

PRELIMINARY ENGINEERING DESIGN PLANS

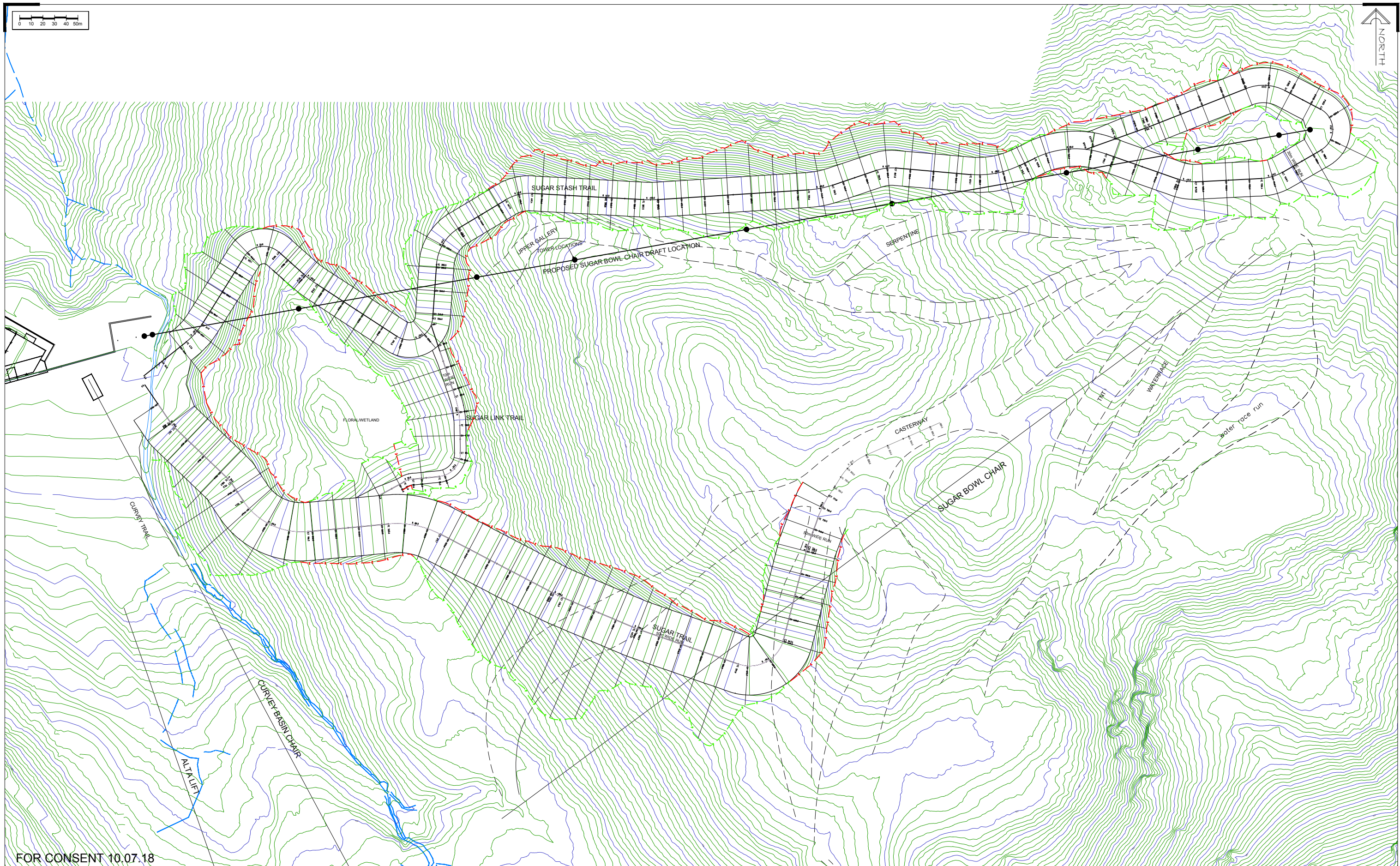
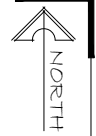
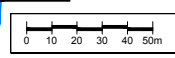
**DESIGN PLANS - SUGAR BOWL II
REMARKABLES SKI FIELD, QUEENSTOWN, NZ**

EARTHWORKS DESIGN
JOB No. 12650 DWG No.18
FOR
NZ SKI LTD

REV -
For Consent 10.07.18

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PREPARED BY



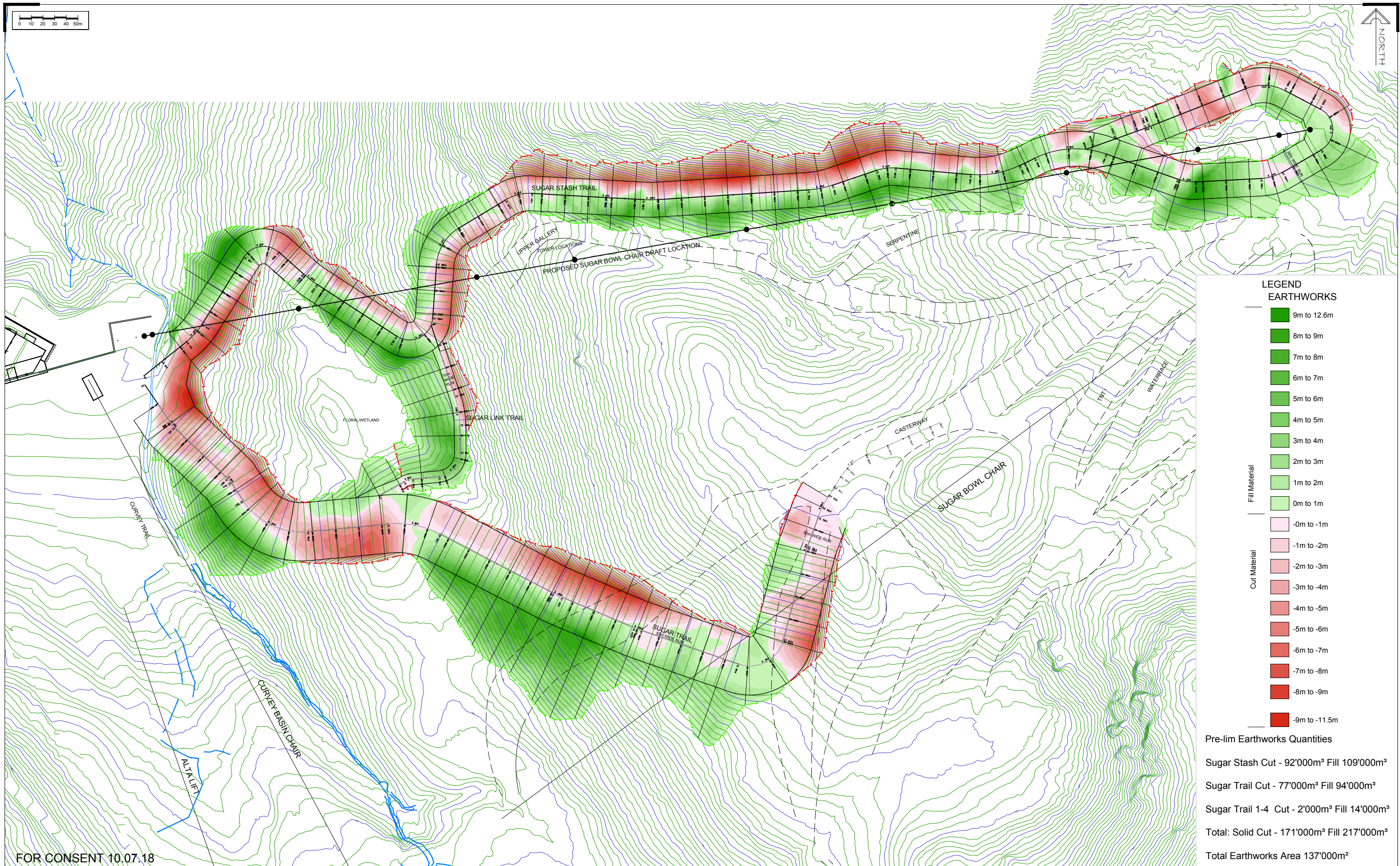
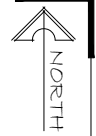
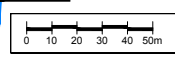
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Shotover Design Limited trading as
Clark Fortune McDonald & Associates
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 309 Lower Shotover Road, P.O.Box 553 Queenstown
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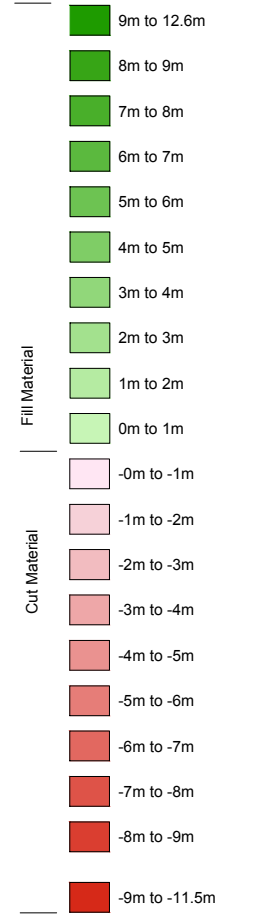
Rev.	Date	Revision Details	By

REMARKABLES SKI FIELD OVERALL LAYOUT PLAN

Client	NZ SKI LTD		Surveyed	Signed	Date	Job No.	Drawing No.
					x.x.18	12650	18-01
Notes:	Drawn	Signed	Date	Scale			
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	Designed	Signed	Date	Datum & Level	Rev.		
	CFM w NZSKI		2018	NZMG & MSL	-		



**LEGEND
EARTHWORKS**



Pre-lim Earthworks Quantities

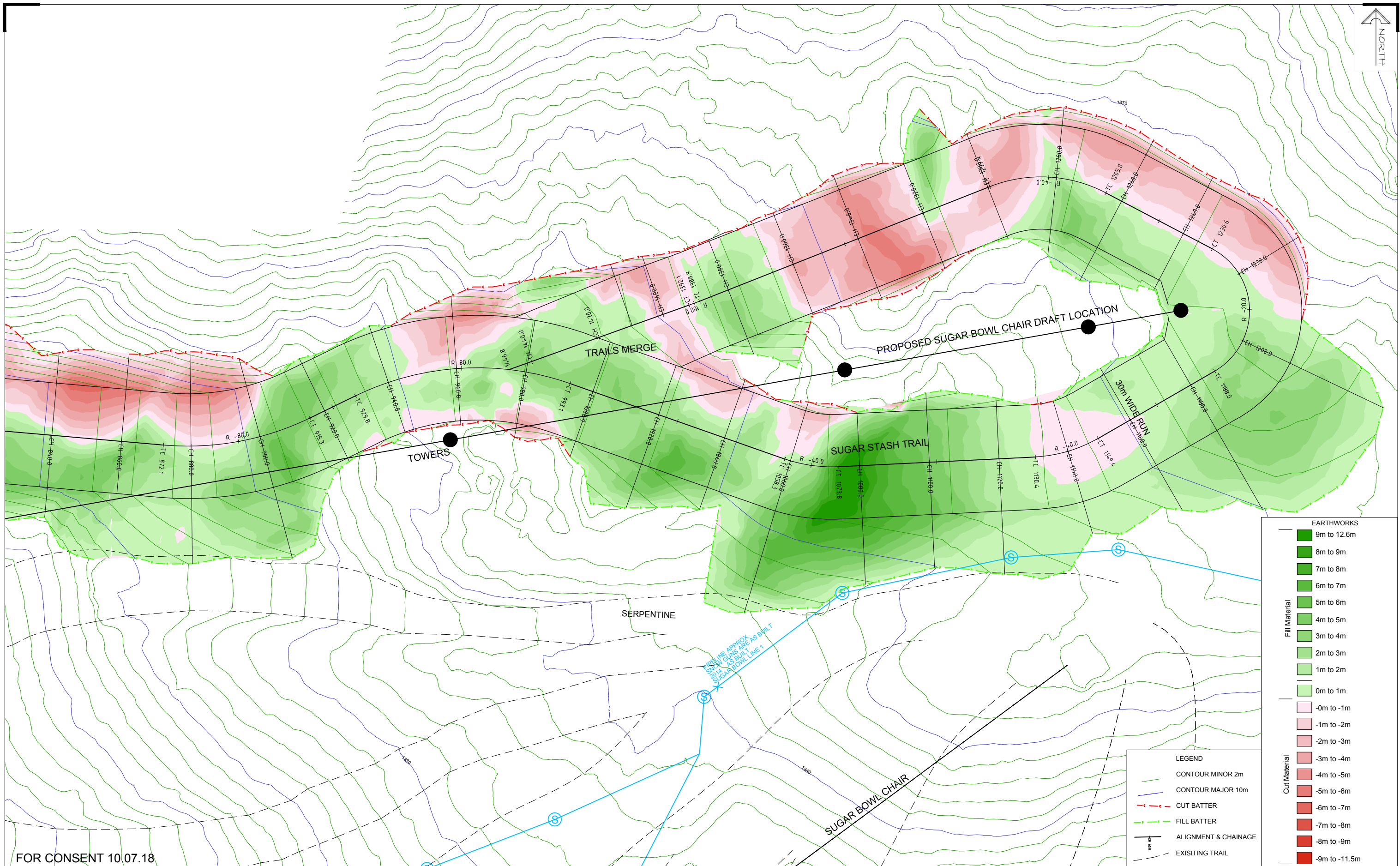
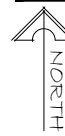
Sugar Stash Cut	- 92'000m ³	Fill 109'000m ³
Sugar Trail Cut	- 77'000m ³	Fill 94'000m ³
Sugar Trail 1-4 Cut	- 2'000m ³	Fill 14'000m ³
Total: Solid Cut	- 171'000m³	Fill 217'000m³
Total Earthworks Area		137'000m²

