APPENDICES.

APPENDIX A.

RETURN showing the Interruptions to Telegraphic Communication in Victoria, including also a Statement of the Interruptions to Intercolonial Communication between Adelaide, Melbourne, and Sydney, from 1st January to 31st December, 1865, both days inclusive, from a Record kept at the Central Office, Melbourne.

Date.	Designation of Line.	Points of Interruption.	Period of Interruption.	Supposed or ascertained cause of Interruption.
16th Jan.	Southern Coast Line ...	Between Sandridge and Snapper Point	2½ hours	Not ascertained
27th „	Cape Otway Line ...	„ Geelong and Cape Otway ...	6 „	Line on ground
3rd Feb.	North-eastern Branch Line	„ Yackandandah and Chiltern	5 „	Tree fell on line
10th „	Cross Country Line ...	„ Moonambel and Redbank ...	1 day ...	„ „
14th „	Cape Otway Line ...	„ Geelong and Cape Otway ...	1 „	„ „
15th „	„ „ ...	„ „ „ ...	1 „	„ „
16th „	„ „ ...	„ „ „ ...	6 hours	„ „
22nd „	Western Branch Line ...	„ Ararat and Stawell ...	4 „	Men working on line
27th „	Gipps Land Line ...	„ Melbourne and Sale ...	6 „	Tree fell on line
28th „	Cross Country Line ...	„ Avoca and Moonambel ...	8 „	Bush fire; several posts burnt
28th „	North-eastern Branch Line	„ Kilmore and Heathcote ...	5 „	Bush fire; four posts burnt
6th March	Gipps Land Line ...	„ Melbourne and Sale ...	4 „	Tree fell on line
12th May	Western Lines	„ Portland and Mount Gambier	6 „	„ „
13th „	„ „	„ „ „ ...	1 day ...	„ „
15th „	Gipps Land Line ...	„ Melbourne and Sale ...	1 „	„ „
16th „	„ „ ...	„ „ „ ...	1 „	„ „
17th „	„ „ ...	„ „ „ ...	5 hours	„ „
26th „	„ „ ...	„ Sale and Port Albert ...	5 „	„ „
12th June	„ „ ...	„ „ „ ...	1 day ...	„ „
13th „	„ „ ...	„ „ „ ...	5 hours	„ „
21st „	„ „ ...	„ Melbourne and Sale ...	6 „	„ „
24th „	North-eastern Branch Line	„ Wahgunyah and Chiltern ...	6 „	„ „
26th „	Gipps Land Line ...	„ Melbourne and Sale ...	10 „	„ „
27th „	„ „ ...	„ „ „ ...	8 „	„ „
3rd July	„ „ ...	„ „ „ ...	1 day ...	Defective connection
4th „	„ „ ...	„ „ „ ...	3 hours	„ „
12th „	Southern Coast Line ...	„ Geelong and Queenscliff ...	4 „	„ „
12th „	Swan Hill Line ...	„ Kerang and Swan Hill ...	5 „	Not ascertained
7th Aug.	Southern Coast Line ...	„ Sandridge and Snapper Point	10 „	„ „
23rd „	Swan Hill Line ...	„ Tarnagulla and Inglewood	5 „	Branch of tree fell on lin
5th Sept.	Gipps Land Line ...	„ Melbourne and Sale ...	1 day ...	Tree fell on line
6th „	„ „ ...	„ „ „ ...	4 hours	„ „
9th „	„ „ ...	„ „ „ ...	1 day ..	„ „
9th Oct.	Cape Otway Line ...	„ Geelong and Cape Otway ...	1 „	„ „
9th „	North-eastern Branch Line	„ Chiltern and Wahgunyah ...	5 hours	„ „
10th „	Cape Otway Line ...	„ Geelong and Cape Otway ...	5 „	„ „
18th „	Western Branch Line ...	„ Beaufort and Ararat ...	8 „	„ „
3rd Nov.	Gipps Land Line ...	„ Melbourne and Sale ...	3 „	„ „
20th „	Wood's Point Line ...	„ Jamieson and Wood's Point	3 „	„ „
25th „	Gipps Land Line ...	„ Melbourne and Sale ...	1 day ...	Several trees fell on line
27th „	„ „ ...	„ „ „ ...	1 „	Burnt by bush fires
28th „	„ „ ...	„ „ „ ...	1 „	„ „
29th „	„ „ ...	„ „ „ ...	4 hours	„ „
28th Dec.	Wood's Point Line ...	„ Benalla and Jamieson ...	2½ „	Tree fell on line
29th „	„ „ ...	„ „ „ ...	1 day ...	„ „
30th „	„ „ ...	„ „ „ ...	3 hours	„ „

