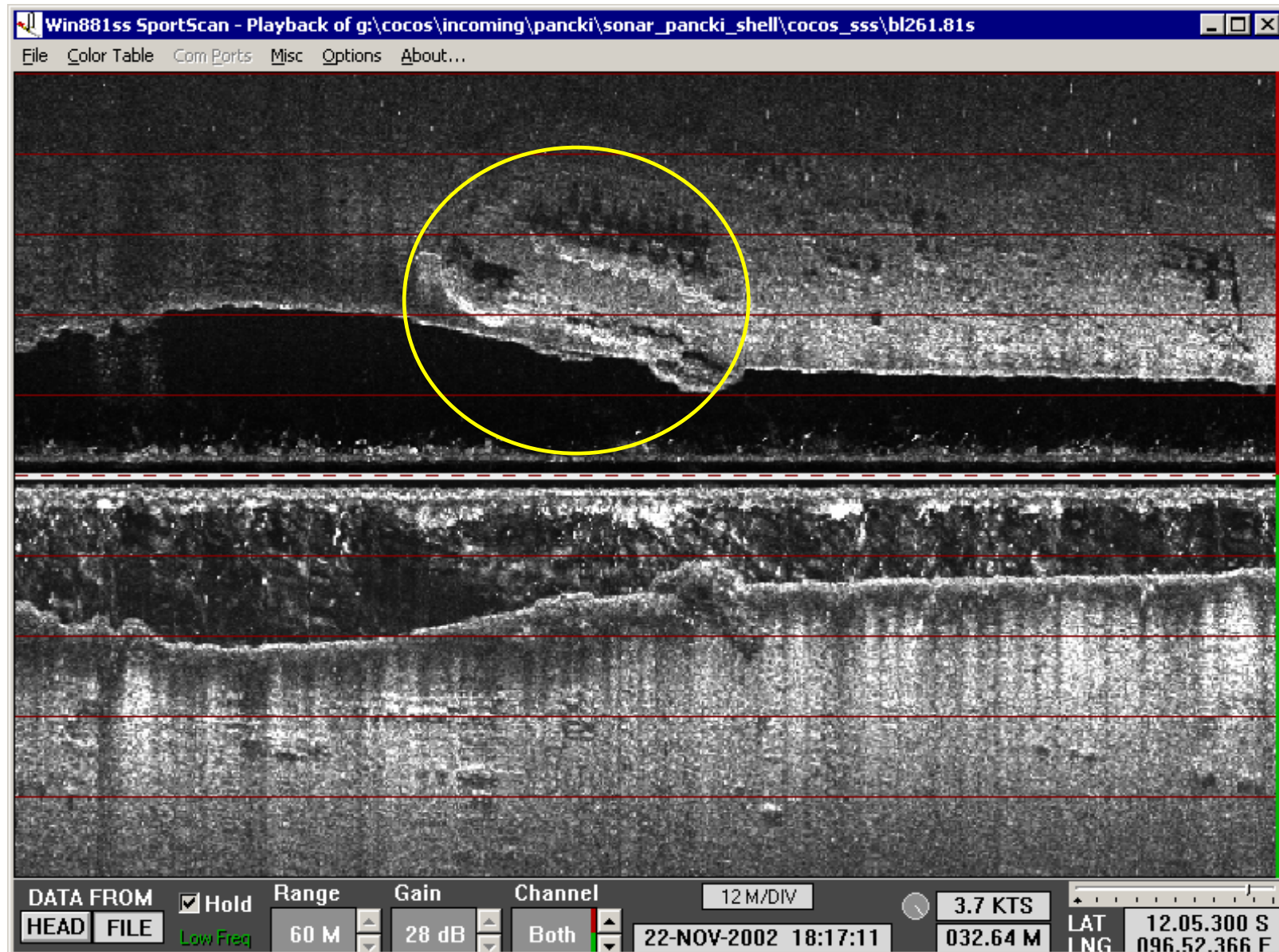
Point 7 – bl231



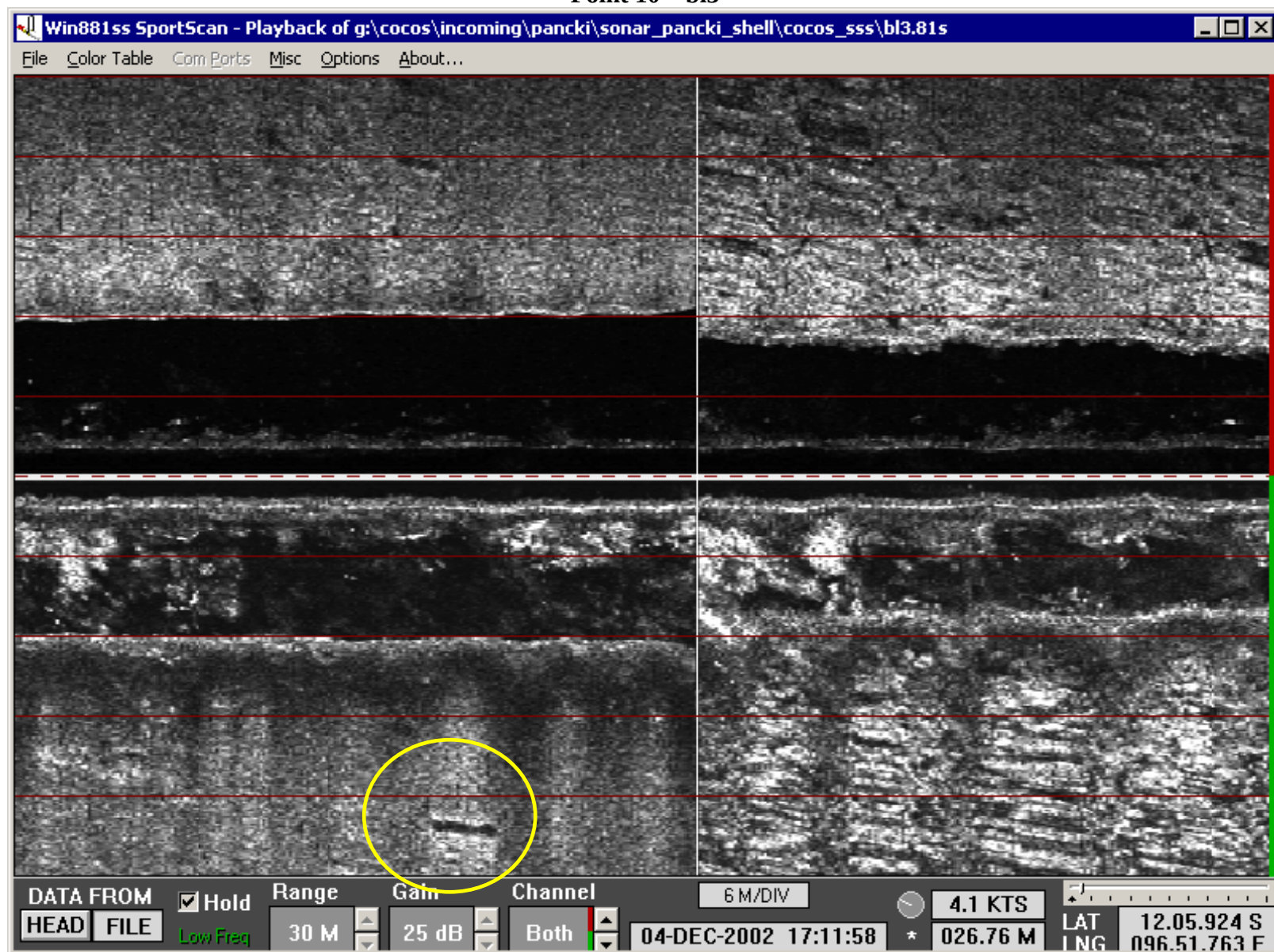
Point 8 – bl186



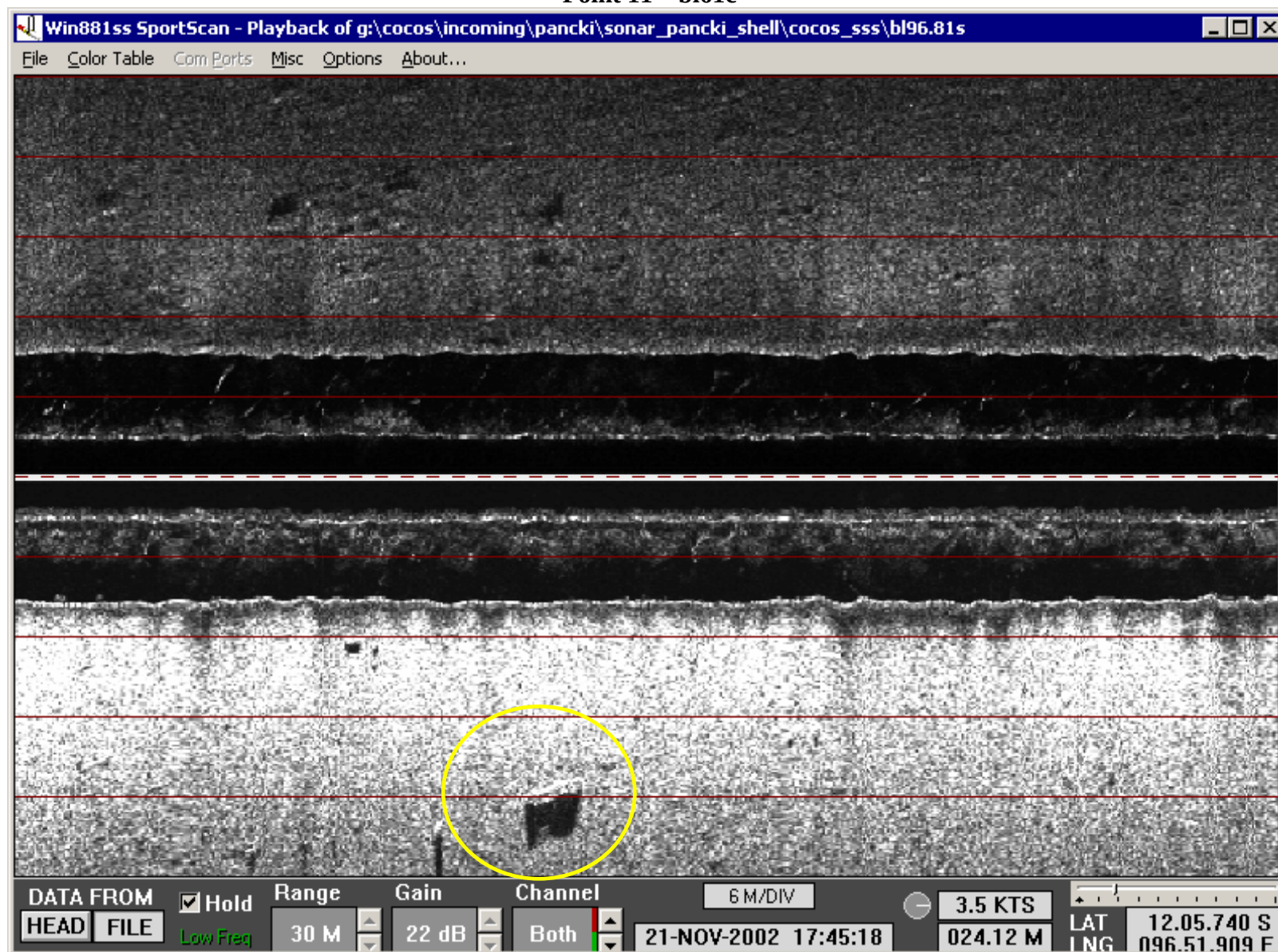
Point 9 – bl261



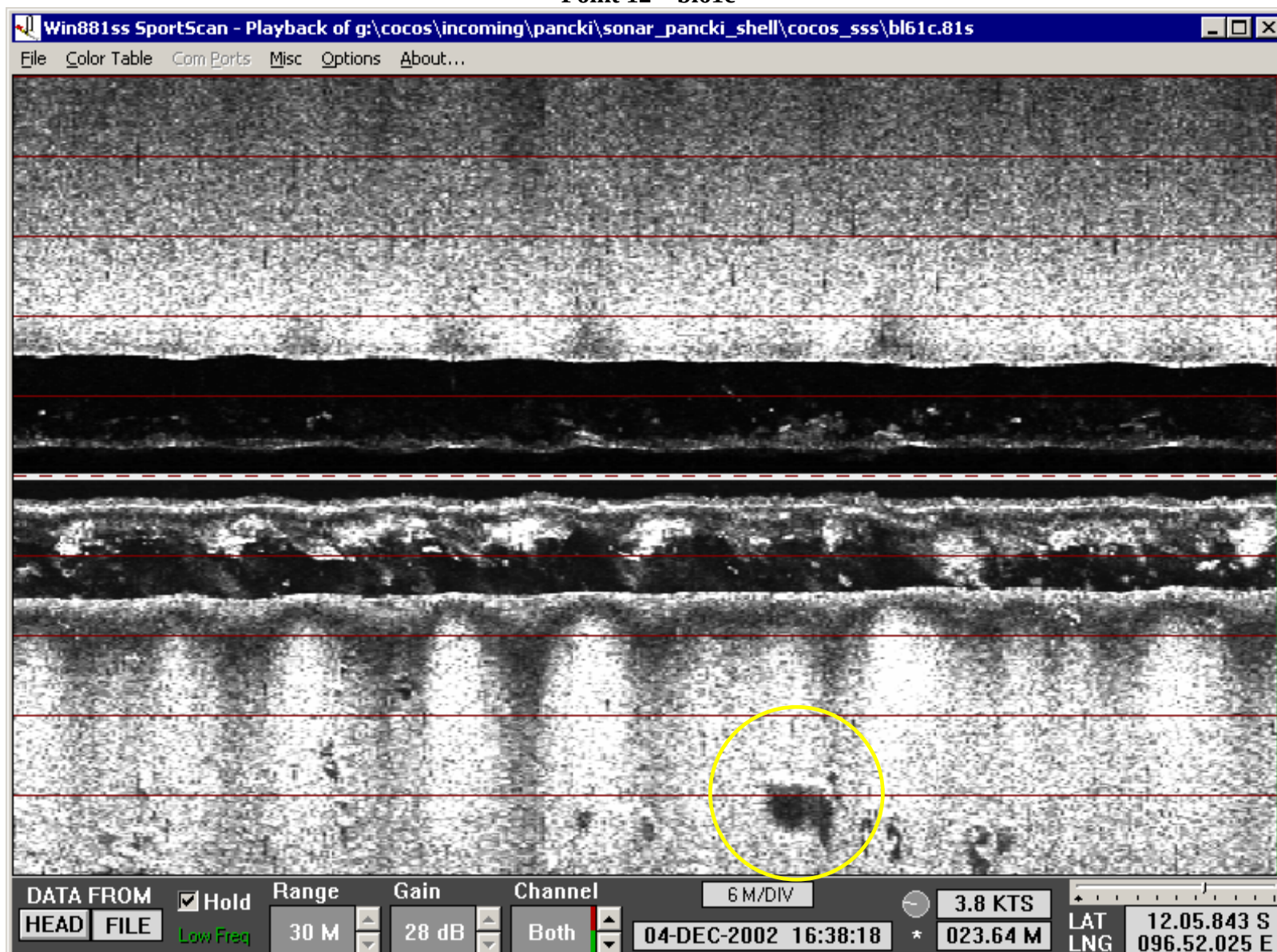
Point 10 – bl3