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**REMARKABLES SKI FIELD
OVERALL LAYOUT & VOLUME PLAN**

Client	NZ SKI LTD		Surveyed	Signed	Date	Job No.	Drawing No.
					x.x.18	12650	18-02
Notes:	All dimensions shown are in meters unless shown otherwise. Any person using Clark Fortune McDonald drawings and other data accepts the risk of:		Drawn	Signed	Date	Scale	
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	- Ensuring the information is the most recent issue.		Designed	Signed	Date	Datum & Level	A3
	- Copyright on this drawing is reserved.		CFM w NZSKI		2018	NZMG & MSL	-



EARTHWORKS	
Fill Material	9m to 12.6m
	8m to 9m
	7m to 8m
	6m to 7m
	5m to 6m
	4m to 5m
	3m to 4m
	2m to 3m
Cut Material	0m to 1m
	-0m to -1m
	-1m to -2m
	-2m to -3m
	-3m to -4m
	-4m to -5m
	-5m to -6m
	-6m to -7m
	-7m to -8m
	-8m to -9m
-9m to -11.5m	

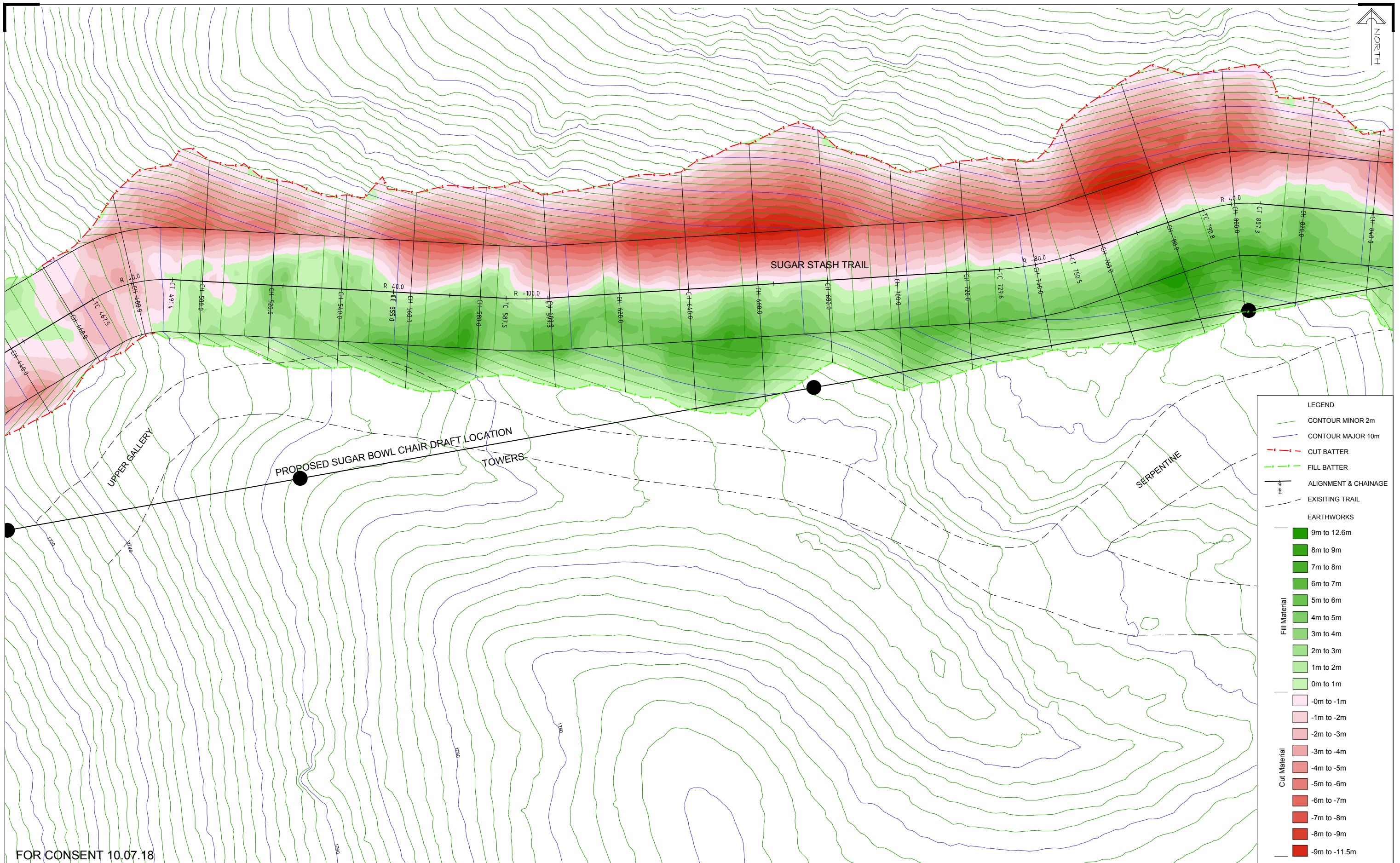
LEGEND	
	CONTOUR MINOR 2m
	CONTOUR MAJOR 10m
	CUT BATTER
	FILL BATTER
	ALIGNMENT & CHAINAGE
	EXISTING TRAIL

FOR CONSENT 10.07.18

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REMARKABLES SKI FIELD SUGAR BOWL LAYOUT & EARTHWORKS

Client	NZ SKI LTD	Surveyed	Signed	Date	Job No.	Drawing No.
				x.x.18	12650	18-04
Notes:	All dimensions shown are in meters unless shown otherwise. Any person using Clark Fortune McDonald drawings and other data accepts the risk of:					
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	- Copyright on this drawing is reserved.					
Drawn	EM	Signed		Date	Scale	1:500 @ A1
Designed	CFM w NZSKI	Signed		11.06.18		1:1000 @ A3
				Date	Datum & Level	Rev.
				2018	NZMG & MSL	-



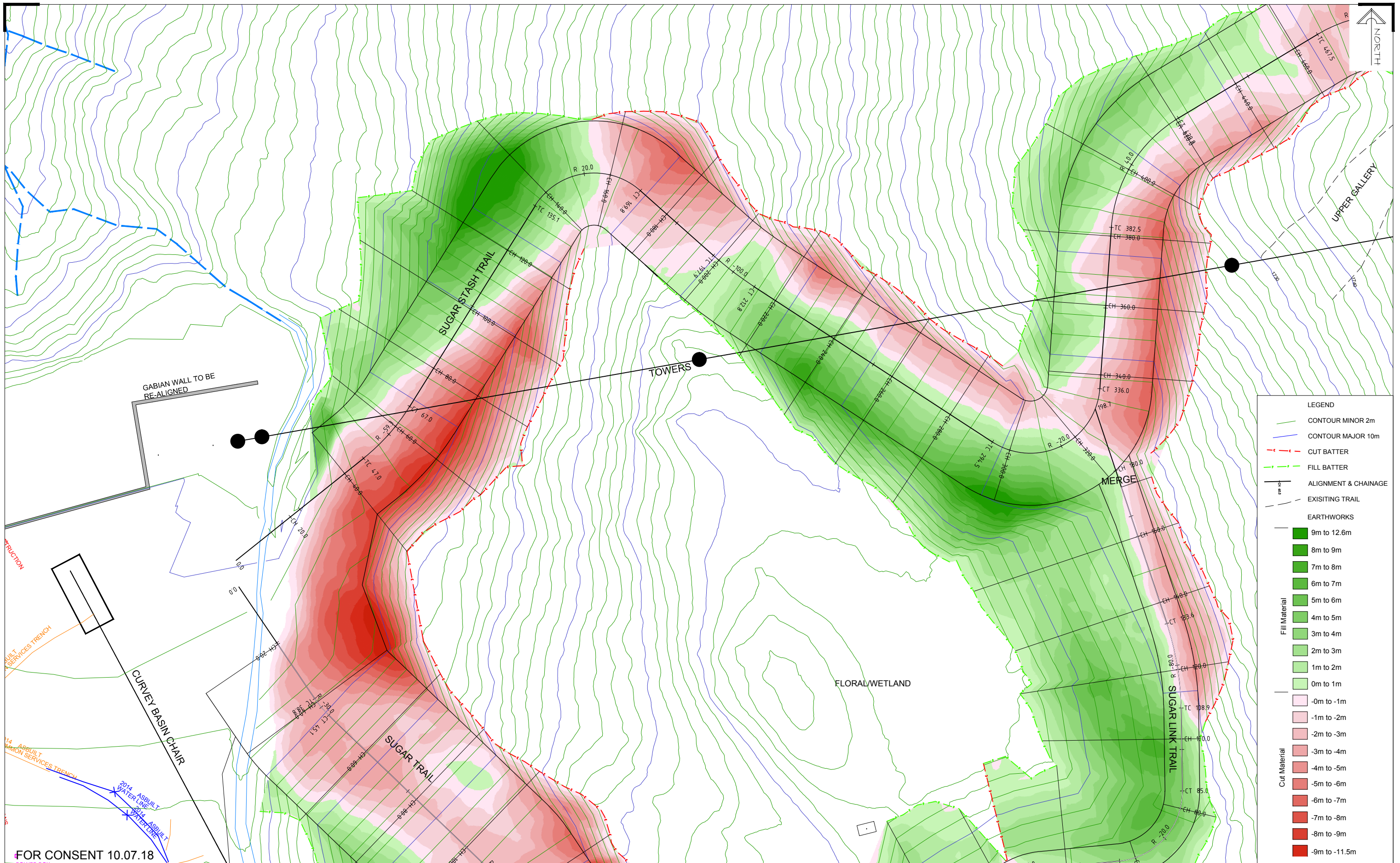
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REMARKABLES SKI FIELD SUGAR BOWL LAYOUT & EARTHWORKS

Client	NZ SKI LTD	Surveyed	Signed	Date	Job No.	Drawing No.
				x.x.18	12650	18-05
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Designed	CFM w NZSKI	Signed		Date	Datum & Level	
				2018	NZMG & MSL	
						Rev.
						-



LEGEND

- CONTOUR MINOR 2m
- CONTOUR MAJOR 10m
- CUT BATTER
- FILL BATTER
- ALIGNMENT & CHAINAGE
- EXISTING TRAIL

EARTHWORKS

Fill Material

- 9m to 12.6m
- 8m to 9m
- 7m to 8m
- 6m to 7m
- 5m to 6m
- 4m to 5m
- 3m to 4m
- 2m to 3m
- 1m to 2m
- 0m to 1m