REMARKS.

January 17.—Western lines worked badly during the afternoon; atmospheric disturbances.

January 20.—Western lines worked badly, west of Warrnambool, between 3.30 p.m. and 7 p.m.; atmospheric disturbances.

January 21.—All lines worked badly after 4.30 p.m.; atmospheric disturbances.

February 15.—During afternoon all lines affected by atmospheric disturbances.

April 8.—Western lines worked badly west of Portland; several posts destroyed by bush fires; also all lines affected during afternoon by atmospheric disturbances.

May 9.—All lines affected by atmospheric disturbances during the afternoon.

May 13.—All lines affected by atmospheric disturbances.

July 12.—All lines affected by atmospheric disturbances.

July 19.—Western lines worked badly during the afternoon; atmospheric disturbances.

August 21.—Western lines affected during afternoon; atmospheric disturbances.

September 22.—Western lines worked badly during afternoon west of Belfast; atmospheric disturbances.

November 10.—During afternoon all lines slightly affected by atmospheric disturbances.

December 22.—All lines affected by wet weather during the afternoon.

RETURN showing the Interruptions to Telegraphic Communication, &c.—*continued.*

INTERCOLONIAL.

Date.	Locality of Interruption.	Period of Interruption.
5th January ...	East of Albury, New South Wales	5 hours
21st „ ...	„ „ „	5 „
16th February ...	East of Mount Gambier, South Australia	8 „
6th April ...	West of Mount Gambier, South Australia...	5 „
13th May ...	„ „ „	4 „
15th „ ...	„ „ „	1 day
16th „ ...	„ „ „	1 „
17th „ ...	„ „ „	4 hours
15th „ ...	East of Wagga-wagga, New South Wales	10 „
29th „ ...	One mile east of Mount Gambier, South Australia	6 „
2nd September ...	West of Mount Gambier, South Australia...	4 „
26th „ ...	„ „ „	5 „
8th November ...	„ „ „	4 „
21st December ...	East of Albury, New South Wales	8 „

APPENDIX B.

Department of Electric Telegraph,
(Office of the General Superintendent,)
Melbourne, 3rd July, 1865.

SIR,

With reference to the letter of the Honorable the Colonial Secretary for New Zealand, dated 1st ultimo, forwarded for my consideration and report from your office on the 14th idem, requesting information in respect to the proposed connection of the North and Middle Islands of New Zealand by means of a submarine cable, crossing Cook Strait at the most favorable point of departure on either shore, I have the honor to submit the following observations :—

REPORT.

1. It is essential to the proper consideration of the subject on its general merits, that special regard should primarily be directed to the peculiar physical features of the locality in which it is proposed to deposit the cable.

The necessity for such a precaution will be quite obvious when it is remembered that telegraph cables are usually constructed to meet certain existing conditions previously determined by practical observation or inspection.

2. With the view of eliminating the most ample and authentic information on this point, I have carefully consulted the best charts, and the latest and most accurate detailed accounts of surveys of Cook Strait and adjacent shores, published through the Hydrographic Office, under authority of the Lords Commissioners of the Admiralty. From the particulars thus obtained, combined with a personal reference to the experience of several masters of vessels frequenting Cook Strait, I have been enabled to deduce the following conclusions :—

3. Atmospheric disturbance in the form of violent gales of wind, accompanied by a heavy confused sea, appear to be more than usually prevalent in and about the locality under mention. The accounts of surveys before referred to show that marked irregularities in soundings, and the presence of very strong tides, are leading characteristics of Cook Strait.