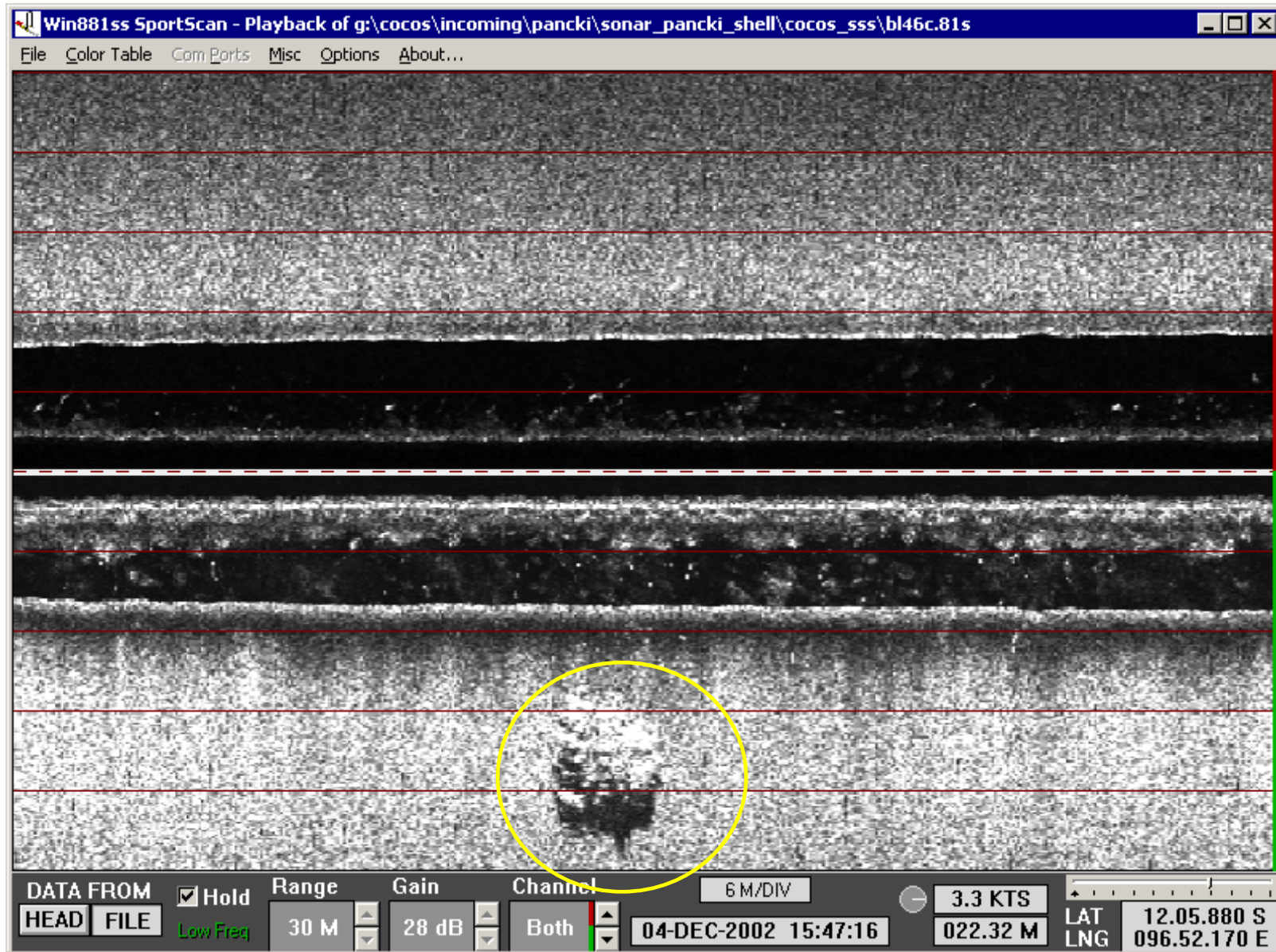
Point 11 – bl61c



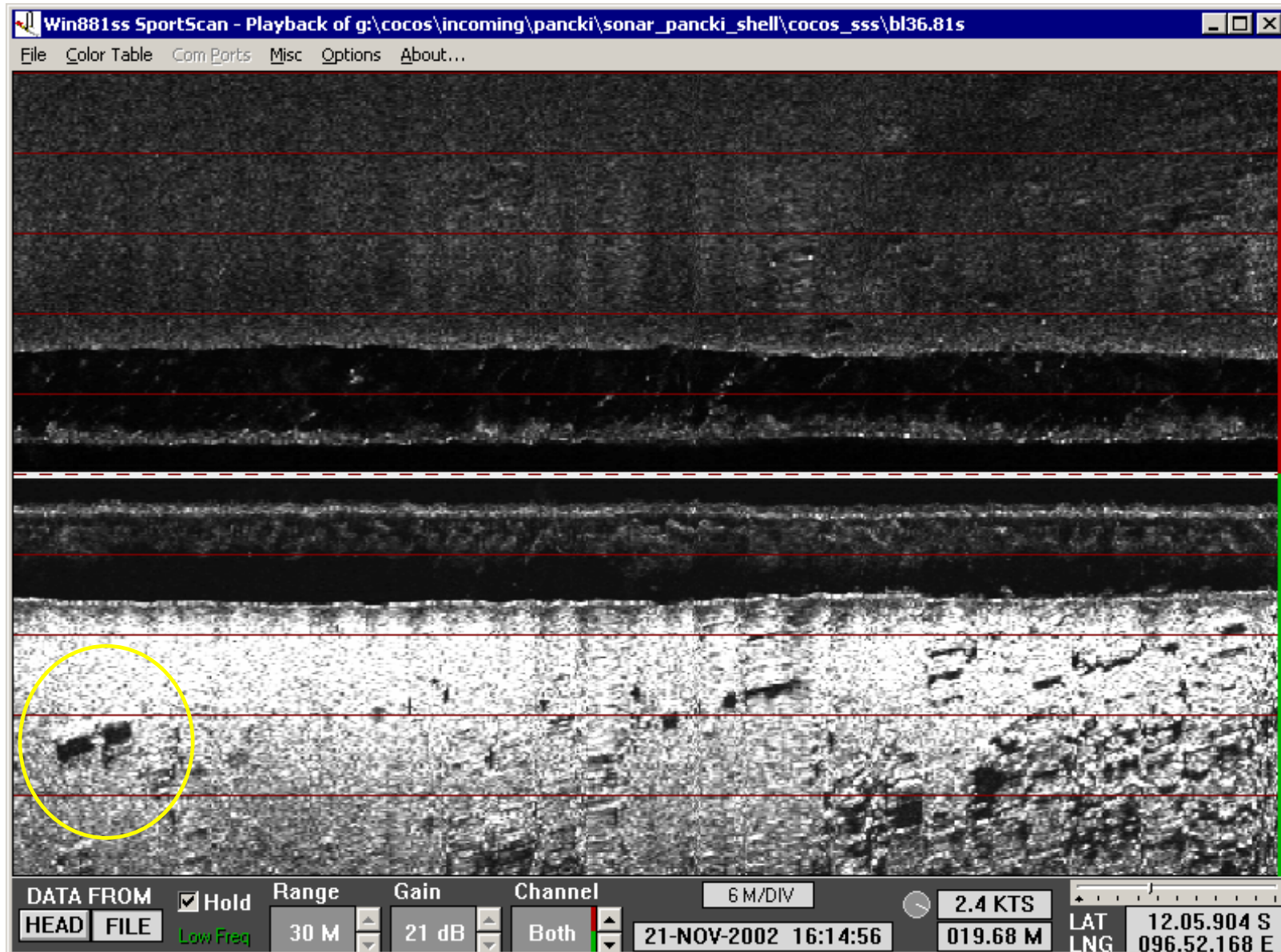
Point 12 – bl61c



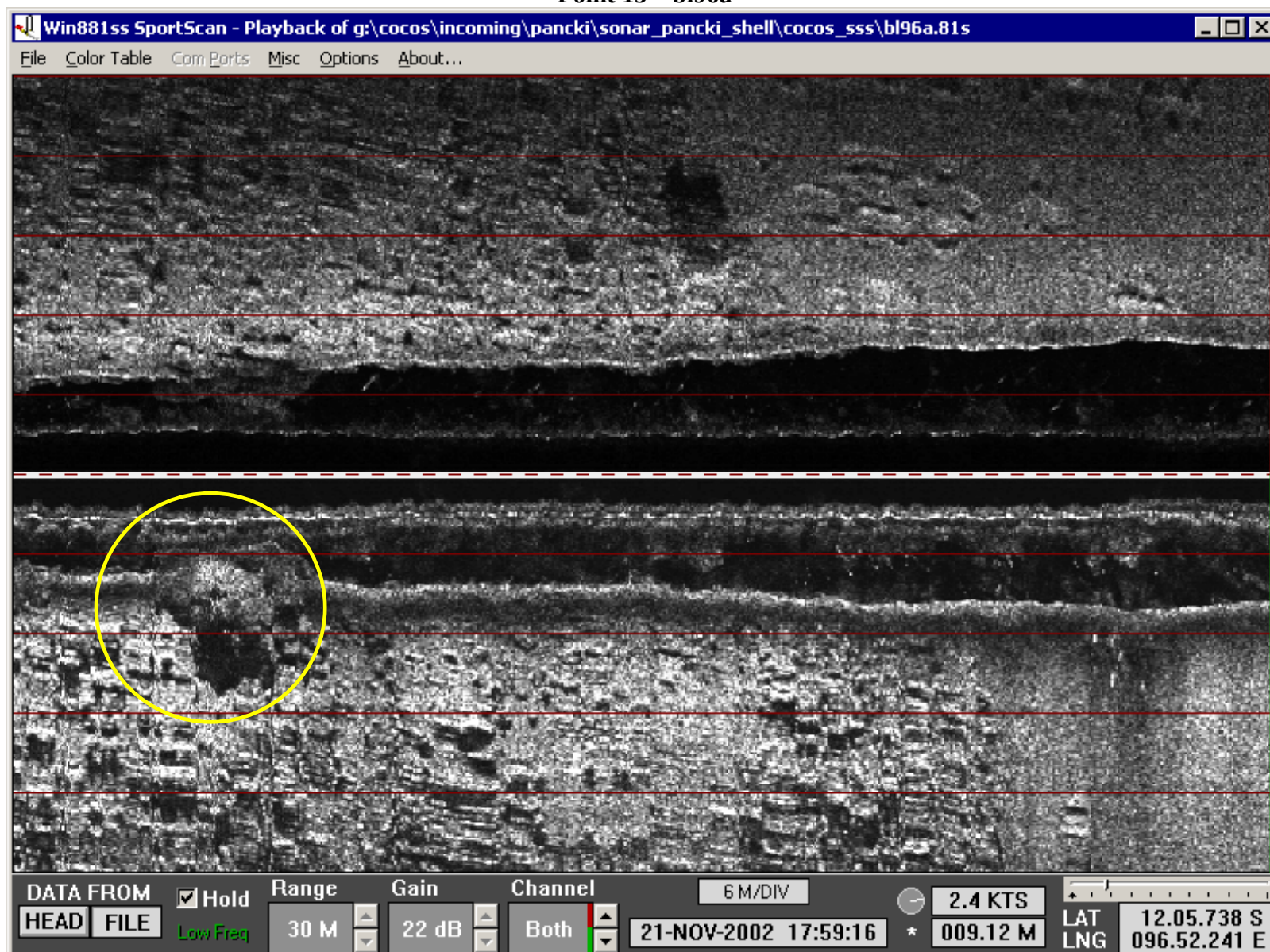
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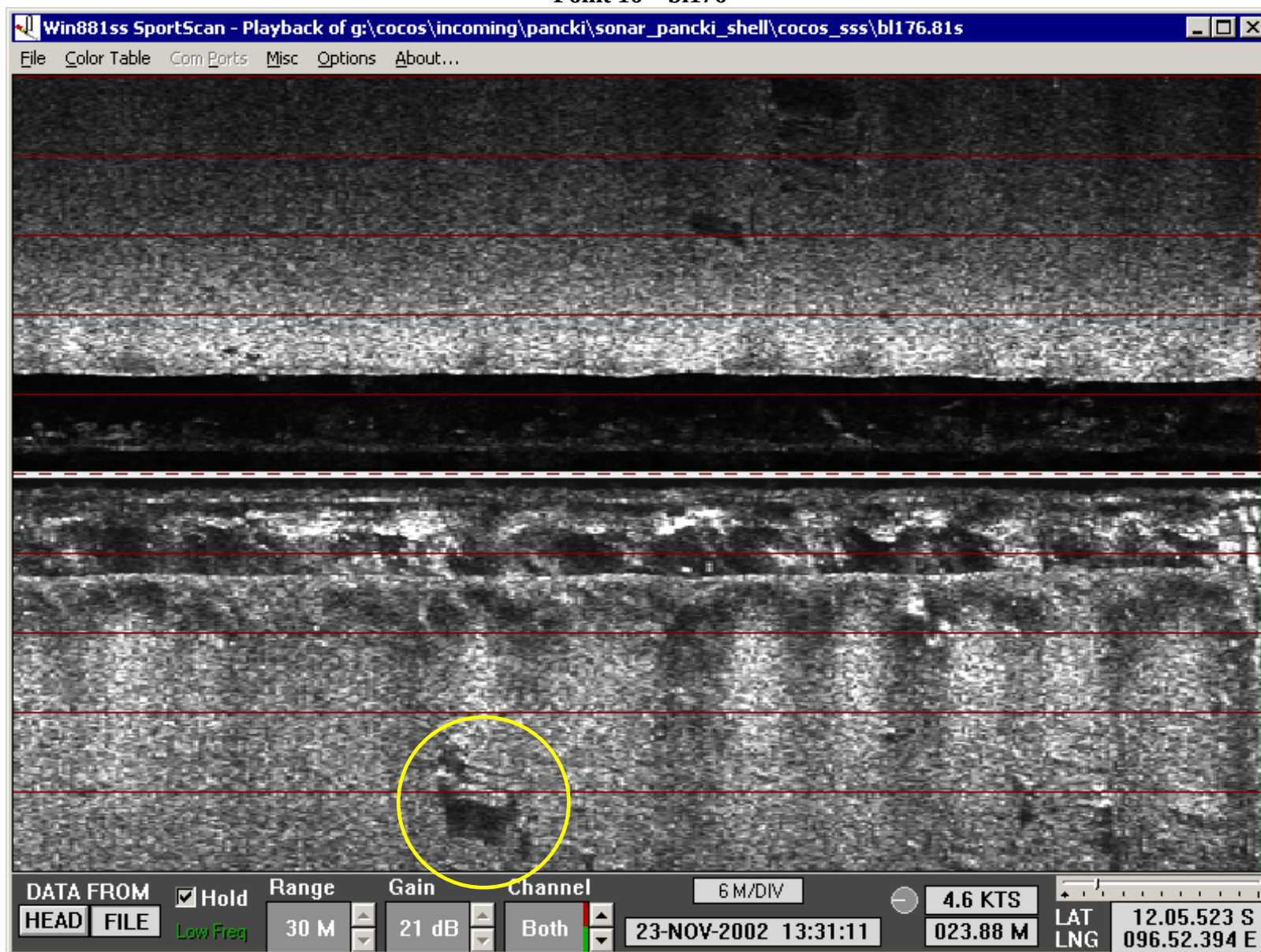
Point 14 – bl36