Cut Material

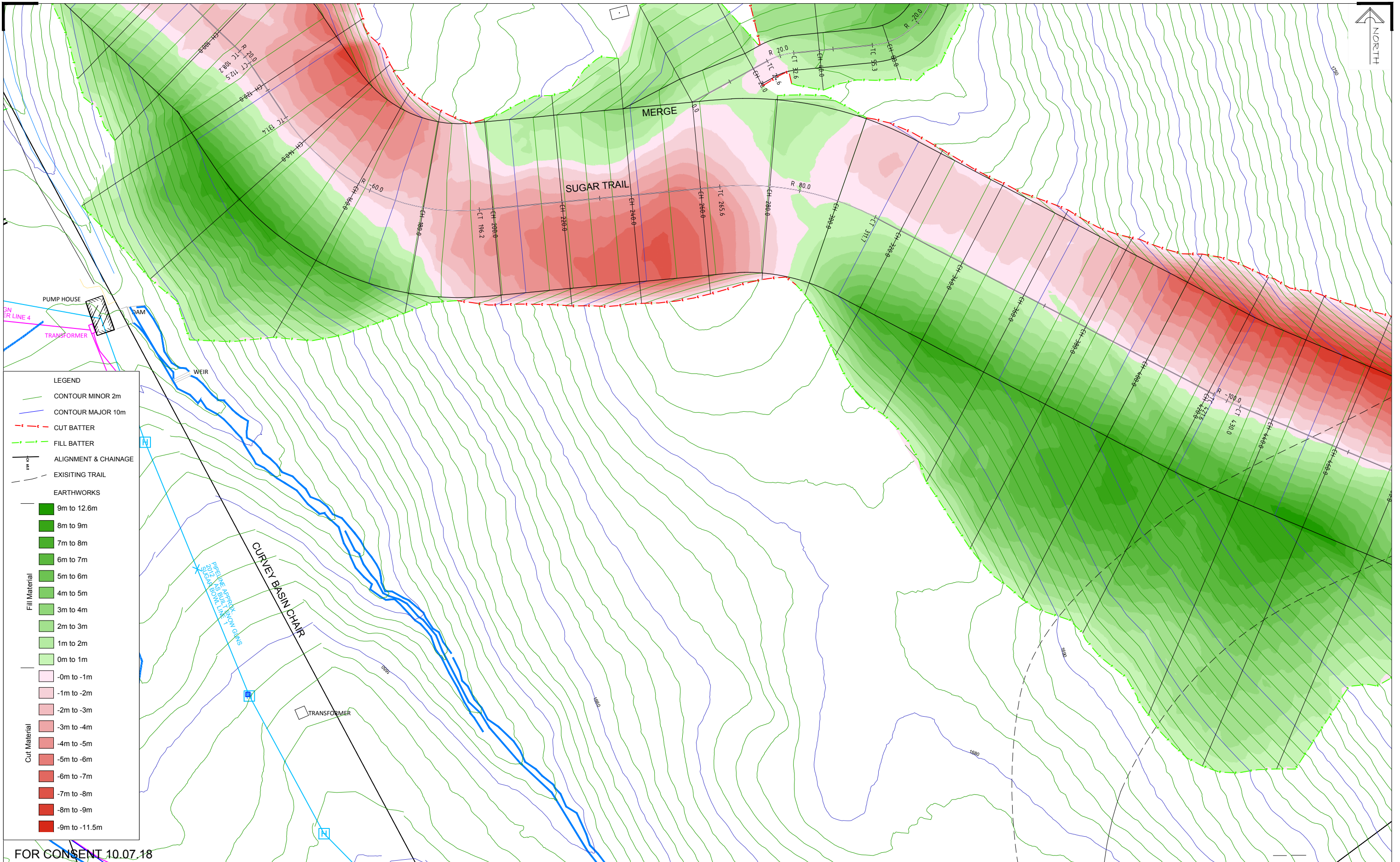
- 0m to -1m
- 1m to -2m
- 2m to -3m
- 3m to -4m
- 4m to -5m
- 5m to -6m
- 6m to -7m
- 7m to -8m
- 8m to -9m
- 9m to -11.5m

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**REMARKABLES SKI FIELD
 SUGAR BOWL
 LAYOUT & EARTHWORKS**

Client	NZ SKI LTD	Surveyed	Signed	Date	Job No.	Drawing No.
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Drawn	EM	Signed		Date	Scale	
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Designed	CFM w NZSKI	Signed		Date	Datum & Level	Rev.
				2018	NZMG & MSL	-



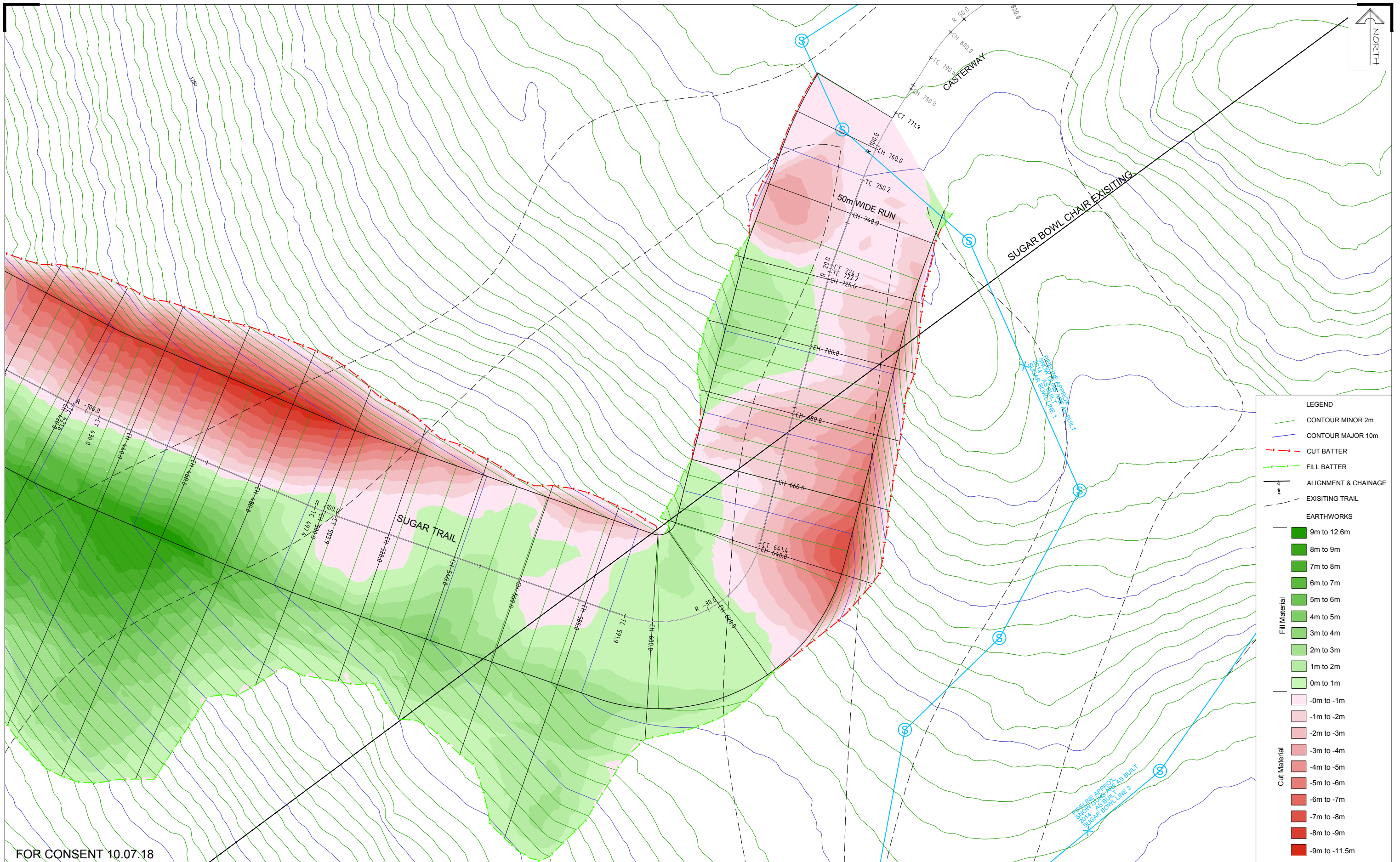
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REMARKABLES SKI FIELD SUGAR BOWL LAYOUT & EARTHWORKS

Client	NZ SKI LTD	Surveyed	Signed	Date	Job No.	Drawing No.
		EM	Signed	x.x.18	12650	18-07
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- Using the drawings and other data in electronic form without requesting and checking them for accuracy against the original hard copy versions.	CFM w NZSKI	Signed	Signed	11.06.18	2018	1:500 @ A1 1:1000 @ A3
- Ensuring the information is the most recent issue.						Datum & Level
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						-



LEGEND	
	CONTOUR MINOR 2m
	CONTOUR MAJOR 10m
	CUT BATTER
	FILL BATTER
	ALIGNMENT & CHAINAGE
	EXISTING TRAIL
EARTHWORKS	
	9m to 12.6m
	8m to 9m
	7m to 8m
	6m to 7m
	5m to 6m
	4m to 5m
	3m to 4m
	2m to 3m
	1m to 2m
	0m to 1m
	-0m to -1m
	-1m to -2m
	-2m to -3m
	-3m to -4m
	-4m to -5m
	-5m to -6m
	-6m to -7m
	-7m to -8m
	-8m to -9m
	-9m to -11.5m

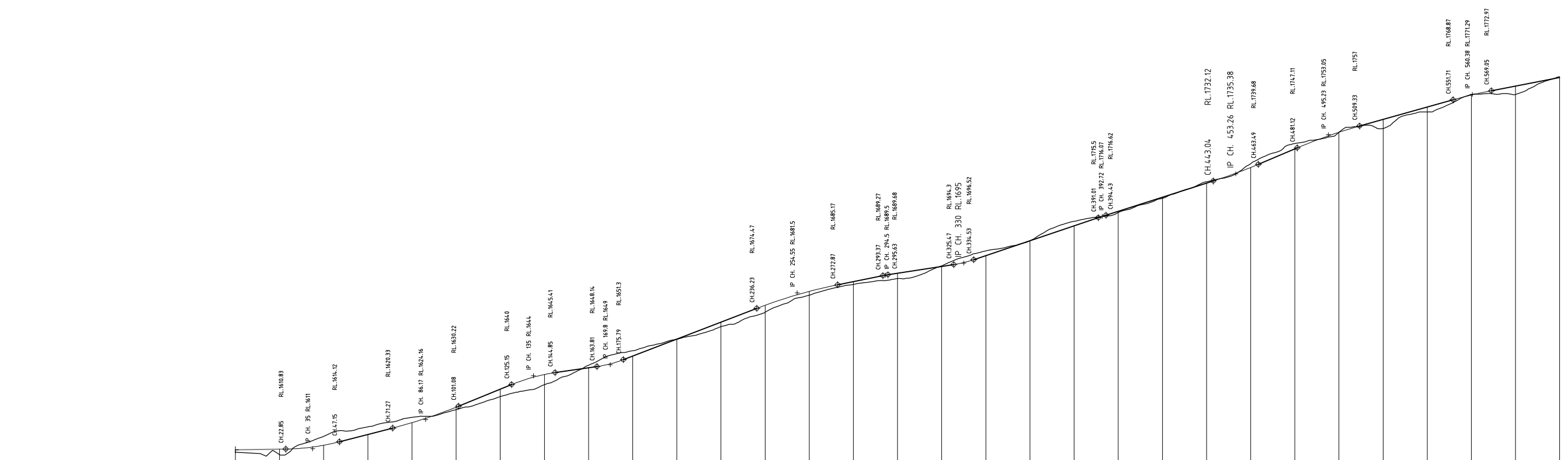
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REMARKABLES SKI FIELD SUGAR BOWL LAYOUT & EARTHWORKS

Client	NZ SKI LTD	Surveyed	Signed	Date	Job No.	Drawing No.
				x.x.18	12650	18-08
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Designed	CFM w NZSKI	Signed		Date	Datum & Level	2018 NZMG & MSL
						Rev. -



HORIZ CURVE DATA

VERT GEOMETRY GRADE (%)
 VERT GRADE LENGTH (m)
 VERT CURVE LENGTH (m)