4. These conditions, I need scarcely remark, present serious obstacles to the permanent success of almost every submarine work of magnitude, but, perhaps, most of all to the permanency of a submarine cable.

5. South-east gales prevail most frequently in May, June, and July, while gales from the opposite quarter (north-west) are usually common during the spring and summer months (September to March).

6. On the chart accompanying this Report, I have indicated two proposed courses for a submarine cable : one from Pencarrow Head to Port Underwood, by a bearing deviating to the southward, to avoid uneven bottom ; and another from a point on the main land, nearly abreast of Kapiti Island, northerly around Cape Stephens, and through Blind Bay to the Port of Nelson.

7. The soundings on a direct course from Pencarrow Head to the entrance of Port Underwood (about 40 miles) are shown to be very irregular, varying suddenly twenty, and even thirty fathoms, in distances of from three to five miles. A more favorable line of soundings might, I think, be found on a course bearing from Pencarrow Head for the mouth of the river Kaipara-tahau to within about ten miles off that point, then bearing gradually westward and northward to Port Underwood; this would increase the distance by about ten miles, but the soundings appear to be much more regular than on the direct course ; the deepest is marked as 97 fathoms, while the general average depth is shown as 40, 50, 60, and 70 fathoms undulating, within distances of five miles, to the extent of from 10 to 27 fathoms; the bottom shows principally sand, mixed occasionally with minute shells.

8. The distance from Port Underwood to Nelson, overland, is probably about fifty miles, but I am without information as to the nature of the country or relating to the facilities for intercourse between those places ; there would probably, however, be no serious difficulty in constructing a line of telegraph along the route, provided that timber for poles might be readily obtainable.

9. The connection on the northern shore, between Pencarrow Head and Wellington, would be effected by continuing the cable, by overland line to the most convenient position inside the entrance, thence across the Bay to the best landing, and thence by a short length of land line to Wellington.

10. Should a favorable position for landing the northern end of the cable be attainable on the west side of the entrance, at or near Lyall Bay, such a course might perhaps be adopted, the communication to be completed by a land line thence to Wellington; but a decision as to the best landing point could not be determined until a careful survey of both localities might first have been made.

11. In any case I consider that it would be inadvisable to submerge the cable directly through the entrance to the inlet, as the danger from anchors of vessels would present a too serious risk of injury to the work irrespective of other important considerations, in connection with the effects of strong tidal currents, and the greatly increased power of the sea on a cable, when laid in less than 20 fathoms.

12. The general character of Cook Strait, viewed by the soundings (*vide* Chart), is most unfavorable to the permanent success of a submarine cable, as a deep and irregular channel appears to exist with greater or lesser uniformity throughout nearly the whole extent of the passage; commencing, for example, at a point nearly midway between Taourakira Head and Cape Campbell, and terminating about midway between Porirua Harbor and Cape Koamoroo, are shown soundings as follows:—First 250 fathoms, sand bottom; then on a course northerly and westerly, within less than seven miles, 97 fathoms, bottom not stated; then on same course, at about five miles to seven miles, 102 fathoms, sand and shell; 78 fathoms, rock; then 90, 96, and at seven miles farther, 122 fathoms, sand; then 169 fathoms, sand and mud; 157 fathoms, dark sand; 143 fathoms, sand and shell; 178 fathoms, dark sand—the last sounding at about twelve miles distant from that of 122 fathoms; then at ten miles farther, on nearly the same course, and at what may be considered the northern entrance to the Strait, is shown 86 fathoms, sand.