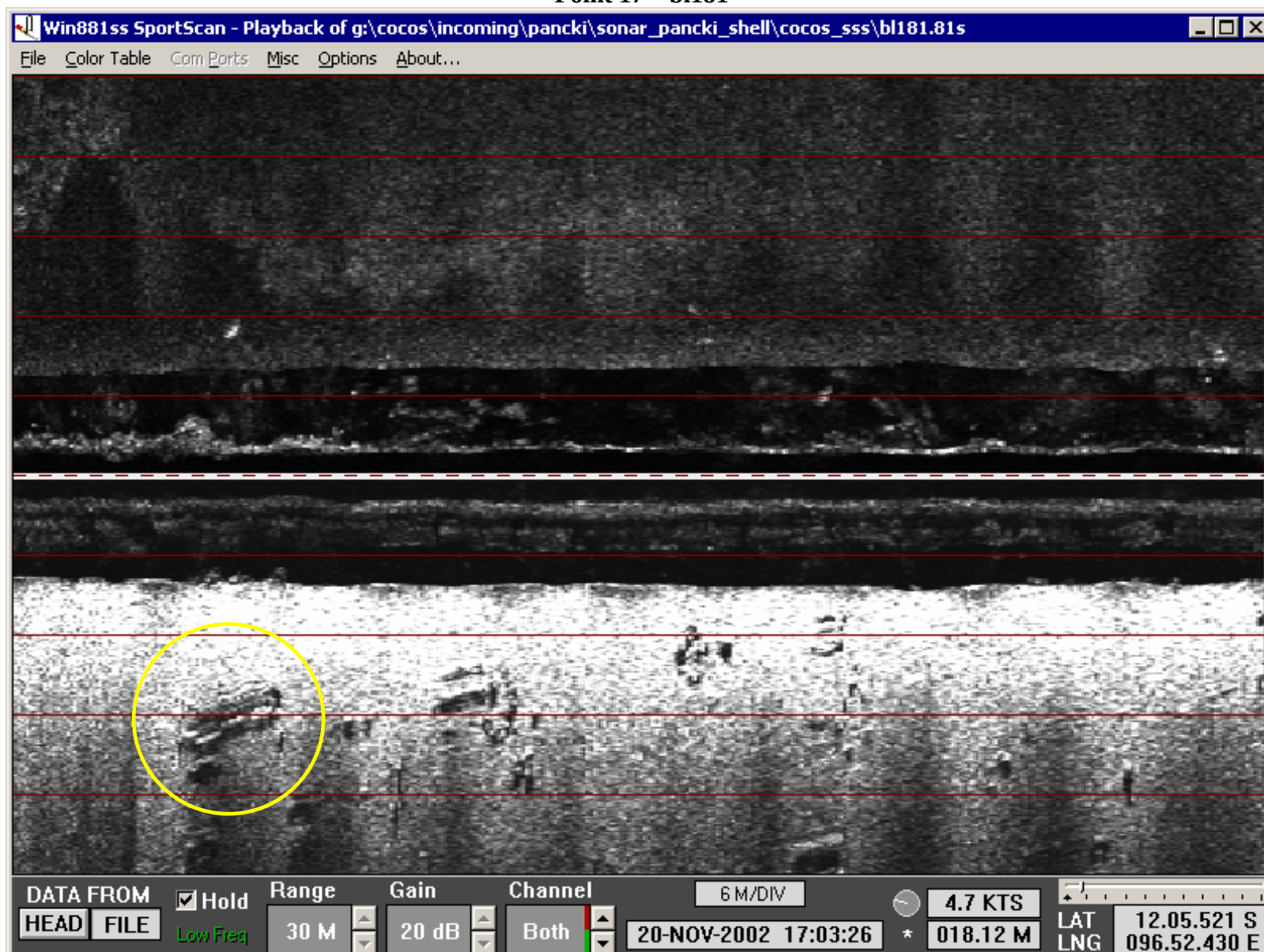
Point 15 – bl96a



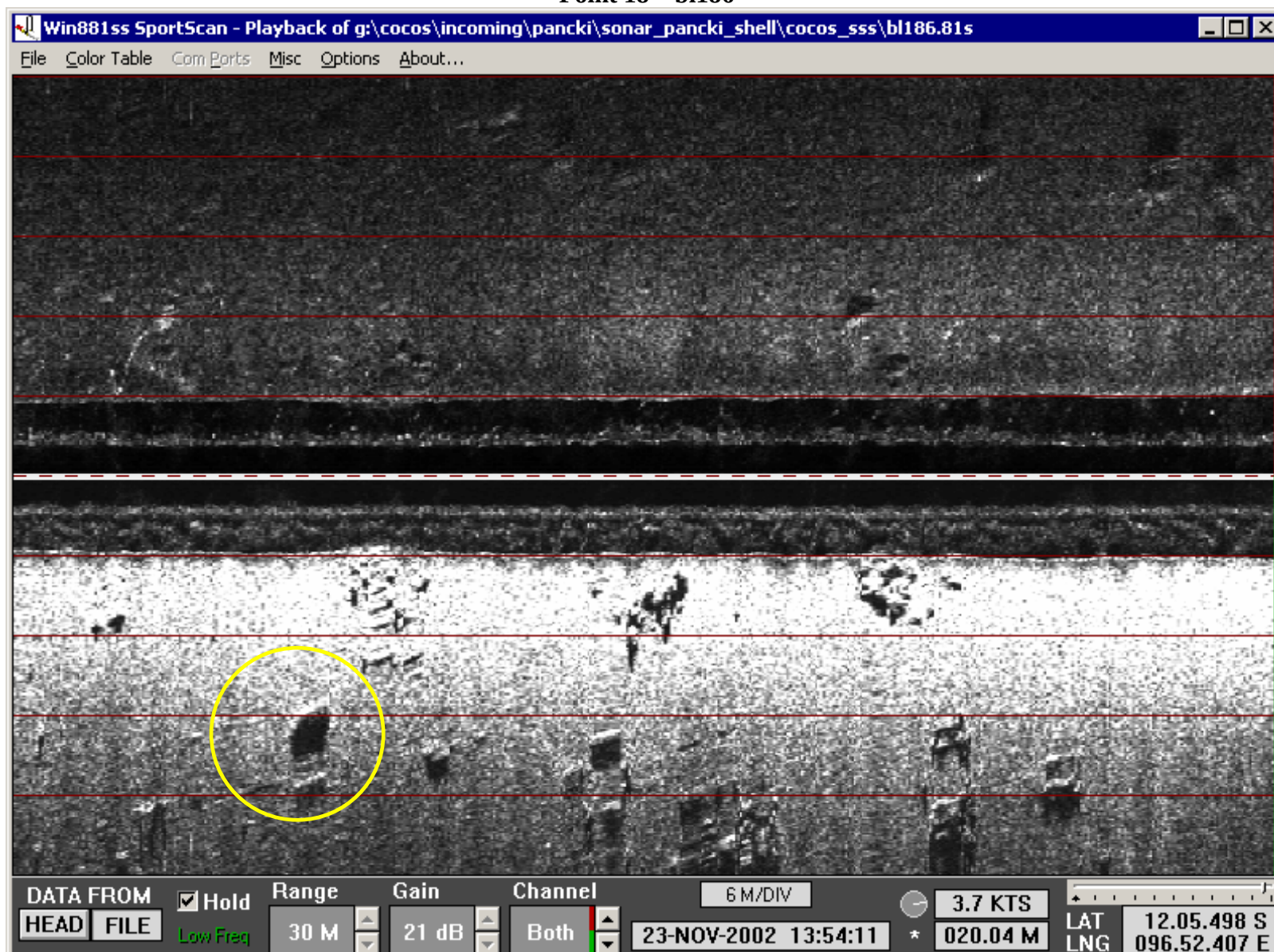
Point 16 – bl176



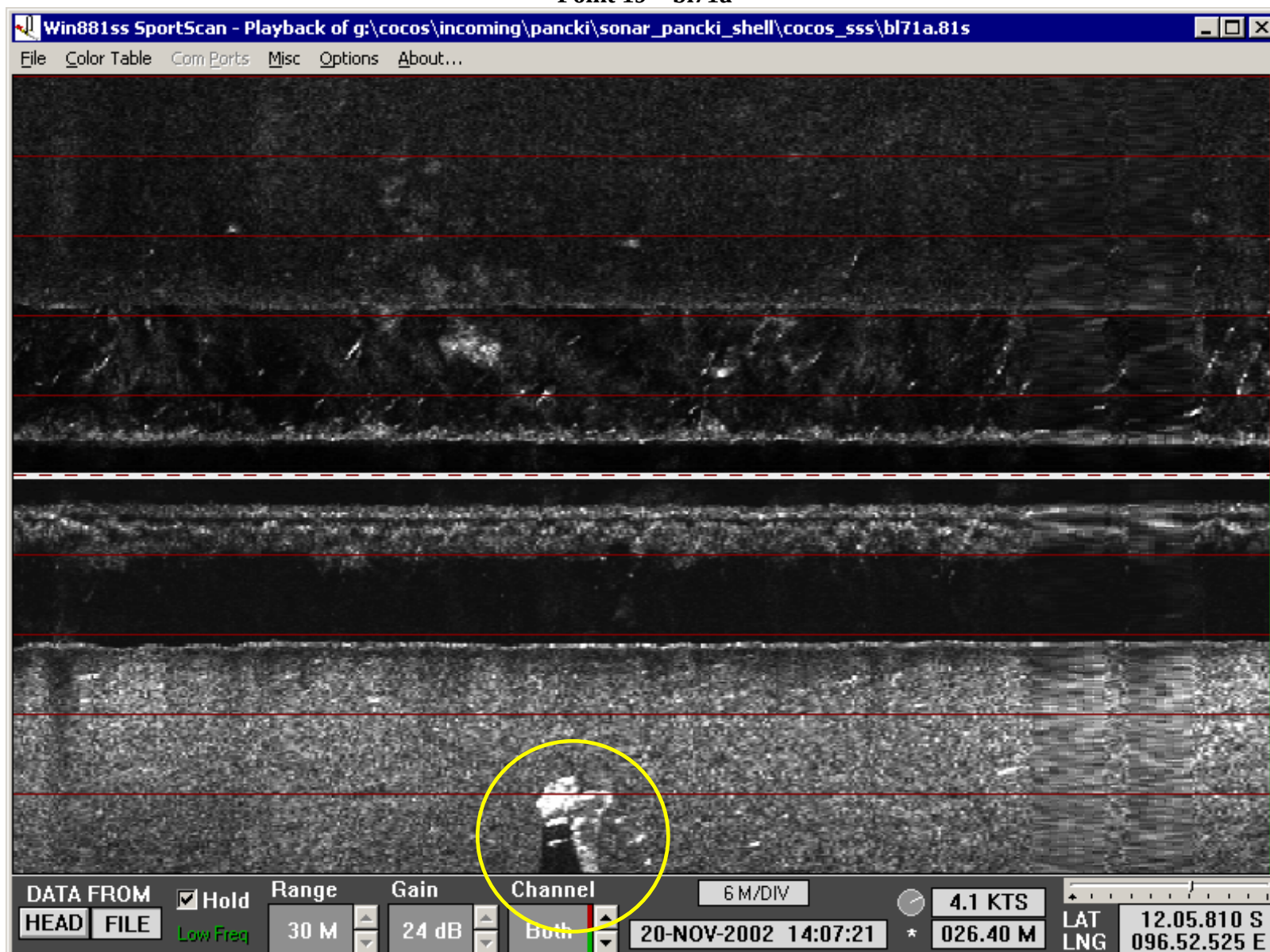
Point 17 – bl181



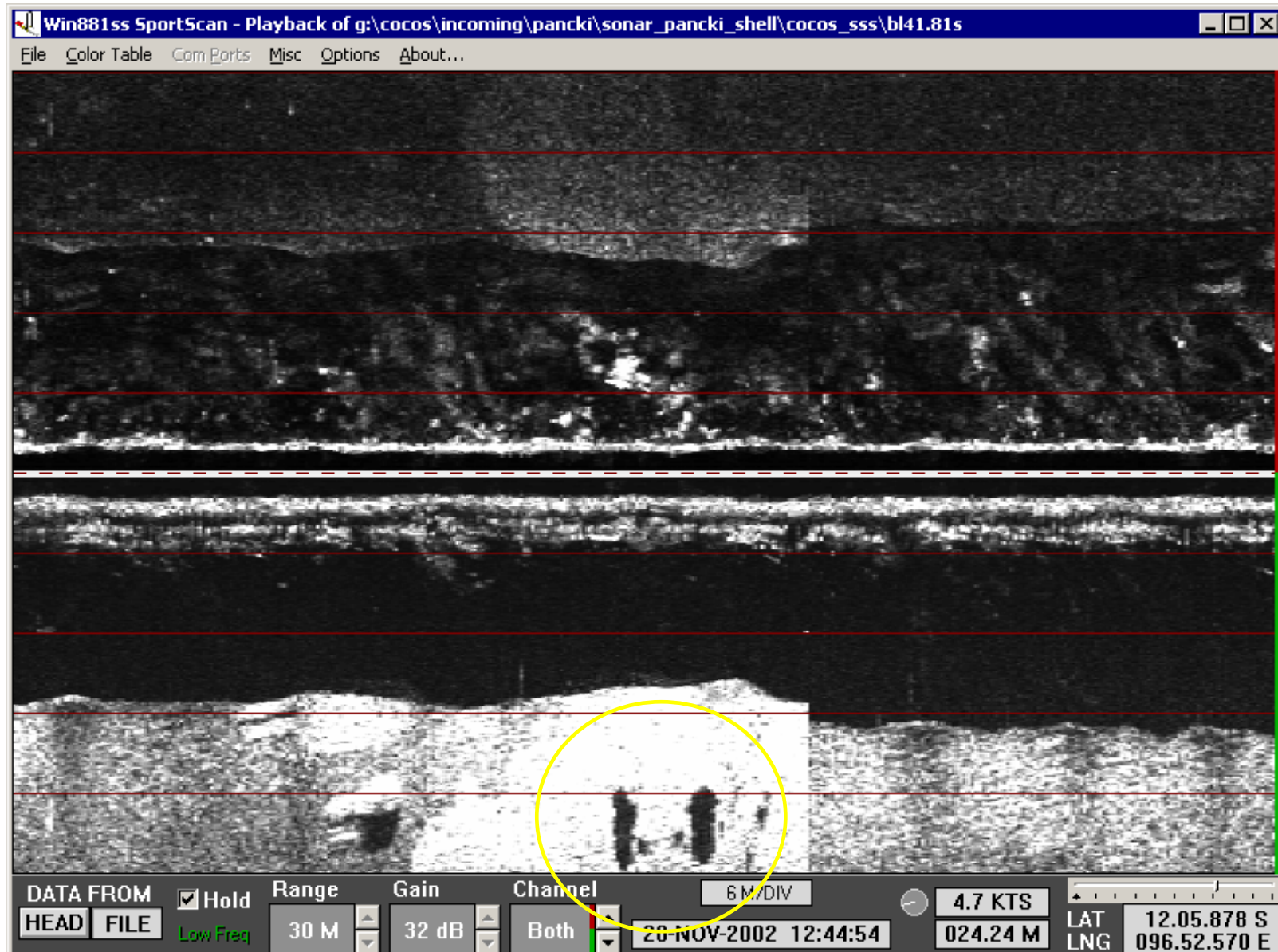