DATUM R.L.1547.00

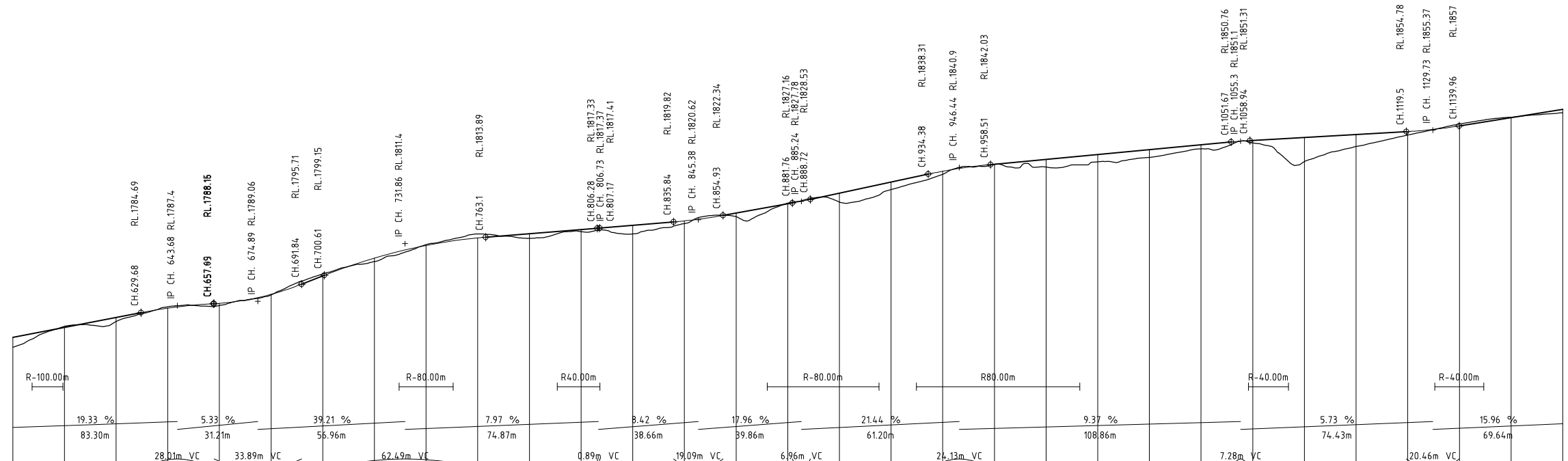
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C.L. FINISHED LEVEL	1609.39	1610.50	1611.11	1612.54	1614.03	1615.57	1617.43	1619.12	1620.89	1622.77	1624.64	1626.51	1628.38	1630.25	1632.12	1633.99	1635.86	1637.73	1639.60	1641.47	1643.34	1645.21	1647.08	1648.95	1650.82	1652.69	1654.56	1656.43	1658.30	1660.17	1662.04	1663.91	1665.78	1667.65	1669.52	1671.39	1673.26	1675.13	1677.00	1678.87	1680.74	1682.61	1684.48	1686.35	1688.22	1690.09	1691.96	1693.83	1695.70	1697.57	1699.44	1701.31	1703.18	1705.05	1706.92	1708.79	1710.66	1712.53	1714.40	1716.27	1718.14	1720.01	1721.88	1723.75	1725.62	1727.49	1729.36	1731.23	1733.10	1734.97	1736.84	1738.71	1740.58	1742.45	1744.32	1746.19	1748.06	1749.93	1751.80	1753.67	1755.54	1757.41	1759.28	1761.15	1763.02	1764.89	1766.76	1768.63	1770.50	1772.37	1774.24	1776.11	1777.98	1779.85	1781.72	1783.59	1785.46	1787.33	1789.20	1791.07	1792.94	1794.81	1796.68	1798.55	1799.38																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
EXISTING G.L.	1609.39	1608.31	1607.23	1606.15	1605.07	1603.99	1602.91	1601.83	1600.75	1599.67	1598.59	1597.51	1596.43	1595.35	1594.27	1593.19	1592.11	1591.03	1589.95	1588.87	1587.79	1586.71	1585.63	1584.55	1583.47	1582.39	1581.31	1580.23	1579.15	1578.07	1576.99	1575.91	1574.83	1573.75	1572.67	1571.59	1570.51	1569.43	1568.35	1567.27	1566.19	1565.11	1564.03	1562.95	1561.87	1560.79	1559.71	1558.63	1557.55	1556.47	1555.39	1554.31	1553.23	1552.15	1551.07	1550.00	1548.92	1547.84	1546.76	1545.68	1544.60	1543.52	1542.44	1541.36	1540.28	1539.20	1538.12	1537.04	1535.96	1534.88	1533.80	1532.72	1531.64	1530.56	1529.48	1528.40	1527.32	1526.24	1525.16	1524.08	1523.00	1521.92	1520.84	1519.76	1518.68	1517.60	1516.52	1515.44	1514.36	1513.28	1512.20	1511.12	1510.04	1508.96	1507.88	1506.80	1505.72	1504.64	1503.56	1502.48	1501.40	1500.32	1499.24	1498.16	1497.08	1496.00	1494.92	1493.84	1492.76	1491.68	1490.60	1489.52	1488.44	1487.36	1486.28	1485.20	1484.12	1483.04	1481.96	1480.88	1479.80	1478.72	1477.64	1476.56	1475.48	1474.40	1473.32	1472.24	1471.16	1470.08	1469.00	1467.92	1466.84	1465.76	1464.68	1463.60	1462.52	1461.44	1460.36	1459.28	1458.20	1457.12	1456.04	1454.96	1453.88	1452.80	1451.72	1450.64	1449.56	1448.48	1447.40	1446.32	1445.24	1444.16	1443.08	1442.00	1440.92	1439.84	1438.76	1437.68	1436.60	1435.52	1434.44	1433.36	1432.28	1431.20	1430.12	1429.04	1427.96	1426.88	1425.80	1424.72	1423.64	1422.56	1421.48	1420.40	1419.32	1418.24	1417.16	1416.08	1415.00	1413.92	1412.84	1411.76	1410.68	1409.60	1408.52	1407.44	1406.36	1405.28	1404.20	1403.12	1402.04	1400.96	1399.88	1398.80	1397.72	1396.64	1395.56	1394.48	1393.40	1392.32	1391.24	1390.16	1389.08	1388.00	1386.92	1385.84	1384.76	1383.68	1382.60	1381.52	1380.44	1379.36	1378.28	1377.20	1376.12	1375.04	1373.96	1372.88	1371.80	1370.72	1369.64	1368.56	1367.48	1366.40	1365.32	1364.24	1363.16	1362.08	1361.00	1359.92	1358.84	1357.76	1356.68	1355.60	1354.52	1353.44	1352.36	1351.28	1350.20	1349.12	1348.04	1346.96	1345.88	1344.80	1343.72	1342.64	1341.56	1340.48	1339.40	1338.32	1337.24	1336.16	1335.08	1334.00	1332.92	1331.84	1330.76	1329.68	1328.60	1327.52	1326.44	1325.36	1324.28	1323.20	1322.12	1321.04	1320.00	1318.92	1317.84	1316.76	1315.68	1314.60	1313.52	1312.44	1311.36	1310.28	1309.20	1308.12	1307.04	1305.96	1304.88	1303.80	1302.72	1301.64	1300.56	1299.48	1298.40	1297.32	1296.24	1295.16	1294.08	1293.00	1291.92	1290.84	1289.76	1288.68	1287.60	1286.52	1285.44	1284.36	1283.28	1282.20	1281.12	1280.04	1278.96	1277.88	1276.80	1275.72	1274.64	1273.56	1272.48	1271.40	1270.32	1269.24	1268.16	1267.08	1266.00	1264.92	1263.84	1262.76	1261.68	1260.60	1259.52	1258.44	1257.36	1256.28	1255.20	1254.12	1253.04	1251.96	1250.88	1249.80	1248.72	1247.64	1246.56	1245.48	1244.40	1243.32	1242.24	1241.16	1240.08	1239.00	1237.92	1236.84	1235.76	1234.68	1233.60	1232.52	1231.44	1230.36	1229.28	1228.20	1227.12	1226.04	1224.96	1223.88	1222.80	1221.72	1220.64	1219.56	1218.48	1217.40	1216.32	1215.24	1214.16	1213.08	1212.00	1210.92	1209.84	1208.76	1207.68	1206.60	1205.52	1204.44	1203.36	1202.28	1201.20	1200.12	1199.04	1197.96	1196.88	1195.80	1194.72	1193.64	1192.56	1191.48	1190.40	1189.32	1188.24	1187.16	1186.08	1185.00	1183.92	1182.84	1181.76	1180.68	1179.60	1178.52	1177.44	1176.36	1175.28	1174.20	1173.12	1172.04	1170.96	1169.88	1168.80	1167.72	1166.64	1165.56	1164.48	1163.40	1162.32	1161.24	1160.16	1159.08	1158.00	1156.92	1155.84	1154.76	1153.68	1152.60	1151.52	1150.44	1149.36	1148.28	1147.20	1146.12	1145.04	1143.96	1142.88	1141.80	1140.72	1139.64	1138.56	1137.48	1136.40	1135.32	1134.24	1133.16	1132.08	1131.00	1129.92	1128.84	1127.76	1126.68	1125.60	1124.52	1123.44	1122.36	1121.28	1120.20	1119.12	1118.04	1116.96	1115.88	1114.80	1113.72	1112.64	1111.56	1110.48	1109.40	1108.32	1107.24	1106.16	1105.08	1104.00	1102.92	1101.84	1100.76	1099.68	1098.60	1097.52	1096.44	1095.36	1094.28	1093.20	1092.12	1091.04	1090.00	1088.92	1087.84	1086.76	1085.68	1084.60	1083.52	1082.44	1081.36	1080.28	1079.20	1078.12	1077.04	1075.96	1074.88	1073.80	1072.72	1071.64	1070.56	1069.48	1068.40	1067.32	1066.24	1065.16	1064.08	1063.00	1061.92	1060.84	1059.76	1058.68	1057.60	1056.52	1055.44	1054.36	1053.28	1052.20	1051.12	1050.04	1048.96	1047.88	1046.80	1045.72	1044.64	1043.56	1042.48	1041.40	1040.32	1039.24	1038.16	1037.08	1036.00	1034.92	1033.84	1032.76	1031.68	1030.60	1029.52	1028.44	1027.36	1026.28	1025.20	1024.12	1023.04	1021.96	1020.88	1019.80	1018.72	1017.64	1016.56	1015.48	1014.40	1013.32	1012.24	1011.16	1010.08	1009.00	1007.92	1006.84	1005.76	1004.68	1003.60	1002.52	1001.44	1000.36	999.28	998.20	997.12	996.04	994.96	993.88	992.80	991.72	990.64	989.56	988.48	987.40	986.32	985.24	984.16	983.08	982.00	980.92	979.84	978.76	977.68	976.60	975.52	974.44	973.36	972.28	971.20	970.12	969.04	967.96	966.88	965.80	964.72	963.64	962.56	961.48	960.40	959.32	958.24	957.16	956.08	955.00	953.92	952.84	951.76	950.68	949.60	948.52	947.44	946.36	945.28	944.20	943.12	942.04	940.96	939.88	938.80	937.72	936.64	935.56	934.48	933.40	932.32	931.24	930.16	929.08	928.00	926.92	925.84	924.76	923.68	922.60	921.52	920.44	919.36	918.28	917.20	916.12	915.04	913.96	912.88	911.80	910.72	909.64	908.56	907.48	906.40	905.32	904.24	903.16	902.08	901.00	899.92	898.84	897.76	896.68	895.60	894.52	893.44	892.36	891.28	890.20	889.12	888.04	886.96	885.88	884.80	883.72	882.64	881.56	880.48	879.40	878.32	877.24	876.16	875.08	874.00	872.92	871.84	870.76	869.68	868.60	867.52	866.44	865.36	864.28	863.20	862.12	861.04	860.00	858.92	857.84	856.76	855.68	854.60	853.52	852.44	851.36	850.28	849.20	848.12	847.04	845.96	844.88	843.80	842.72	841.64	840.56	839.48	838.40	837.32	836.24	835.16	834.08	833.00	831.92	830.84	829.76	828.68

HORIZ CURVE DATA

VERT GEOMETRY GRADE (%)
 VERT GRADE LENGTH (m)
 VERT CURVE LENGTH (m)

DATUM R.L.1711.00

DEPTH	3.81	-0.43	1.56	-0.52	0.83	0.19	-0.78	1.35	-0.29	-1.53	1.82	0.80	3.35	1.03	1.39	-0.24	3.47	2.89	1.20	0.07	3.00	2.81	2.97	1.60	0.99	9.34	4.67	1.38	-0.70	-0.18	1.33
C.L. FINISHED LEVEL	1775.09	1778.95	1782.82	1786.42	1788.29	1791.77	1798.91	1805.81	1810.72	1813.62	1815.24	1816.83	1818.48	1820.21	1823.25	1826.84	1830.94	1835.23	1839.44	1842.17	1844.04	1845.92	1847.79	1849.67	1851.37	1852.52	1853.66	1854.81	1857.01	1860.20	1863.39
EXISTING G.L.	1771.28	1779.38	1781.27	1786.94	1787.46	1791.57	1799.68	1804.46	1811.01	1815.15	1813.42	1816.03	1815.14	1819.18	1821.86	1827.08	1827.48	1832.34	1836.24	1842.10	1841.05	1843.11	1844.83	1846.07	1850.38	1843.17	1849.00	1853.43	1857.71	1860.38	1862.06
CHAINAGE	580.00	600.00	620.00	640.00	660.00	680.00	700.00	720.00	740.00	760.00	780.00	800.00	820.00	840.00	860.00	880.00	900.00	920.00	940.00	960.00	980.00	1000.00	1020.00	1040.00	1060.00	1080.00	1100.00	1120.00	1140.00	1160.00	1180.00