13. When it is borne in mind that the ordinary tidal currents commonly set through the channel in which these soundings have been found at a velocity of from two to four knots per hour, the extreme difficulty of submerging a submarine cable in such a position, having due regard to the future stability of the work, may readily be understood. The currents would, of course, flow generally at right angles to the direction of the line, so that at points where, through the inequalities of the bottom, the cable would remain partially suspended (so to speak), the active oscillation occasioned by the currents would, in a comparatively short space of time, render the cable extremely defective, if not wholly useless; while, as to the prospects of repairing breaks or defects in such a position, I need scarcely remark that the chances would be extremely doubtful, if, indeed, the process would be practicable.

14. These considerations have led me to the conclusion that it would be injudicious to select a route for the proposed cable *directly* across any portion of Cook Strait.

15. A northern route (*vide* Chart), and from all the evidence I have been enabled to collect, apparently a most favorable course for the purpose required, might be found by starting from the position marked on the chart as Waikanai (latitude 40° 53′ south, longitude 175° east), keeping to the northward of Kapiti Island, thence north-westerly until about fifteen miles due north of Cape Stephens, thence south-westerly to a landing place to be selected near Nelson anchorage.

16. The soundings on this route are comparatively even and regular, not exceeding 75 fathoms, and showing in the shallower portions traversing Blind Bay extensive plateaus, varying from 25 to 35 fathoms in depth, sand and mud bottom.

17. The bottom over the whole distance from abreast of Kapiti to Nelson anchorage is shown to be composed of sand, sand and shell, sand and mud, and mud alone.

18. On the whole, the northern route thus indicated presents in its leading and most important essentials a much superior course to a direct (or semi-direct) line crossing the southern portion of Cook Strait; the principal drawback, however, to this superiority of position would be the necessarily increased extent of ground to be traversed by the cable.

19. The length of cable requisite would probably amount to about 125 miles. This, as compared with the relatively much shorter length of cable (say 55 miles) necessary for the route *via* Pencarrow Head and Port Underwood, would perhaps carry some weight in determining the question of route; but while allowing full force to every argument in favor of the more direct route, I am nevertheless of opinion, from the peculiar nature of the leading features in each case, viz., on the one side marked abruptness in the soundings, evidencing great unevenness in bottom, the presence of shingle (usually shifting in position), stones, rock, &c., accompanied by powerful tides in narrow waters. On the other side a nearly total absence of marked unevenness or irregularity in the bottom, a decided preponderance of soundings most favorable for the security of a submarine cable, and a considerably reduced force in tidal currents, that, after impartially considering the respective merits of the question, the longer route will be found eventually to be the safest and best for the ultimate success of the work.

20. The northern route, if adopted, would necessitate the construction of a short land line from Wellington to Waikanai, *via* Ohariu Bay and Porirua Harbor, a distance not exceeding 40 miles; a length of probably two or three miles of land line would also be required at the Nelson terminal of the line.

21. Difficulties would of course require to be surmounted in extending a land line from Wellington to Waikanai, but I apprehend that nothing more serious would present itself (assuming the natives to be pacific) than has been already overcome in this colony in extending telegraphic communication to Cape Otway, where the impracticable nature of the country compelled the adoption of manual transport for over fifteen tons weight of material along some 60 miles of line, the track being then too dangerous to admit of either bullocks or pack-horses being employed.

22. The relative propositions as to distances stand as follows:—

SOUTHERN ROUTE *VIA* PORT UNDERWOOD.

Cable	55 miles
Land line on Middle Island ... ...,	50 „
Land line on Northern Island	3 „
Total	108 miles

NORTHERN ROUTE *VIA* WAIKANAI.

Cable	125 miles
Land line on Northern Island	40 „
Land line on Middle Island	3 „
Total	168 miles.

23. Having thus, I hope, fully discussed the question of route for the proposed line of communication, I have now to deal with the proper description of cable to be recommended for the purpose, embracing also the cost of the work.

24. The forms and adaptations of submarine cables have undergone many most important and valuable modifications and improvements during the past five years; indeed it may be said that the form and mode of manufacturing telegraphic cables is constantly in a progressive state, as new conditions become gradually developed, either through scientific research, or by the aid of practical experience, from the results already obtained in carrying out extensive submarine works for electro-telegraphic purposes in various parts of the world.