Point 18 – bl186



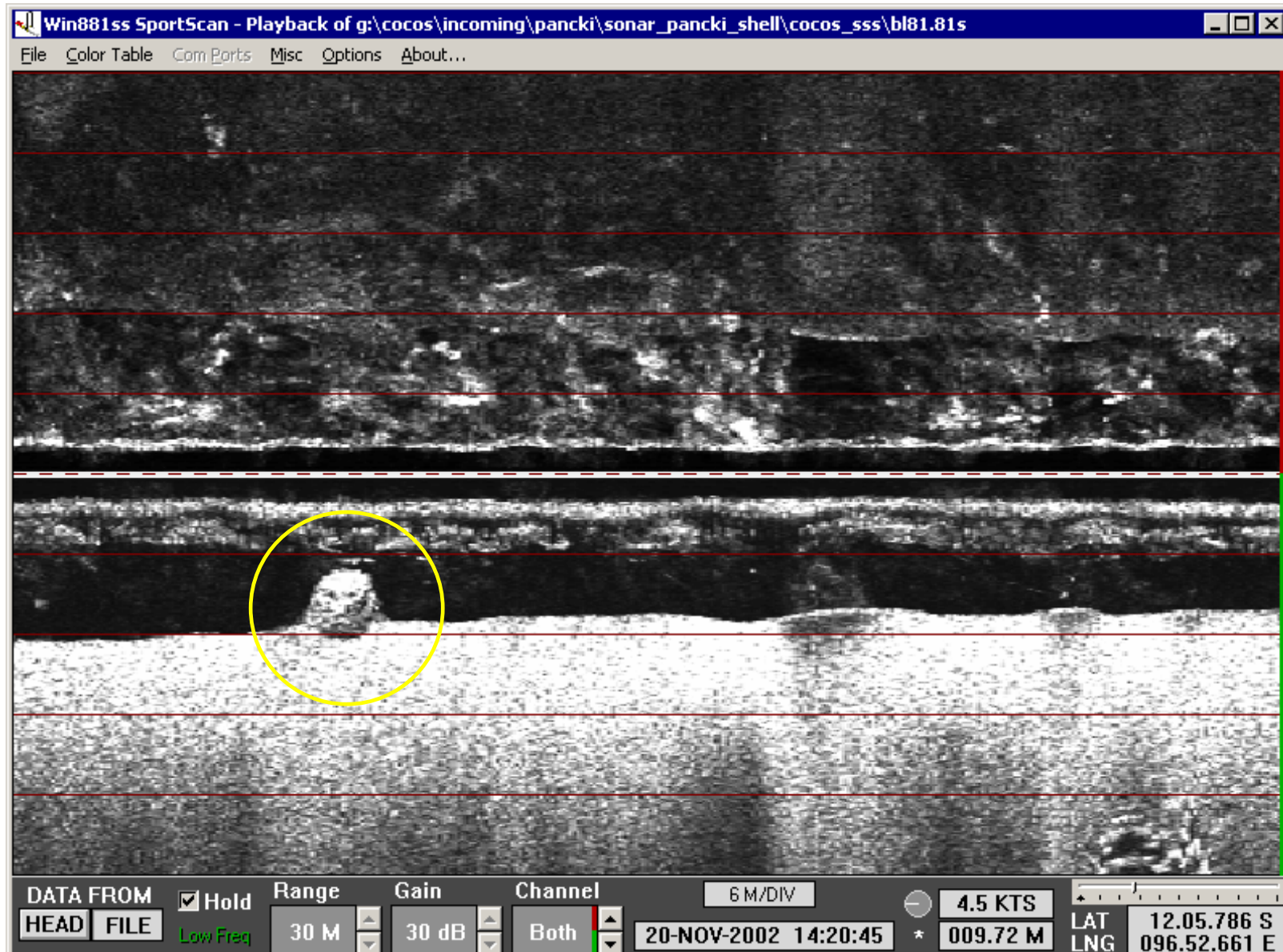
Point 19 – bl71a



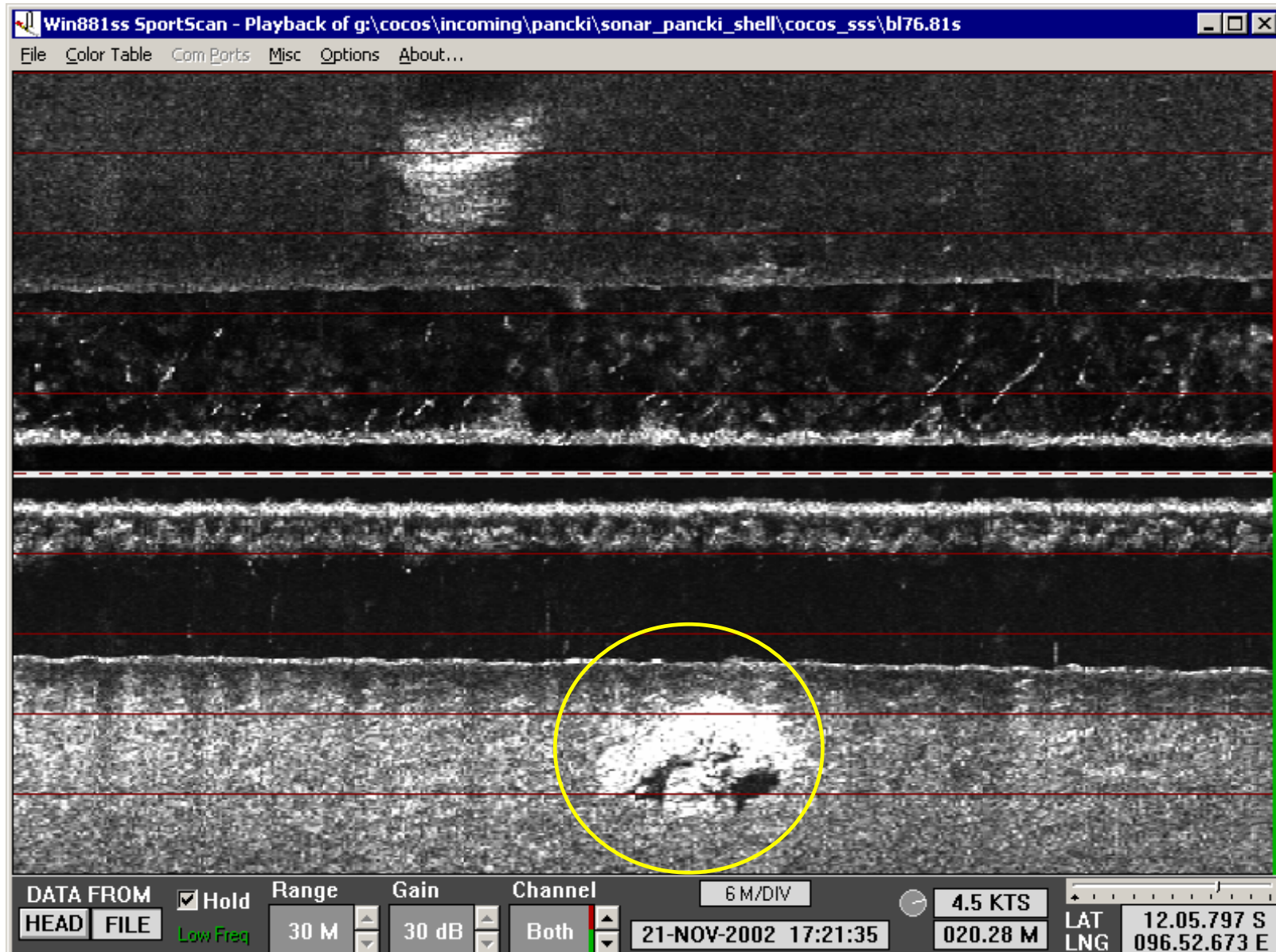
Point 20 – bl41



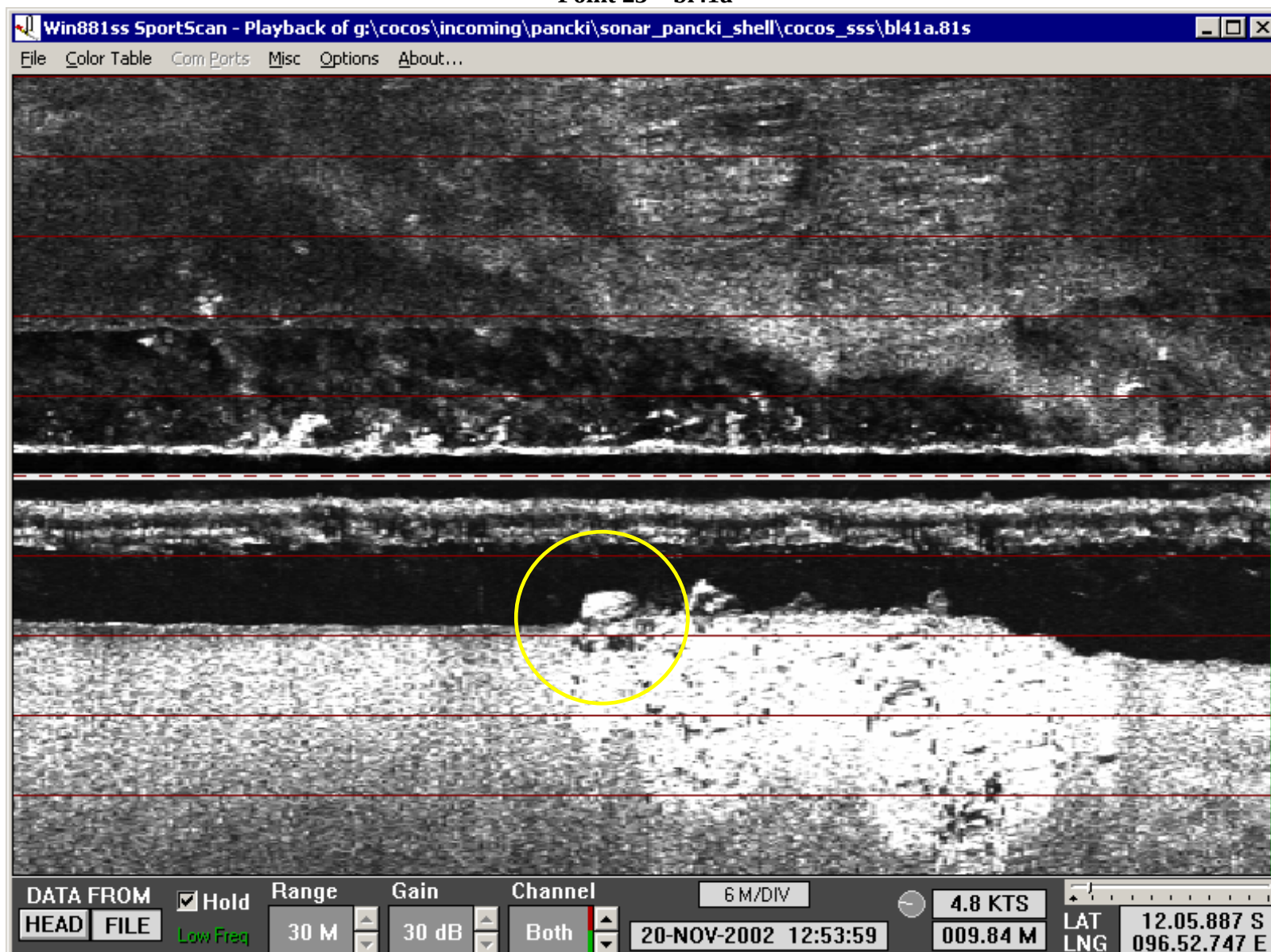