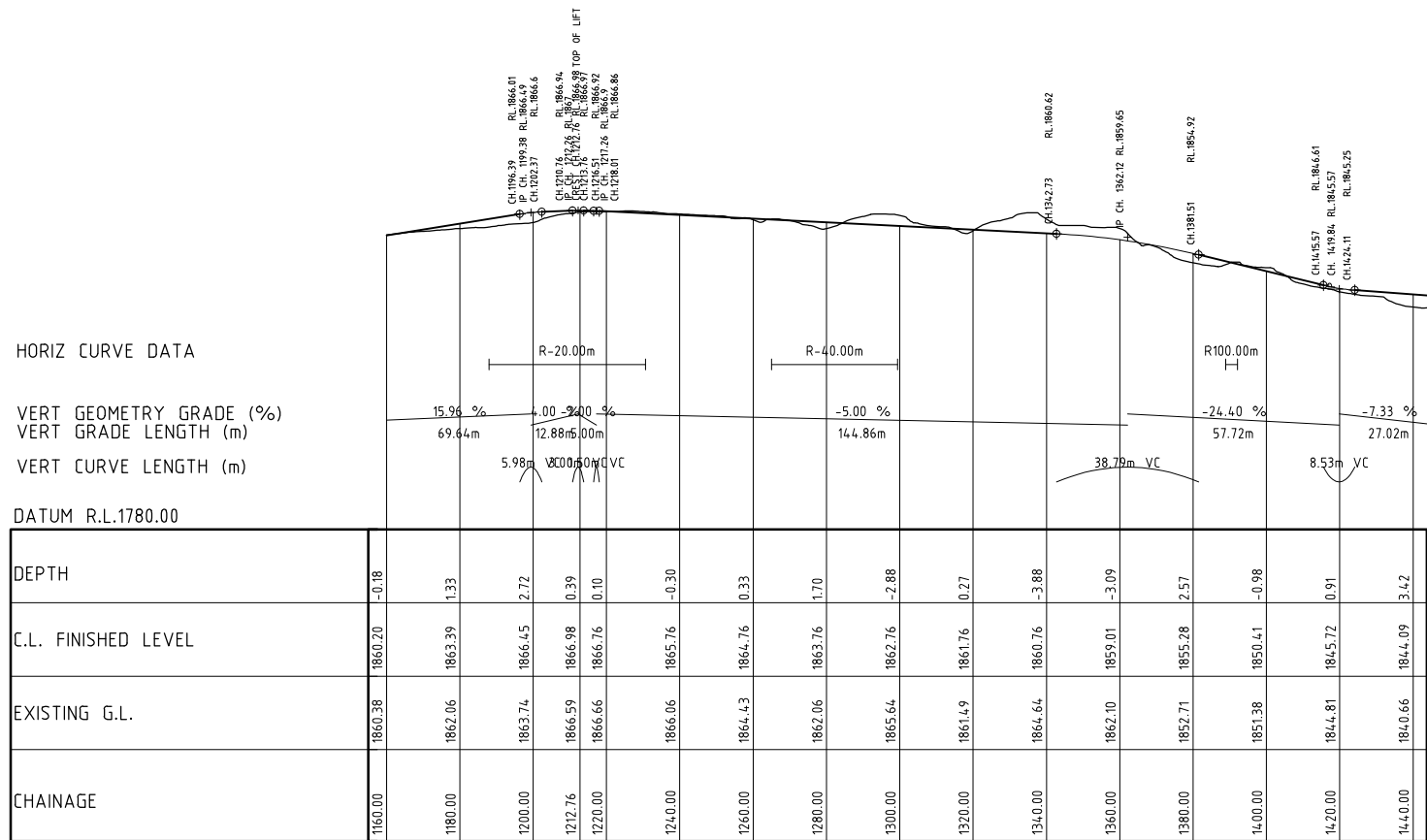
LONGSECTION - 180704 Sugar Stash 1
 A1 HORIZ SCALE 1 : 1000
 A1 VERT SCALE 1 : 1000

FOR CONSENT 10.07.18

Clark Fortune McDonald & Associates
 Licensed Cadastral Surveyors - Land Development - Planning Consultants
 309 Lower Shotover Road, P.O.Box 553 Queenstown
 Tel. (03)441-6044, Fax (03)442-1066, Email admin@cfma.co.nz
 Shop 2, Otago House, 475 Moray Place, P.O. Box 5960
 Tel. (03)470-1582, Fax (03)470-1583, Email admin@cfma.co.nz

REMARKABLES SKI FIELD
 LONGSECTION SUGAR STASH TRAIL

Client	NZ SKI LTD	Surveyed	Signed	Date	Job No.	Drawing No.
				x.x.18	12650	18-21
Notes:	All dimensions shown are in meters unless shown otherwise. Any person using Clark Fortune McDonald drawings and other data accepts the risk of:					
	Drawn	Signed	Date	Scale	1:1000 @ A1	
	EM		11.06.18	1:2000 @ A3		
	Designed	Signed	Date	Datum & Level	Rev.	
	CFM w NZSKI		2018	NZMG & MSL	-	



LONGSECTION - 180704 Sugar Stash 1
A1 HORIZ SCALE 1 : 1000
A1 VERT SCALE 1 : 1000

FOR CONSENT 10.07.18

Shotover Design Limited trading as
Clark Fortune McDonald & Associates
Licensed Cadastral Surveyors - Land Development - Planning Consultants
309 Lower Shotover Road, P.O.Box 553 Queenstown
Tel. (03)441-6044, Fax (03)442-1066, Email admin@cfma.co.nz
Shop 2, Otago House, 475 Moray Place, P.O. Box 5960
Tel. (03)470-1582, Fax (03)470-1583, Email admin@cfma.co.nz

**REMARKABLES SKI FIELD
LONGSECTION SUGAR STASH TRAIL**

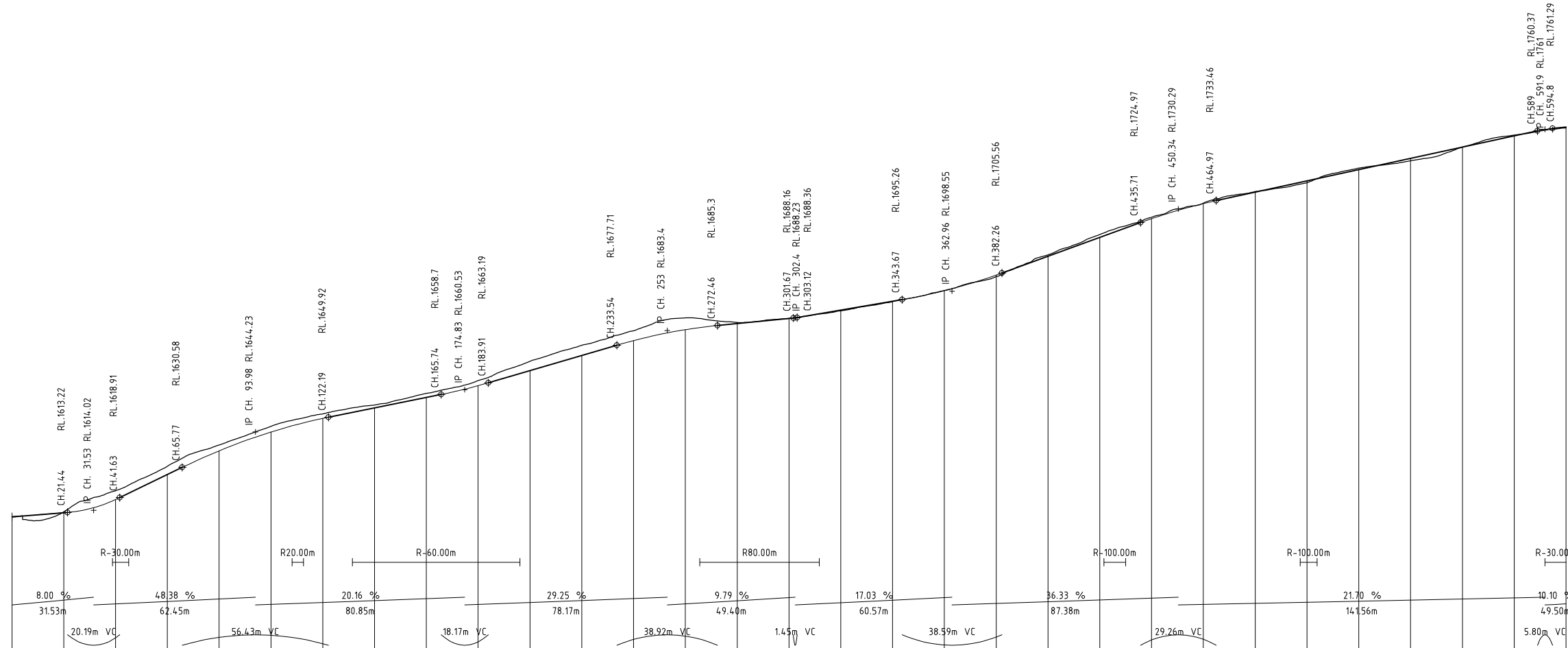
Client	Surveyed	Signed	Date	Job No.	Drawing No.
NZ SKI LTD			x.x.18	12650	18-22
Notes: All dimensions shown are in meters unless shown otherwise. Any person using Clark Fortune McDonald drawings and other data accepts the risk of: - Using the drawings and other data in electronic form without requesting and checking them for accuracy against the original hard copy versions. - Ensuring the information is the most recent issue. - Copyright on this drawing is reserved.	Drawn	Signed	Date <td>Scale</td> <td>Rev.</td>	Scale	Rev.
	EM		11.06.18	1:1000 @ A1 1:2000 @ A3	-
	Designed	Signed	Date	Datum & Level	Rev.
CFM w NZSKI			2018	NZMG & MSL	-

HORIZ CURVE DATA

VERT GEOMETRY GRADE (%)
 VERT GRADE LENGTH (m)
 VERT CURVE LENGTH (m)

DATUM R.L.1549.00

DEPTH	C.L. FINISHED LEVEL	EXISTING G.L.	CHAINAGE
-0.06	1611.50	1611.56	0.00
-0.32	1613.10	1613.42	20.00
-3.42	1618.14	1621.57	40.00
-5.24	1627.79	1631.03	60.00
-2.24	1636.96	1639.20	80.00
-2.21	1644.21	1646.43	100.00
-1.75	1649.47	1651.22	120.00
-1.13	1653.51	1654.64	140.00
-1.57	1657.54	1659.12	160.00
-1.97	1662.08	1664.05	180.00
-3.59	1667.90	1671.49	200.00
-3.93	1673.75	1677.67	220.00
-3.79	1679.49	1683.29	240.00
-4.54	1683.69	1686.23	260.00
-0.41	1686.04	1686.45	280.00
-0.04	1688.00	1688.04	300.00
0.25	1691.23	1690.98	320.00
0.14	1694.64	1694.49	340.00
-0.07	1698.71	1698.78	360.00
0.57	1704.75	1704.18	380.00
-0.53	1712.00	1712.53	400.00
-1.16	1719.27	1720.43	420.00
-0.57	1726.49	1727.05	440.00
-0.19	1732.32	1732.51	460.00
-0.24	1736.72	1736.96	480.00
0.68	1741.06	1740.38	500.00
-0.59	1745.40	1745.99	520.00
0.86	1749.74	1748.88	540.00
-0.02	1754.08	1754.10	560.00
-0.35	1758.42	1758.77	580.00
0.28	1761.82	1761.54	600.00