25. A valuable record of statistics recently (April, 1865) published concerning submarine cables, through a most authentic source in England, proves the following facts, selected from other matter in the same paper, as being specially applicable to the case under mention:—"That no light cables have proved "very successful, even when laid in a moderate depth; they are subject to continual breakages by anchors

"and currents. When the outer wires have been rusted away by the chemical action of the salt water and of "certain metals, such as copper, which occasionally enter into the composition of the sea bottom, the bare "core soon becomes useless and quite unable to exist deprived of its iron protection."—"That all heavy cables "laid in a moderate depth have proved permanently successful and efficient, and when broken occasionally by "mechanical violence, such as anchors or currents, they are capable of being easily and speedily repaired."—"This is the only class of submarine telegraph that, up to the present time, has had permanent success."—"Cables laid in a moderate depth are such as lie in 20 to 100 fathoms ; a less depth than 20 fathoms is highly "objectionable. A heavy cable may be taken as weighing two (2) tons or more per statute mile, and a "light cable is that whose weight is below that mark, though of course the weight of the iron casing must be "adapted to the nature and depth of the bottom."

26. I need scarcely observe that the results above mentioned have been derived from well authenticated official returns, embracing, among other interesting particulars, facts as to the number of conducting wires, the length, the depth of submersion, weight per mile, and the period during which each cable has worked, on all the principal telegraph lines in Europe and elsewhere, since 1851.

27. Full consideration of the valuable experience thus available has led me to recommend a form of cable which, I believe, would be best suited for the proposed connection now under discussion ; and I am fortunately in a position to furnish a specimen section (herewith supplied) of the particular description of cable referred to, together with details as to the probable cost of the work.

28. My estimates are as follow :—

SOUTHERN ROUTE, AS PER CHART.

40 miles of main cable, at £151	6,040
15 miles of shore ends, at £244	3,660
	9,700
Provision for say 60 miles of land line, at £50	3,000
Testing boxes, instruments, fittings, and other gear	1,300
	£14,000
Expenses attending transport from England, including cost of steam power in laying cable between the points indicated	7,500
Engineer's expenses, including temporary labor	1,500
Incidental expenses	1,000
ESTIMATED TOTAL COST OF THE WORK	£24,000

NORTHERN ROUTE, AS PER CHART.

120 miles of main cable, at £151	18,120
10 miles of shore ends, at £244	2,440
	20,560
Provision for say 40 miles of land line, at £50	2,000
Testing boxes, instruments, fittings, and other gear	1,300
	£23,860
Expenses attending transport from England, including cost of steam power in laying cable between the points indicated	8,000
Engineer's expenses, including temporary labor	1,500
Incidental expenses	1,000
	£34,360

29. The above estimates, in so far as the probable cost of the cable is shown, are based on the authority of the description and prices given by Messrs. Glass, Elliott, and Co., cable manufacturers, for the particular description of cable now under mention, as follows :—

Components.

7 copper wires in one strand, per knot	150 lbs.	
3 coverings of gutta percha, and 3 of Chatterton's compound	230 lbs.	
Weight of core	380 lbs.	= 3·40 cwt.
Jute and tar		4·20 „
10 best charcoal iron wires (No. 6)		52·40 „
Outer covering of Clark's patent preparation		14·00 „
Weight per knot complete		74·00 cwt.

Shore ends of the same materials, but much heavier, would weigh 154 cwt. to the mile. The prices named are as below :—For main cable, f. o. b., £151 per mile ; for shore ends, do., £244 do.

30. It will thus be seen that the cable recommended for Cook Strait would consist of a single copper conductor, composed in the aggregate of seven small copper wires combined in one strand, insulated by a triple covering of gutta percha and the same of Chatterton's patent compound, forming together the core ; this would be protected by a covering of jute saturated in tar, which would interpose between the insulation and the ten No. 6 iron wires forming the sheathing, next to be applied as the outer protection of the core ; this in turn would be covered by Mr. L. Clark's patent preservative preparation as a preventive of rapid oxidization in the sheathing wires.