Point 21 - bl81



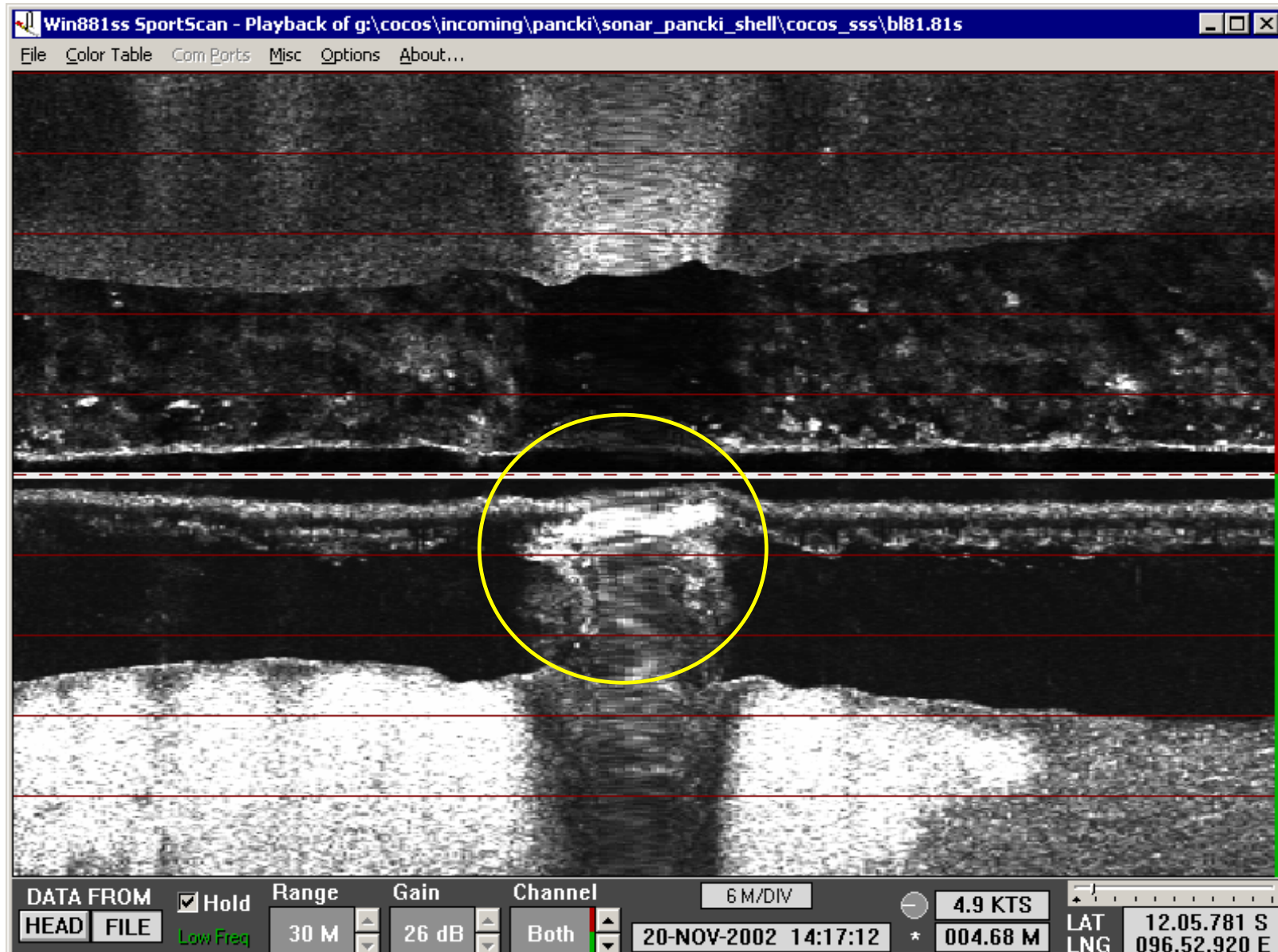
Point 22 – b176



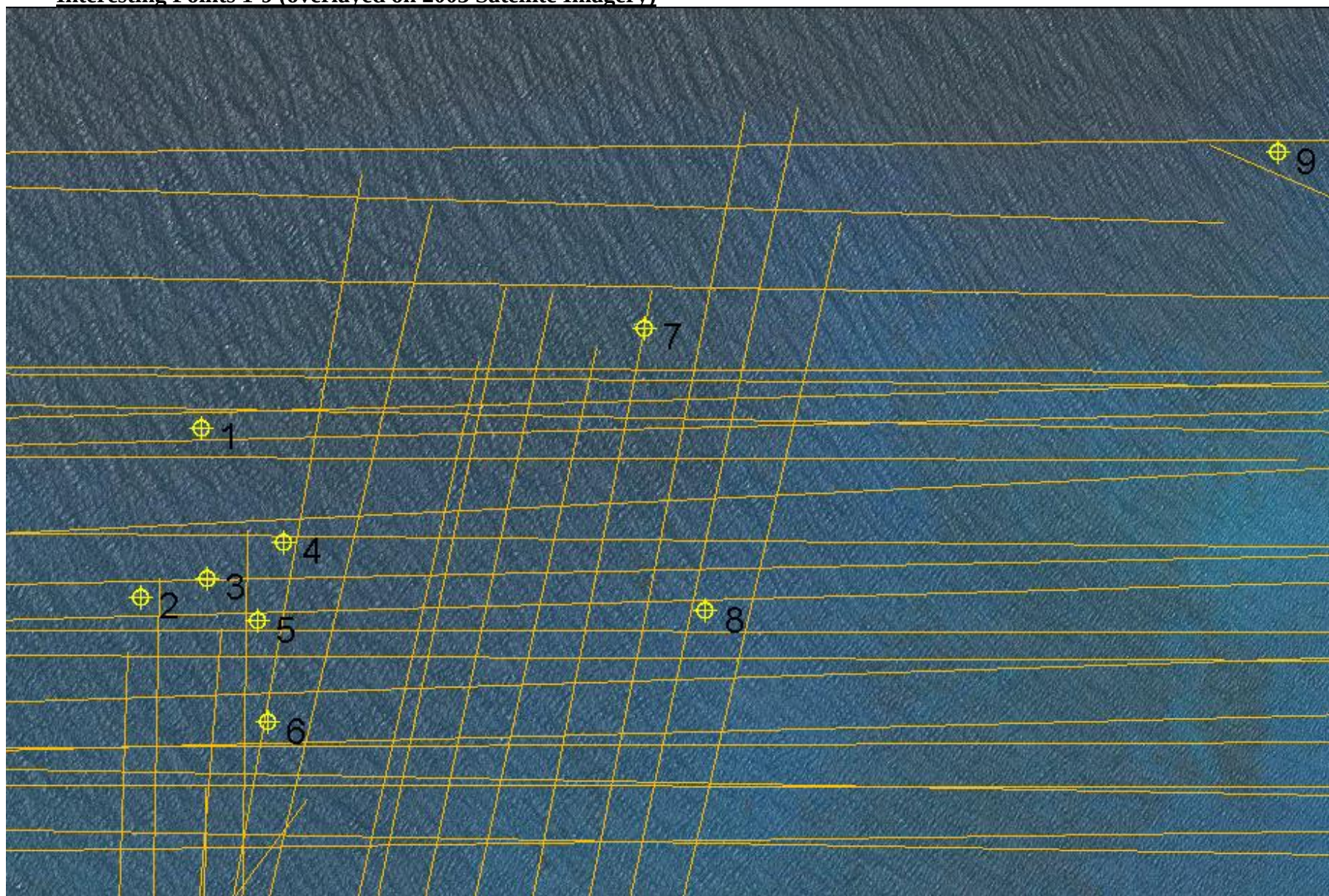
Point 23 – bl41a



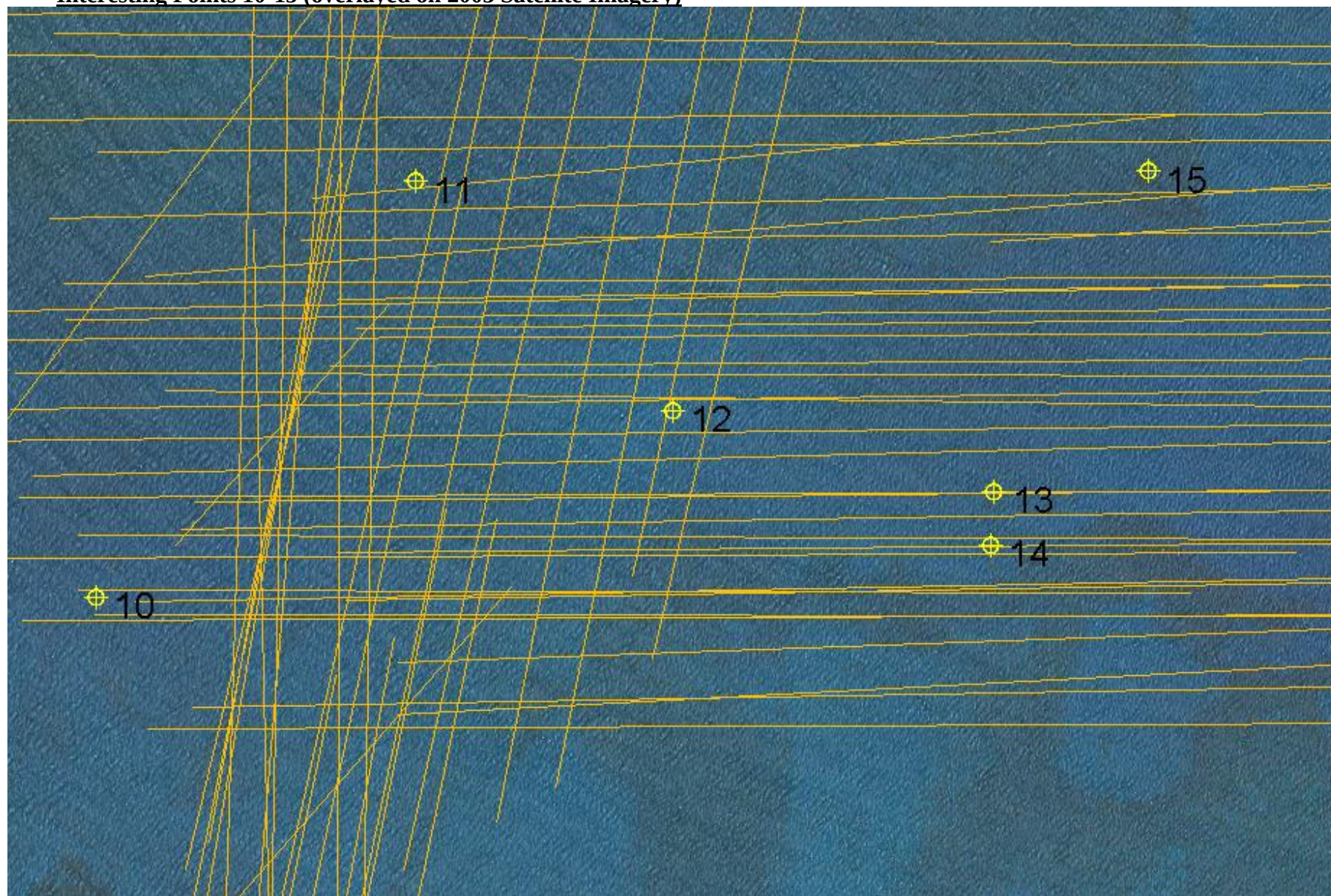
Point 24 – bl81