LONGSECTION - 180628 Sugar Stash 4
 A1 HORIZ SCALE 1 : 1000
 A1 VERT SCALE 1 : 1000

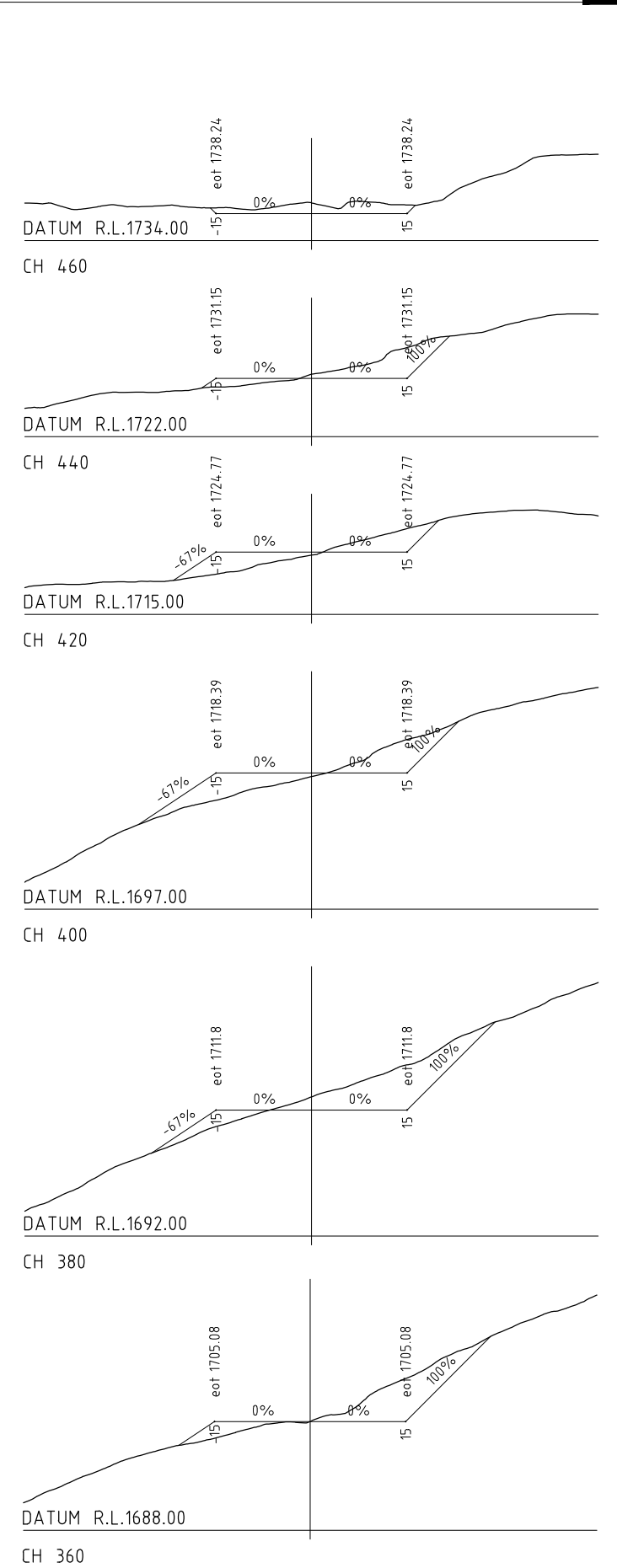
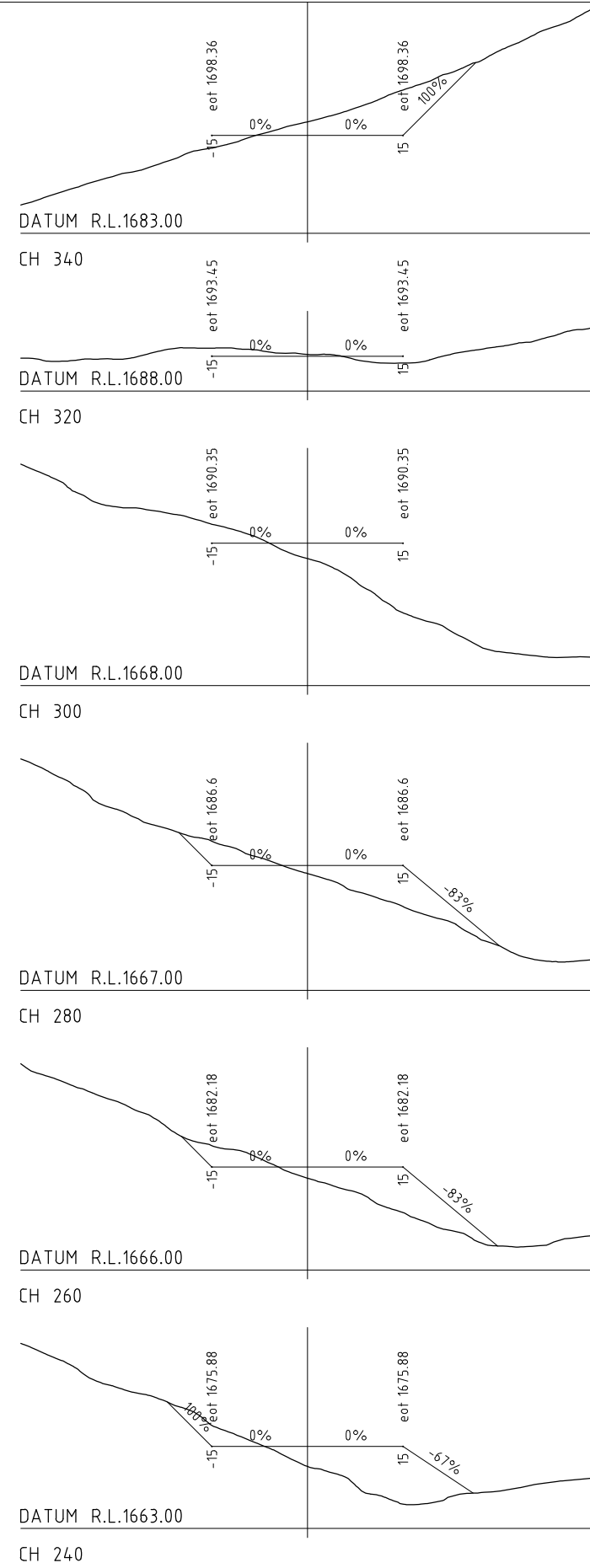
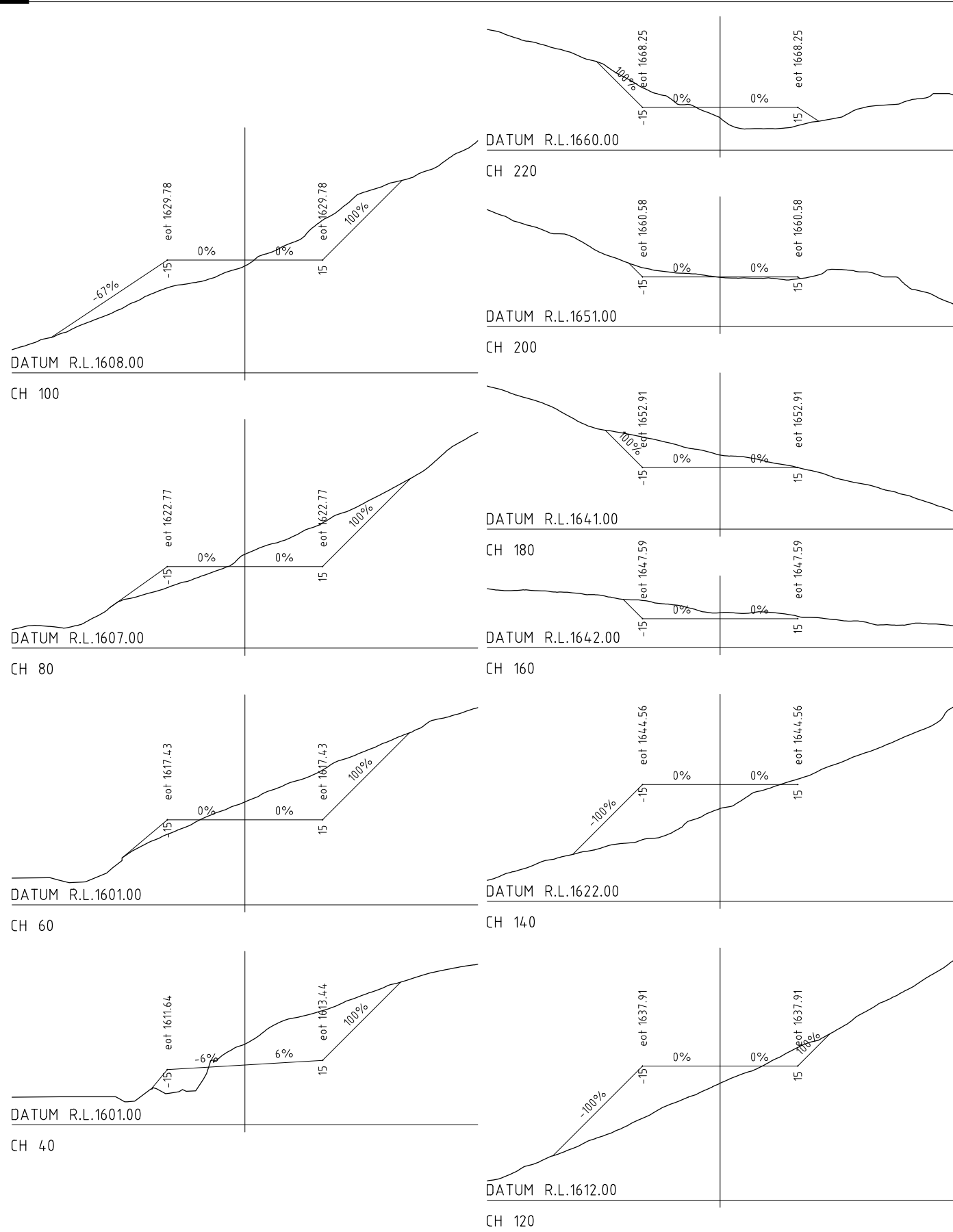
FOR CONSENT 10.07.18

Clark Fortune McDonald & Associates
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 Shop 2, Otago House, 475 Moray Place, P.O. Box 5960
 Tel. (03)470-1582, Fax (03)470-1583, Email admin@cfma.co.nz

Rev.	Date	Revision Details	By

REMARKABLES SKI FIELD
 LONGSECTION SUGAR TRAIL

Client	NZ SKI LTD	Surveyed	Signed	Date	Job No.	Drawing No.
Notes:	EM			x.x.18	12650	18-22
Drawn				11.06.18	Scale	1:1000 @ A1
Designed					Date	1:2000 @ A3
CFM w NZSKI				2018	Datum & Level	Rev.
					NZMG & MSL	-