31. I have carefully examined the various specimen sections of cables at present in my possession, and find none in my opinion so well adapted for the proposed service as that now recommended.

32. With regard to the mode in which the work should be performed, I consider that the best course would be to invite and accept tenders in England from competent persons for carrying out and completing, under stated conditions, the whole of the submarine portion. The short lengths of land line required on either side of the strait might, in the meantime, be provided directly under local supervision.

I have the honor to be, Sir,
Your obedient servant,
(Signed) SAML. W. McGOWAN,
General Superintendent of Electric Telegraph, Victoria.

The Honorable the Chief Secretary, &c., &c.

APPENDIX C.

STATEMENT showing the Names of the several Electric Telegraph Stations, and the Lines of Telegraph now in Operation in the Colony of Victoria.

Main Lines.	Name of Station.	Extent in Miles from the Melbourne Office.	Branch Line.	Name of Station.	Extent in Miles.
Southern Coast Line	Melbourne ...	126			
	Williamstown ...				
	Geelong				
	Queenscliff				
	Point Lonsdale ...				
	Sandridge				
	Snapper Point ...				
	Cape Schanck ...				
Western Coast Line	Mount Gambier ...	303			
	Portland		Hamilton Branch ...	Hamilton ...	53 from Portland
	Belfast				
	Warrnambool ...				
	Camperdown ...				
	Colac				
Western Line	Ballarat	239	Buninyong Branch ...	Buninyong ...	7 from Ballarat
			Smythesdale Branch	Smythesdale ...	14 from Ballarat
	Beaufort		Stawell Branch	Ararat ...	49 from Beaufort
				Stawell ...	
	Streatham				
	Hexham		Mortlake Branch ...	Mortlake ...	9 from Hexham
	Hamilton		Casterton Branch ...	Casterton ...	50 from Hamilton
Cape Otway ...	Otway	140			
Cross Country Line	Creswick	312			
	Daylesford ...				
	Maldon				
	Dunolly				
	Carisbrook				
	Maryborough ...		Clunes Branch	Talbot ...	20 from Maryborough
				Clunes ...	
	Avoca				
	Moonambel ...				
	Redbank				
	St. Arnaud... ...				
Swan Hill Line	Tarnagulla	231			
	Inglewood				
	Kerang				
	Swan Hill				
Northern Line	Collingwood ...	156			
	Gisborne				
	Kyneton				
	Malmsbury ...				
	Taradale				
	Castlemaine ...		Newstead Branch ...	Newstead ...	10 from Castlemaine
	Sandhurst				
	Echuca				
North Eastern Line	Kilmore	200	Heathcote Branch ...	Heathcote ...	31 from Kilmore
	Seymour				
	Longwood		Wood's Point Branch	Jamieson ...	85 from Benalla
	Benalla			Wood's Point...	
	Wangaratta ...			Yackandandah	50 from Beechworth
	Beechworth ...		Wahgunyah Branch	Chiltern ...	
				Wahgunyah ...	
				Rutherglen ...	
	Belvoir				
	Albury				
Gipps Land Line	Sale	181			
	Port Albert ...				
Railway Circuit.					
Northern Line	Spencer Street ...	154			
	Woodend				
	Kyneton				
	Castlemaine ...			*Special Wires.*	
	Sandhurst				
	Runnymede ...			Geelong line (2)	90
	Echuca				
Western Line...	Williamstown Junction	97½		*Special Wire.*	
	Werribee			Melbourne to Albury ...	200
	Little River			Melbourne to Mount Gambier	303
	Geelong				
	Ballarat West ...				

Showing a total of 80 stations or offices; 2,517½ miles of lines, provided with 3,110½ miles of wire.

By Authority: JOHN FERRES, Government Printer, Melbourne.