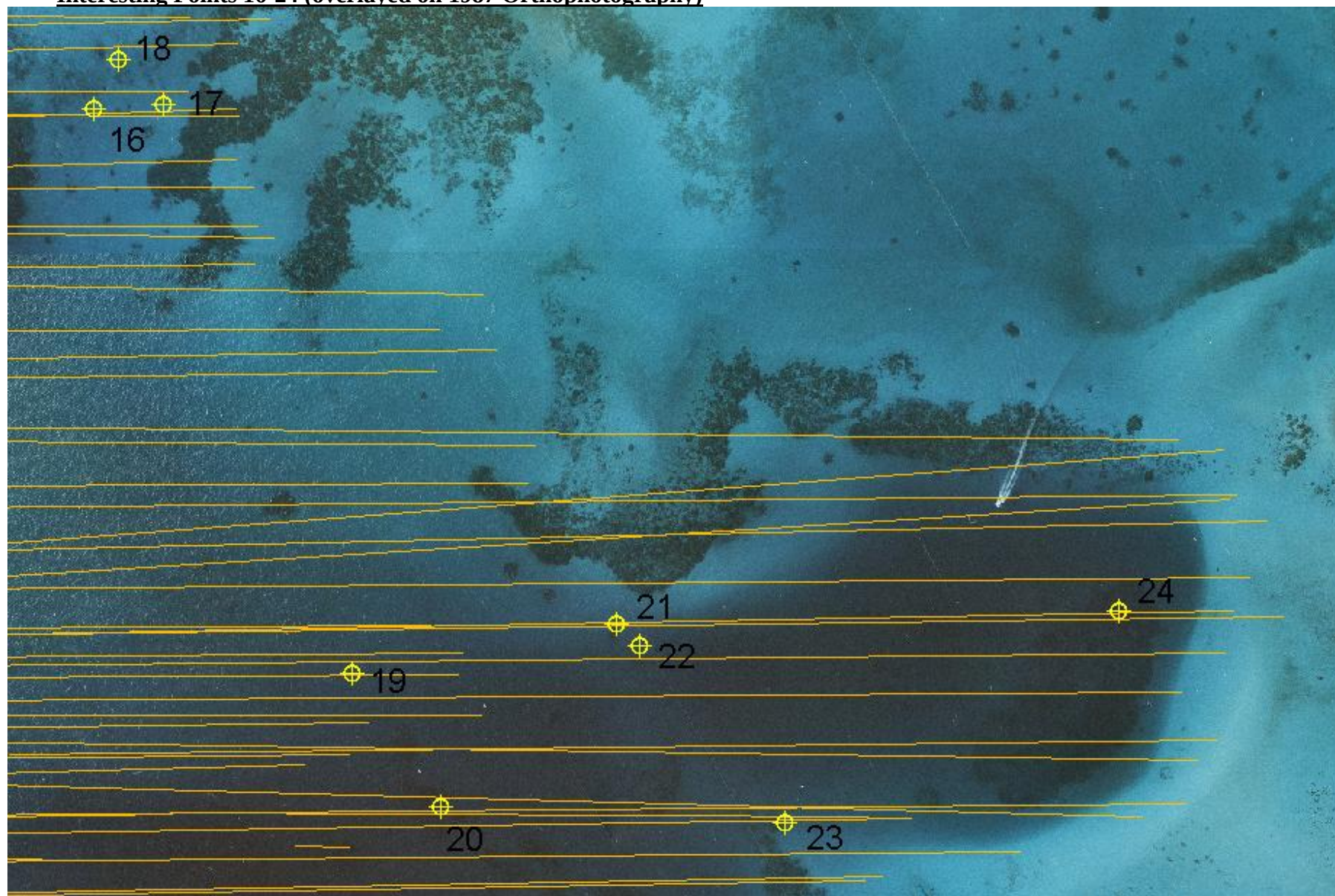
Interesting Points 1-9 (overlaid on 2003 Satellite Imagery)



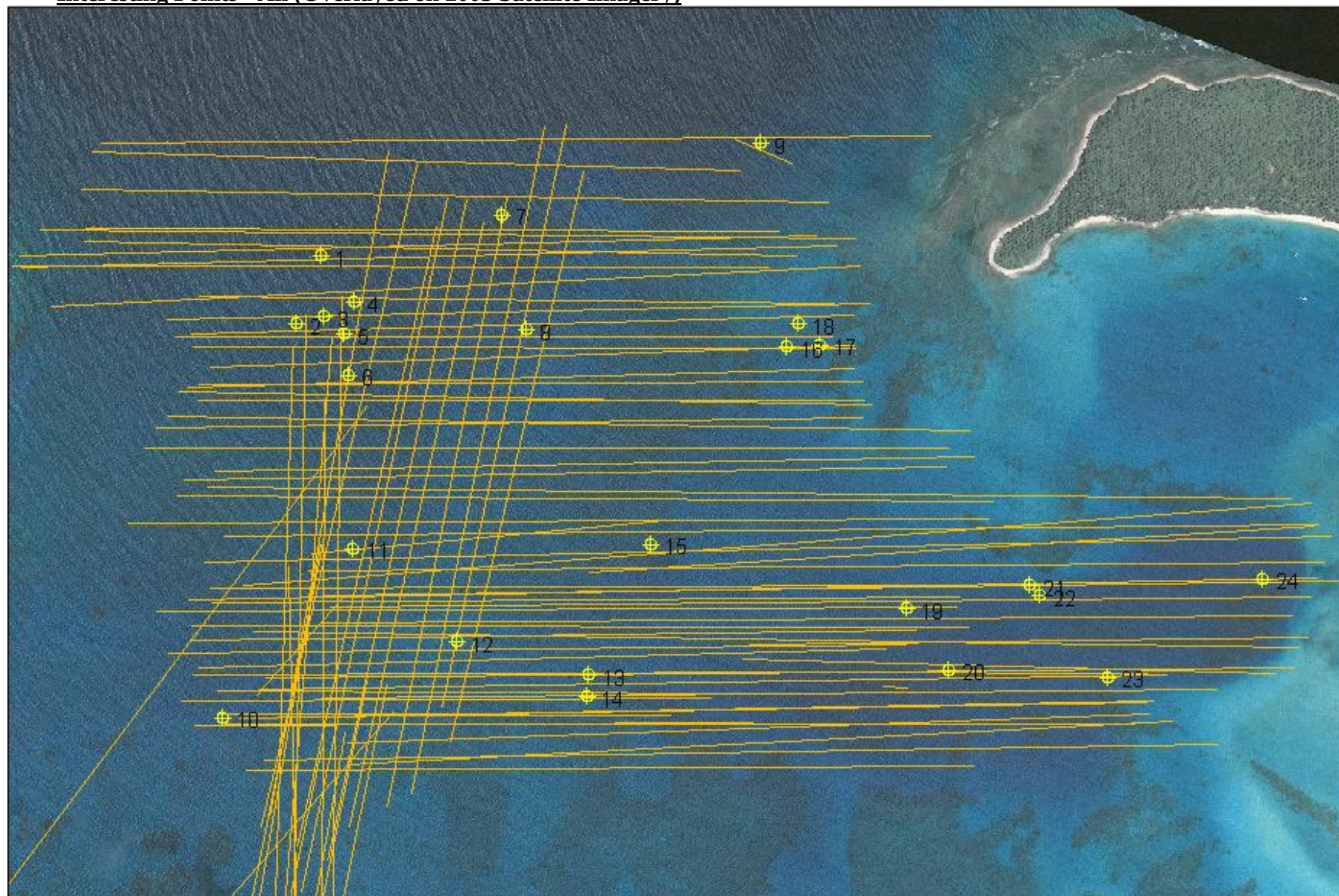
Interesting Points 10-15 (overlayed on 2003 Satellite Imagery)