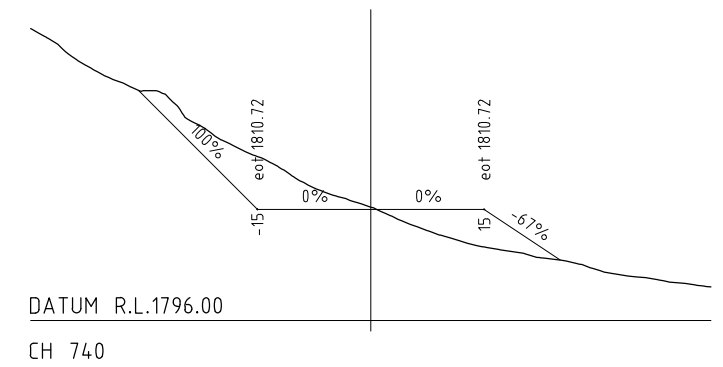
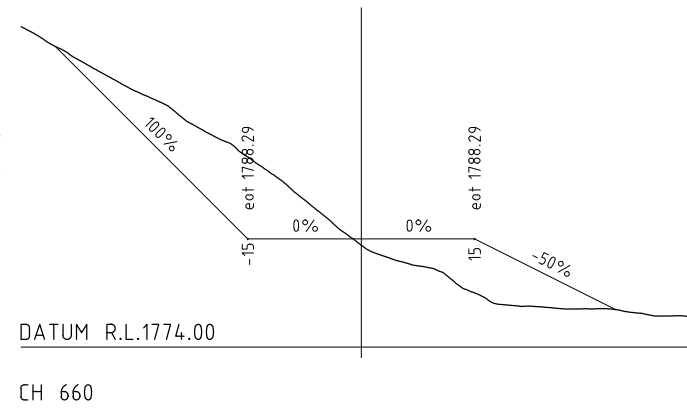
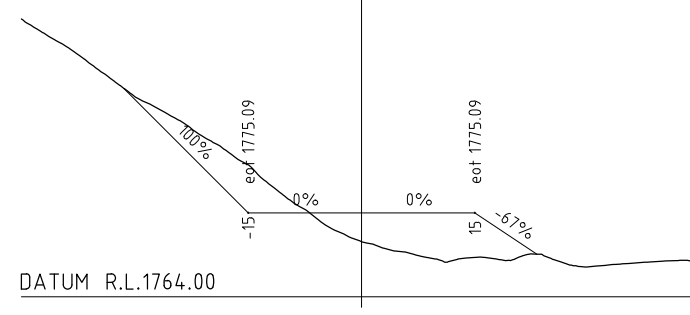
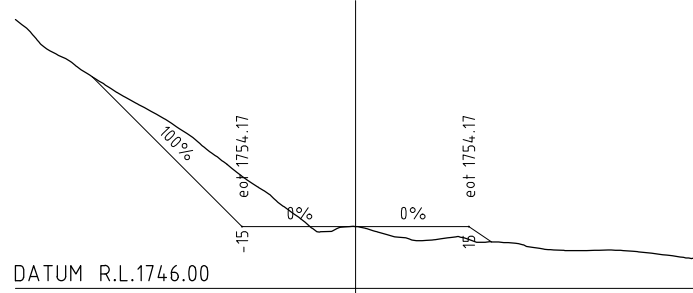
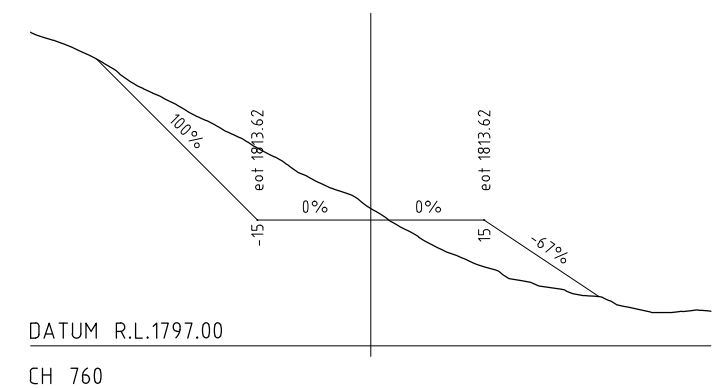
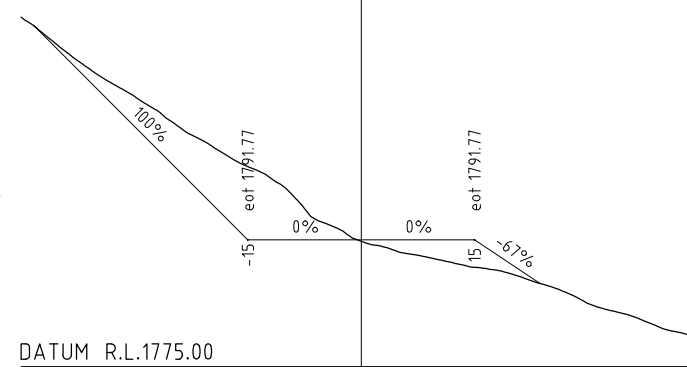
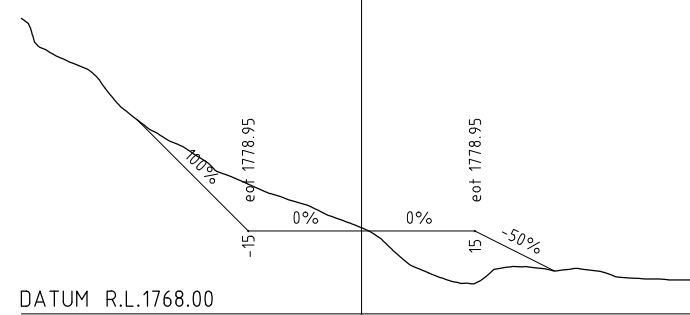
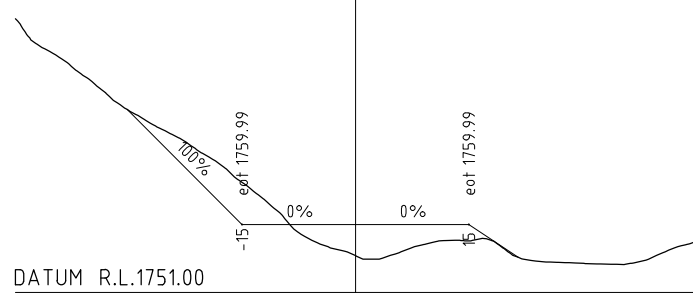
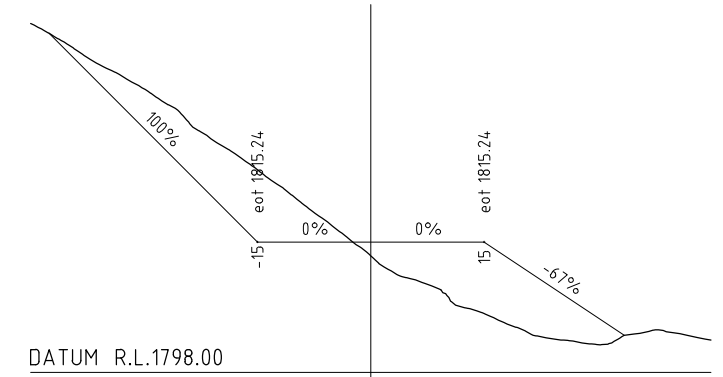
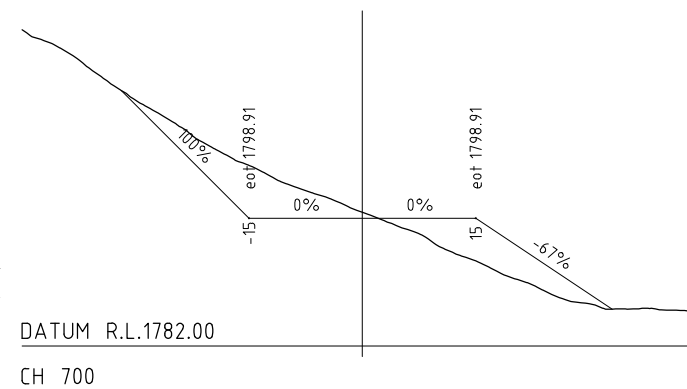
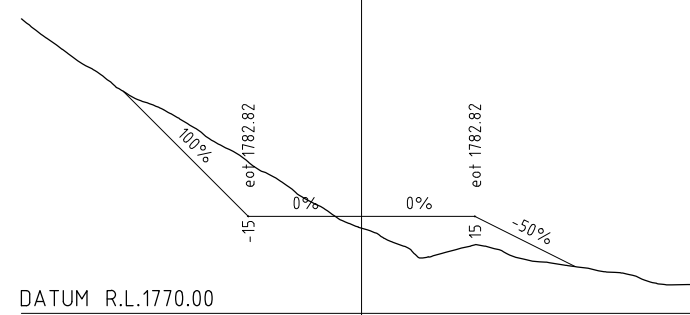
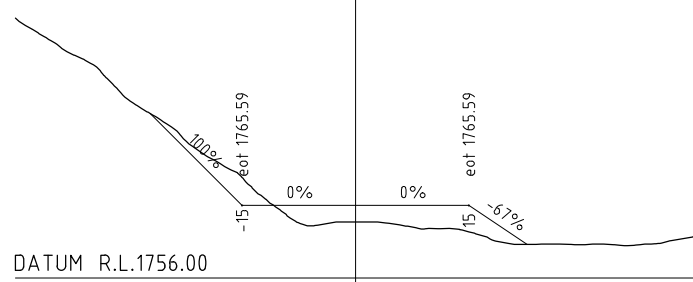
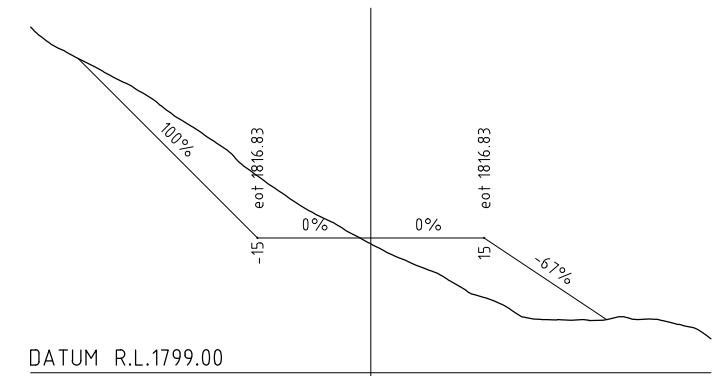
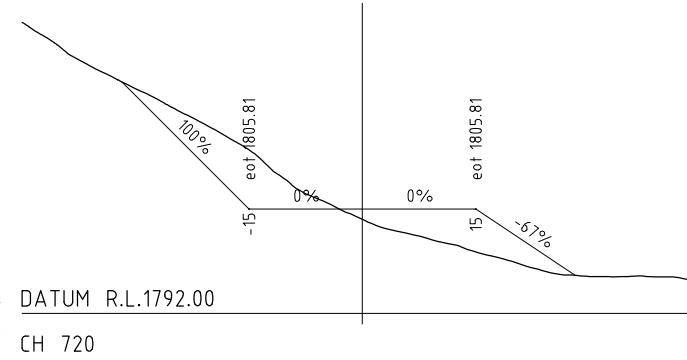
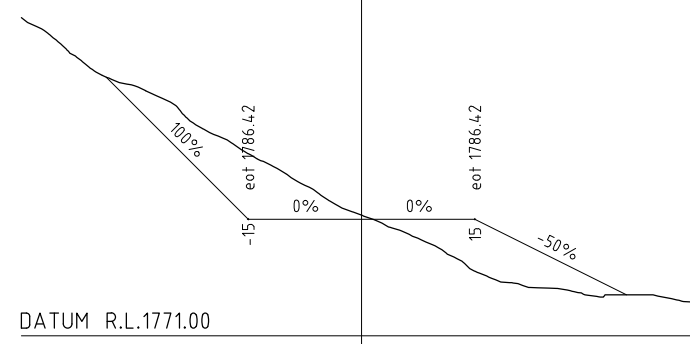
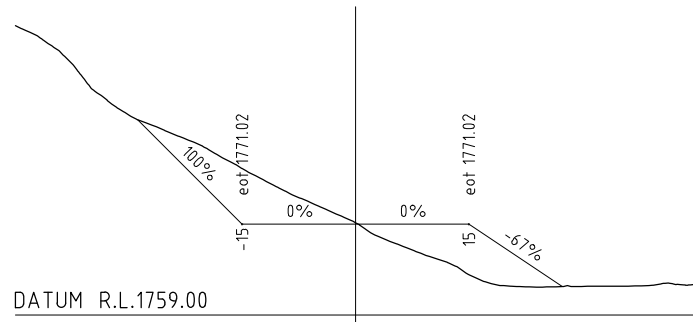
FOR CONSENT 10.07.18

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Rev.	Date	Revision Details	By

**REMARKABLES SKI FIELD
 SUGAR STASH TRAIL
 CROSS SECTIONS**

Client	Surveyed	Signed	Date	Job No.	Drawing No.
NZ SKI LTD	EM	EM	x.x.18	12650	18-30
Notes: All dimensions shown are in meters unless shown otherwise. Any person using Clark Fortune McDonald drawings and other data accepts the risk of: - Using the drawings and other data in electronic form without requesting and checking them for accuracy against the original hard copy versions. - Ensuring the information is the most recent issue. - Copyright on this drawing is reserved.	Drawn	Signed	Date	Scale	Rev.
	EM	EM	11.06.18	1:500 @ A1 1:1000 @ A3	
	Designed	Signed	Date	Datum & Level	Rev.
	CFM w NZSKI		2018	NZMG & MSL	-