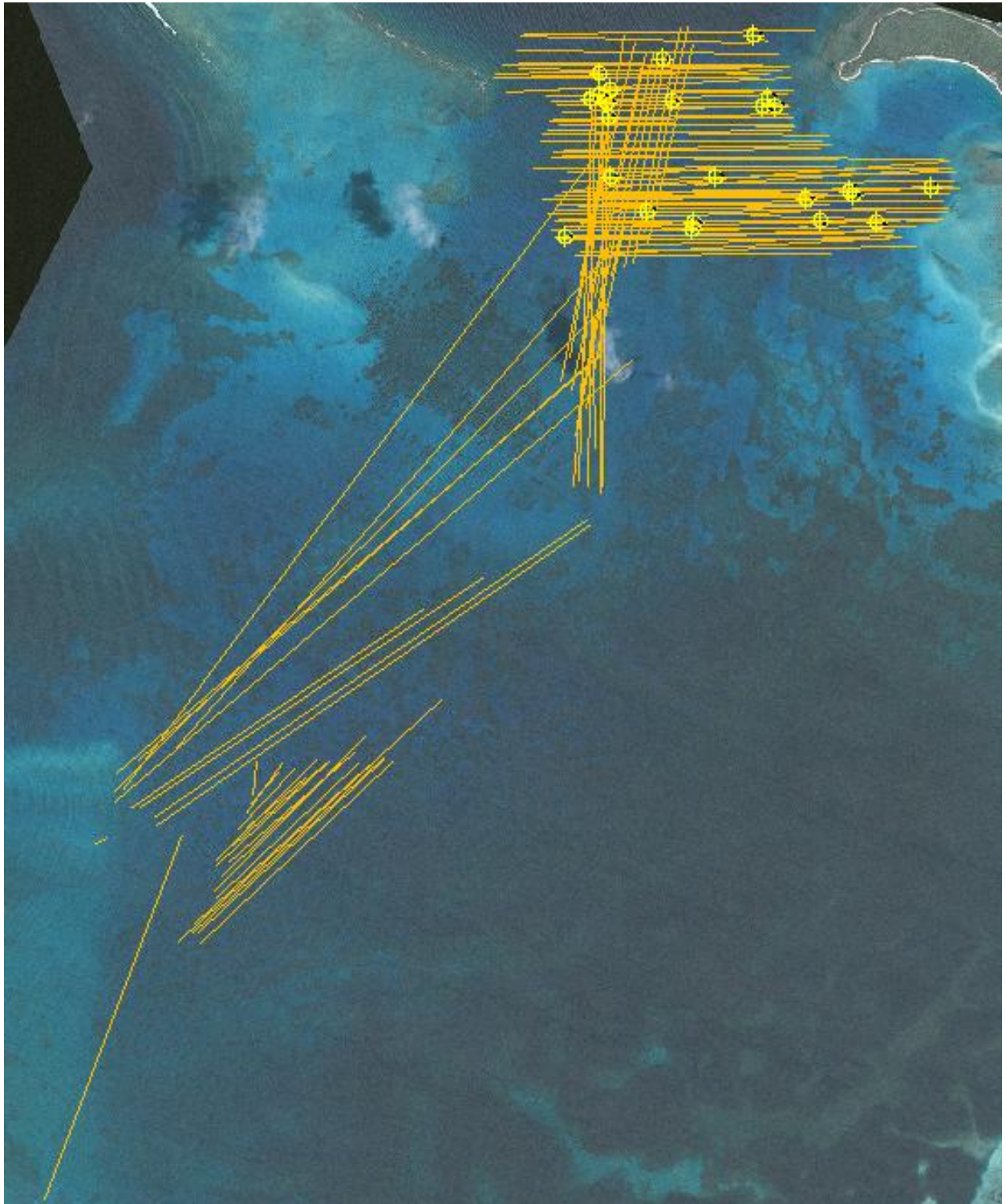
Interesting Points 16-24 (overlaid on 1987 Orthophotography)



Interesting Points - All (Overlaid on 2003 Satellite Imagery)



Sidescan Sonar Paths – All (overlayed on 2003 Satellite Imagery)



Latitude and Longitude from the beginning and end of each sonar path and that of interesting features.

		START								END								
Line	ID	Longitude				Latitude				Longitude				Latitude				Direction
bl106	1	96	51	658	96.86096667	12	5	711	-12.09518333	96	52	616	96.87693333	12	5	714	-12.09523333	W to E
bl101	2	96	52	980	96.883	12	5	723	-12.09538333	96	51	764	96.86273333	12	5	726	-12.09543333	E to W
bl111	3	96	51	786	96.8631	12	5	781	-12.09635	96	52	974	96.8829	12	5	700	-12.095	W to E
bl11	4	96	51	806	96.86343333	12	5	973	-12.09955	96	52	779	96.87965	12	5	963	-12.09938333	W to E
bl1	5	96	52	595	96.87658333	12	5	985	-12.09975	96	51	785	96.86308333	12	5	983	-12.09971667	E to W
bl121	6	96	52	950	96.8825	12	5	695	-12.09491667	96	51	745	96.86241667	12	5	673	-12.09455	E to W
bl116	7	96	52	619	96.87698333	12	5	695	-12.09491667	96	51	710	96.86183333	12	5	682	-12.0947	E to W
bl126	8	96	51	720	96.862	12	5	664	-12.0944	96	52	569	96.87615	12	5	657	-12.09428333	W to E
bl131	9	96	51	755	96.86258333	12	5	655	-12.09425	96	52	600	96.87666667	12	5	646	-12.0941	W to E
bl136	10	96	52	570	96.87616667	12	5	636	-12.09393333	96	51	675	96.86125	12	5	630	-12.09383333	E to W
bl141	11	96	52	593	96.87655	12	5	618	-12.09363333	96	51	702	96.8617	12	5	595	-12.09325	E to W
bl146	12	96	51	688	96.86146667	12	5	607	-12.09345	96	52	476	96.8746	12	5	602	-12.09336667	W to E
bl151	13	96	51	714	96.8619	12	5	568	-12.0928	96	52	486	96.87476667	12	5	589	-12.09315	W to E
bl156	14	96	52	477	96.87461667	12	5	583	-12.09305	96	51	736	96.86226667	12	5	577	-12.09295	E to W
bl16	15	96	51	899	96.86498333	12	5	954	-12.09923333	96	52	792	96.87986667	12	5	929	-12.09881667	W to E
bl161	16	96	52	475	96.87458333	12	5	563	-12.09271667	96	51	735	96.86225	12	5	560	-12.09266667	E to W
bl166	17	96	51	724	96.86206667	12	5	563	-12.09271667	96	52	467	96.87445	12	5	549	-12.09248333	W to E
bl171	18	96	51	750	96.8625	12	5	541	-12.09235	96	52	467	96.87445	12	5	523	-12.09205	W to E
bl176	19	96	52	468	96.87446667	12	5	527	-12.09211667	96	51	730	96.86216667	2	5	519	-12.09198333	E to W
bl181	20	96	52	442	96.87403333	12	5	514	-12.0919	96	51	710	96.86183333	12	5	508	-12.0918	E to W
bl186	21	96	51	729	96.86215	12	5	505	-12.09175	96	52	468	96.87446667	12	5	490	-12.0915	W to E
bl191	22	96	51	703	96.86171667	12	5	489	-12.09148333	96	52	485	96.87475	12	5	478	-12.0913	W to E
bl196	23	96	52	443	96.87405	12	5	477	-12.09128333	96	51	737	96.86228333	12	5	464	-12.09106667	E to W
bl201	24	96	52	372	96.87286667	12	5	437	-12.09061667	96	51	529	96.85881667	12	5	429	-12.09048333	E to W
bl206	25	96	51	574	96.85956667	12	5	474	-12.09123333	96	52	475	96.87458333	12	5	437	-12.09061667	W to E
bl21	26	96	52	775	96.87958333	12	5	940	-12.099	96	51	761	96.86268333	12	5	932	-12.09886667	E to W
bl211	27	96	51	541	96.85901667	12	5	430	-12.0905	96	52	449	96.87415	12	5	414	-12.09023333	W to E
bl216	28	96	52	402	96.87336667	12	5	425	-12.09041667	96	51	610	96.86016667	12	5	403	-12.09005	E to W
bl221	29	96	52	425	96.87375	12	5	402	-12.09003333	96	51	537	96.85895	12	5	418	-12.0903	E to W
bl226	30	96	51	614	96.86023333	12	5	389	-12.08981667	96	52	385	96.87308333	12	5	398	-12.08996667	W to E
bl231	31	96	51	562	96.85936667	12	5	390	-12.08983333	96	52	470	96.8745	12	5	406	-12.0901	W to E

bl241	32	96	51	609	96.86015	12	5	346	-12.0891	96	52	439	96.87398333	12	5	366	-12.08943333	W to E
bl251	33	96	52	398	96.8733	12	5	324	-12.08873333	96	52	334	96.87223333	12	5	296	-12.08826667	E to W
bl251a	34	96	52	340	96.87233333	12	5	331	-12.08885	96	51	619	96.86031667	12	5	305	-12.08841667	E to W
bl25c	35	96	51	729	96.86215	12	5	934	-12.0989	96	52	351	96.87251667	12	5	936	-12.09893333	W to E
bl26	36	96	52	787	96.87978333	12	5	917	-12.09861667	96	51	875	96.86458333	12	5	926	-12.09876667	E to W
bl261	37	96	51	632	96.86053333	12	5	296	-12.08826667	96	52	554	96.8759	12	5	294	-12.08823333	W to E
bl3	38	96	52	258	96.87096667	12	5	926	-12.09876667	96	51	754	96.86256667	12	5	921	-12.09868333	E to W
bl31	39	96	51	780	96.863	12	5	926	-12.09876667	96	52	797	96.87995	12	5	915	-12.09858333	W to E
bl36	40	96	51	872	96.86453333	12	5	905	-12.09841667	96	52	868	96.88113333	12	5	903	-12.09838333	W to E
bl36c	41	96	51	716	96.86193333	12	5	906	-12.09843333	96	52	306	96.87176667	12	5	908	-12.09846667	W to E
bl41	42	96	52	789	96.87981667	12	5	885	-12.09808333	96	52	429	96.87381667	12	5	880	-12.098	E to W
bl41a	43	96	52	811	96.88018333	12	5	886	-12.0981	96	51	801	96.86335	12	5	894	-12.09823333	E to W
bl41b	44	96	52	522	96.87536667	12	5	898	-12.0983	96	52	493	96.87488333	12	5	897	-12.09828333	E to W
bl41c	45	96	52	363	96.87271667	12	5	903	-12.09838333	96	51	754	96.86256667	12	5	896	-12.09826667	E to W
bl46	46	96	52	930	96.88216667	12	5	886	-12.0981	96	52	337	96.87228333	12	5	865	-12.09775	E to W
bl46c	47	96	51	728	96.86213333	12	5	879	-12.09798333	96	52	412	96.87353333	12	5	881	-12.09801667	W to E
bl51	48	96	51	808	96.86346667	12	5	882	-12.09803333	96	52	953	96.88255	12	5	879	-12.09798333	W to E
bl51c	49	96	52	499	96.87498333	12	5	856	-12.0976	96	51	734	96.86223333	12	5	870	-12.09783333	E to W
bl56	50	96	52	347	96.87245	12	5	850	-12.0975	96	52	970	96.88283333	12	5	847	-12.09745	W to E
bl56c	51	96	51	702	96.8617	12	5	854	-12.09756667	96	52	523	96.87538333	12	5	851	-12.09751667	W to E
bl6	52	96	52	816	96.88026667	12	5	937	-12.09895	96	51	898	96.86496667	12	5	977	-12.09961667	E to W
bl61	53	96	52	959	96.88265	12	5	857	-12.09761667	96	51	794	96.86323333	12	5	832	-12.0972	E to W
bl61c	54	96	52	532	96.87553333	12	5	835	-12.09725	96	51	724	96.86206667	12	5	840	-12.09733333	E to W
bl66	55	96	52	951	96.88251667	12	5	823	-12.09705	96	51	869	96.86448333	12	5	822	-12.09703333	E to W
bl66c	56	96	52	590	96.8765	12	5	832	-12.0972	96	51	726	96.8621	12	5	824	-12.09706667	E to W
bl71	57	96	51	799	96.86331667	12	5	901	-12.09835	96	51	897	96.86495	12	5	794	-12.09656667	W to E
bl71a	58	96	51	881	96.86468333	12	5	805	-12.09675	96	52	974	96.8829	12	5	803	-12.09671667	W to E
bl71c	59	96	51	689	96.86148333	12	5	809	-12.09681667	96	52	579	96.87631667	12	5	811	-12.09685	W to E
bl76	60	96	51	873	96.86455	12	5	792	-12.09653333	96	53	4	96.8834	12	5	785	-12.09641667	W to E
bl76c	61	96	52	581	96.87635	12	5	800	-12.09666667	96	51	749	96.86248333	12	5	800	-12.09666667	E to W
bl81	62	96	52	978	96.88296667	12	5	782	-12.09636667	96	51	722	96.86203333	12	5	796	-12.0966	E to W
bl81c	63	96	51	749	96.86248333	12	5	784	-12.0964	96	52	565	96.87608333	12	5	786	-12.09643333	W to E
bl86	64	96	52	986	96.8831	12	5	765	-12.09608333	96	51	856	96.86426667	12	5	766	-12.0961	E to W
bl91	65	96	51	743	96.86238333	12	5	755	-12.09591667	96	52	996	96.88326667	12	5	736	-12.0956	W to E
bl96	66	96	51	862	96.86436667	12	5	747	-12.09578333	96	52	256	96.87093333	12	5	713	-12.09521667	W to E

bl96a	67	96	52	169	96.86948333	12	5	769	-12.09615	96	52	977	96.88295	12	5	725	-12.09541667	W to E
bn8-56	1	96	50	93	96.83488333	12	8	897	-12.14828333	96	50	535	96.84225	12	7	768	-12.12946667	W to E
ch050303	2	96	51	835	96.86391667	12	5	761	-12.09601667	96	51	848	96.86413333	12	6	585	-12.10975	W to E
ch12050303	3	96	51	777	96.86295	12	6	699	-12.11165	96	51	885	96.86475	12	5	508	-12.0918	W to E
ch161103	4	96	51	862	96.86436667	12	6	300	-12.105	96	50	325	96.83875	12	7	578	-12.1263	E to W
ch16b1103	5	96	50	400	96.84	12	7	538	-12.12563333	96	51	870	96.8645	12	6	280	-12.10466667	W to E
ch18050303	6	96	51	877	96.86461667	12	5	579	-12.09298333	96	51	863	96.86438333	12	6	725	-12.11208333	E to W
ch1r050303	7	96	51	795	96.86325	12	6	682	-12.11136667	96	51	842	96.86403333	12	5	518	-12.09196667	W to E
ch24050302	8	96	51	868	96.86446667	12	6	697	-12.11161667	96	51	897	96.86495	12	5	464	-12.09106667	W to E
ch261103	9	96	50	519	96.84198333	12	7	496	-12.12493333	96	51	951	96.86585	12	5	920	-12.09866667	W to E
ch30050303	10	96	51	923	96.86538333	12	5	585	-12.09308333	96	50	344	96.83906667	12	7	633	-12.12721667	E to W
ch3050303	11	96	51	857	96.86428333	12	5	486	-12.09143333	96	51	823	96.86371667	12	6	703	-12.11171667	E to W
ch361103	12	96	51	886	96.86476667	12	6	135	-12.10225	96	50	316	96.8386	12	7	639	-12.12731667	E to W
ch461103	13	96	50	325	96.83875	12	7	667	-12.12778333	96	51	966	96.8661	12	6	305	-12.10508333	W to E
cl00+101703	14	96	52	14	96.8669	12	5	953	-12.09921667	96	52	167	96.86945	12	5	329	-12.08881667	W to E
cl061703	15	96	52	148	96.86913333	12	5	279	-12.08798333	96	52	5	96.86675	12	5	917	-12.09861667	E to W
cl141703	16	96	51	970	96.86616667	12	6	10	-12.10016667	96	52	124	96.86873333	12	5	280	-12.088	W to E
cl221703	17	96	52	81	96.86801667	12	5	359	-12.08931667	96	51	943	96.86571667	12	6	26	-12.10043333	E to W
cl301703	18	96	51	901	96.86501667	12	6	46	-12.10076667	96	52	56	96.8676	12	5	384	-12.08973333	W to E
cl381703	19	96	52	36	96.86726667	12	5	360	-12.08933333	96	51	876	96.8646	12	6	84	-12.1014	E to W
cl461703	20	96	51	847	96.86411667	12	6	116	-12.10193333	96	52	15	96.86691667	12	5	357	-12.08928333	W to E
cl541703	21	96	52	2	96.8667	12	5	390	-12.08983333	96	51	843	96.86405	12	6	68	-12.10113333	E to W
cl621703	22	96	51	802	96.86336667	12	6	45	-12.10075	96	51	982	96.86636667	12	5	320	-12.08866667	W to E
cl701703	23	96	51	950	96.86583333	12	5	307	-12.08845	96	51	813	96.86355	12	6	34	-12.10056667	E to W
newcl_60	24	96	51	768	96.8628	12	6	297	-12.10495	96	51	871	96.86451667	12	5	736	-12.0956	W to E
newcl30	25	96	51	821	96.86368333	12	6	457	-12.10761667	96	51	944	96.86573333	12	5	890	-12.09816667	W to E
newcl35	26	96	51	921	96.86535	12	5	886	-12.0981	96	51	781	96.86301667	12	6	546	-12.1091	E to W
newcl40	27	96	51	897	96.86495	12	5	943	-12.09905	96	51	789	96.86315	12	6	507	-12.10845	E to W
newcl50r	28	96	51	774	96.8629	12	6	399	-12.10665	96	51	871	96.86451667	12	5	959	-12.09931667	W to E
newcl70	29	96	51	875	96.86458333	12	5	732	-12.09553333	96	51	737	96.86228333	12	6	379	-12.10631667	E to W
south32050303	30	96	51	298	96.85496667	12	7	74	-12.1179	96	50	369	96.83948333	12	7	688	-12.12813333	E to W
south38050303	31	96	50	405	96.84008333	12	7	681	-12.12801667	96	51	495	96.85825	12	6	976	-12.11626667	W to E
south44050303	32	96	51	817	96.86361667	12	6	806	-12.11343333	96	50	444	96.84073333	12	7	716	-12.1286	E to W
southside50050302	33	96	50	453	96.84088333	12	7	737	-12.12895	96	51	835	96.86391667	12	6	815	-12.11358333	W to E
sqandwaves	34	96	50	296	96.83826667	12	7	776	-12.1296	96	50	251	96.83751667	12	7	801	-12.13001667	E to W

tr11	35	96	50	582	96.84303333	12	8	70	-12.1345	96	51	174	96.8529	12	7	539	-12.12565	W to E
tr16	36	96	51	171	96.85285	12	7	537	-12.12561667	96	50	561	96.84268333	12	8	78	-12.13463333	E to W
tr21	37	96	50	522	96.84203333	12	8	101	-12.13501667	96	51	362	96.85603333	12	7	351	-12.12251667	W to E
tr26	38	96	51	123	96.85205	12	7	558	-12.12596667	96	50	563	96.84271667	12	8	49	-12.13415	E to W
tr31	39	96	50	642	96.84403333	12	7	963	-12.13271667	96	51	97	96.85161667	12	7	545	-12.12575	W to E
tr36	40	96	51	112	96.85186667	12	7	468	-12.12446667	96	50	630	96.84383333	12	7	950	-12.1325	E to W
tr41	41	96	50	659	96.84431667	12	7	897	-12.13161667	96	51	37	96.85061667	12	7	547	-12.12578333	W to E
tr46	42	96	51	81	96.85135	12	7	519	-12.12531667	96	50	678	96.84463333	12	7	856	-12.13093333	E to W
tr51	43	96	50	643	96.84405	12	7	864	-12.13106667	96	51	2	96.85003333	12	7	542	-12.1257	W to E
tr56	44	96	50	985	96.84975	12	7	523	-12.12538333	96	50	687	96.84478333	12	7	810	-12.13016667	E to W
tr6	45	96	51	197	96.85328333	12	7	546	-12.12576667	96	50	584	96.84306667	12	8	113	-12.13521667	E to W
tr61	46	96	50	641	96.84401667	12	7	845	-12.13075	96	50	964	96.8494	12	7	536	-12.1256	W to E
tr66	47	96	50	739	96.84565	12	7	747	-12.12911667	96	50	929	96.84881667	12	7	590	-12.1265	W to E
tr66r	48	96	50	892	96.8482	12	7	570	-12.12616667	96	50	705	96.84508333	12	7	760	-12.12933333	E to W
tr71	49	96	50	852	96.84753333	12	7	553	-12.12588333	96	50	736	96.8456	12	7	709	-12.12848333	E to W
tr76	50	96	50	751	96.84585	12	7	672	-12.12786667	96	50	846	96.84743333	12	7	575	-12.12625	W to E
tr81	51	96	50	771	96.84618333	12	7	546	-12.12576667	96	50	757	96.84595	12	7	654	-12.12756667	E to W

Latitude and Longitude of Interesting Features and GPS Station located on West Island

Feature	ID	Longitude				Latitude			
point1	1	96	51	877	96.86461667	12	5	419	-12.09031667
point2	2	96	51	849	96.86415	12	5	494	-12.09156667
point3	3	96	51	879	96.86465	12	5	486	-12.09143333
point4	4	96	51	914	96.86523333	12	5	470	-12.09116667
point5	5	96	51	902	96.86503333	12	5	505	-12.09175
point6	6	96	51	906	96.8651	12	5	550	-12.0925
point7	7	96	52	78	96.86796667	12	5	376	-12.0896
point8	8	96	52	105	96.86841667	12	5	502	-12.0917
point9	9	96	52	366	96.87276667	12	5	300	-12.08833333
point10	10	96	51	763	96.86271667	12	5	924	-12.09873333
point11	11	96	51	909	96.86515	12	5	740	-12.09566667
point12	12	96	52	25	96.86708333	12	5	843	-12.09738333
point13	13	96	52	170	96.8695	12	5	880	-12.098
point14	14	96	52	168	96.86946667	12	5	904	-12.0984
point15	15	96	52	241	96.87068333	12	5	738	-12.09563333
point16	16	96	52	394	96.87323333	12	5	523	-12.09205
point17	17	96	52	430	96.87383333	12	5	521	-12.09201667
point18	18	96	52	407	96.87345	12	5	498	-12.09163333
point19	19	96	52	525	96.87541667	12	5	810	-12.09683333
point20	20	96	52	570	96.87616667	12	5	878	-12.09796667
point21	21	96	52	661	96.87768333	12	5	786	-12.09643333
point22	22	96	52	673	96.87788333	12	5	797	-12.09661667
point23	23	96	52	747	96.87911667	12	5	887	-12.09811667
point24	24	96	52	920	96.882	12	5	781	-12.09635
GPS Station		96	50	2.27	96.83337119	12	11	18	-12.18363447