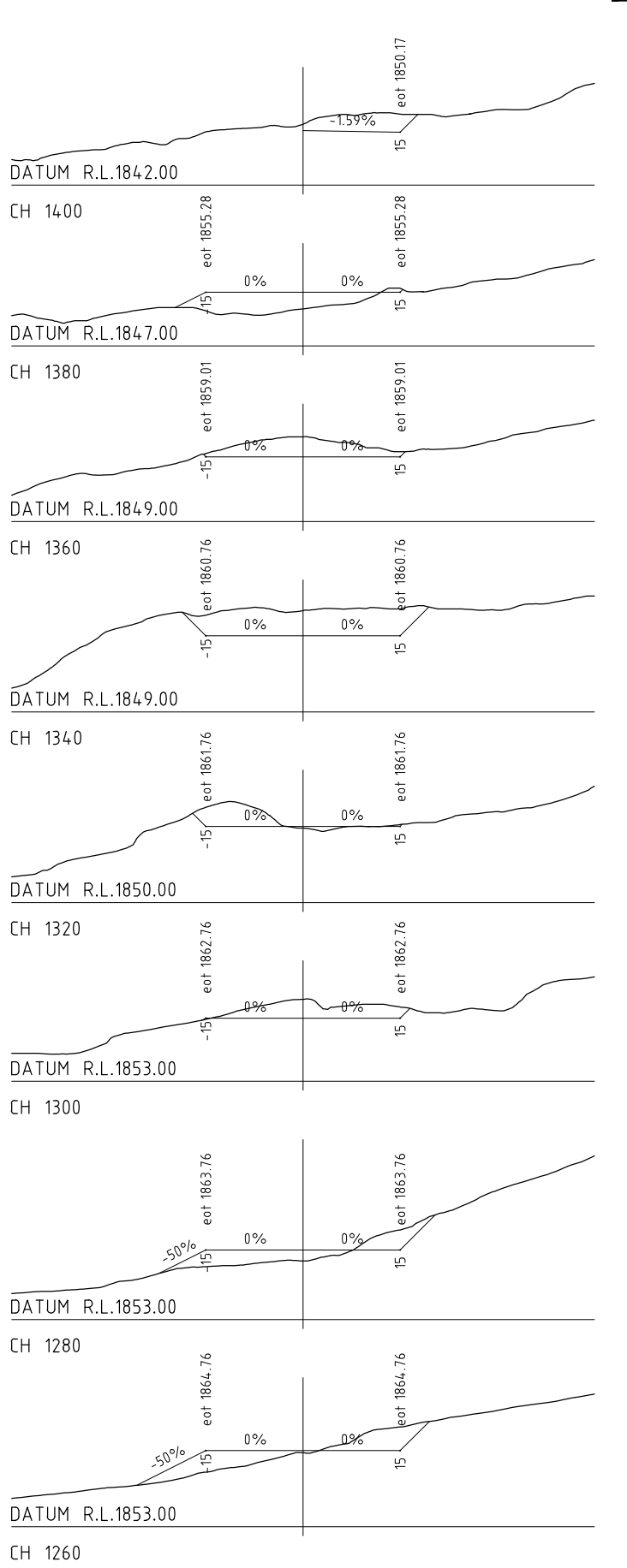
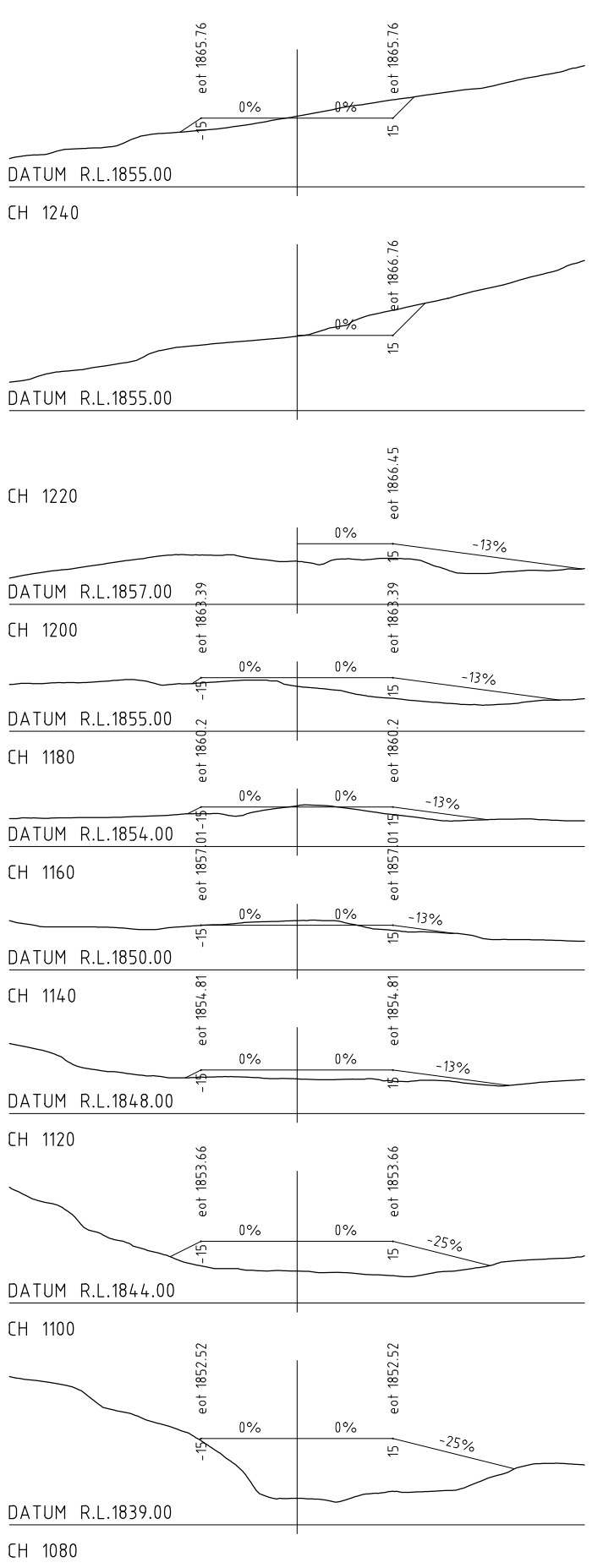
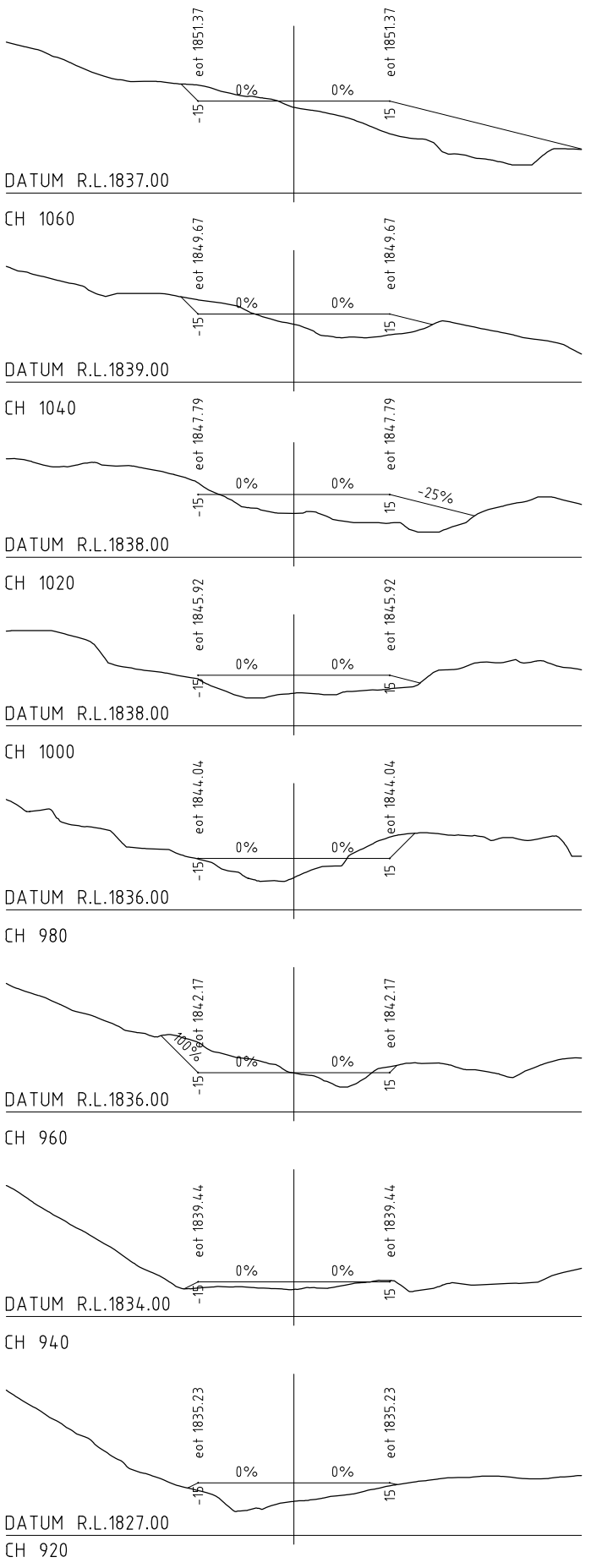
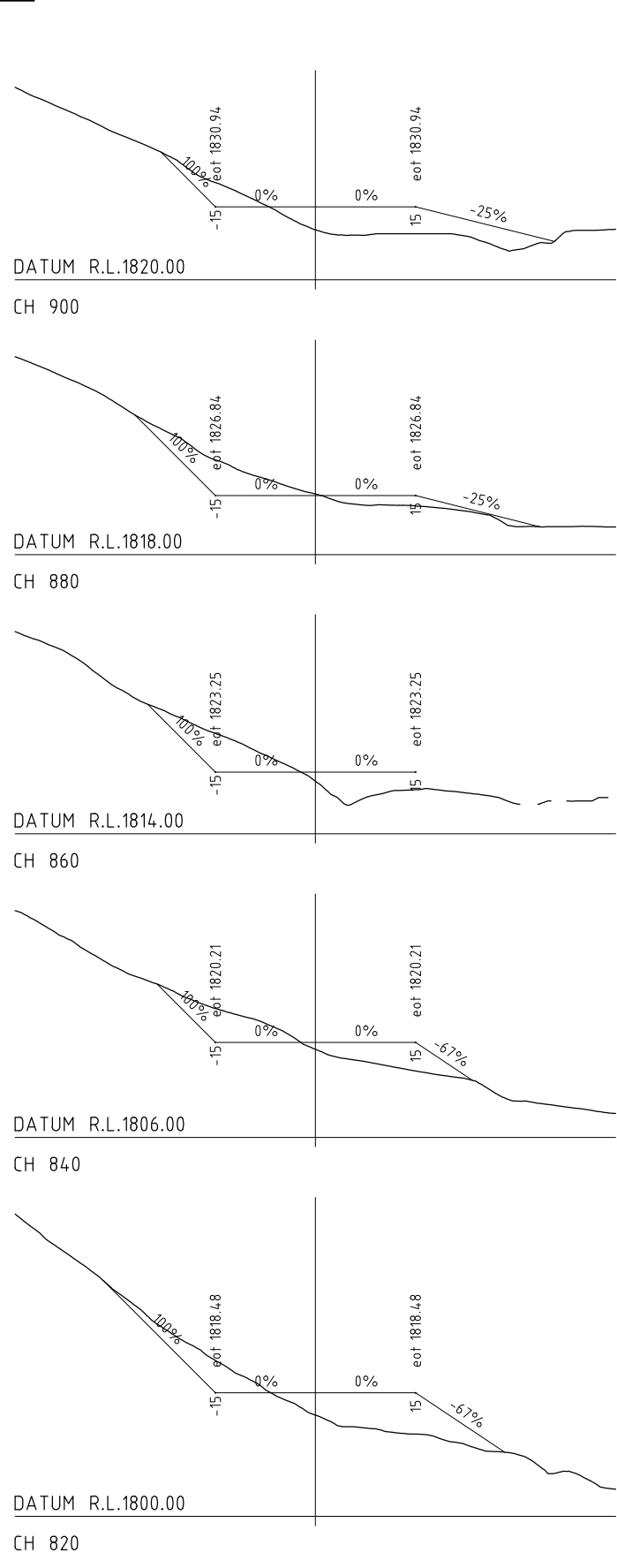
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Rev.	Date	Revision Details	By

**REMARKABLES SKI FIELD
 SUGAR STASH TRAIL
 CROSS SECTIONS**

Client	NZ SKI LTD	Surveyed	Signed	Date	Job No.	Drawing No.
				x.x.18	12650	18-31
Notes:	All dimensions shown are in meters unless shown otherwise. Any person using Clark Fortune McDonald drawings and other data accepts the risk of: - Using the drawings and other data in electronic form without requesting and checking them for accuracy against the original hard copy versions. - Ensuring the information is the most recent issue. - Copyright on this drawing is reserved.					
Drawn	EM	Signed		Date	Scale	1:500 @ A1 1:1000 @ A3
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				2018	NZMG & MSL	-



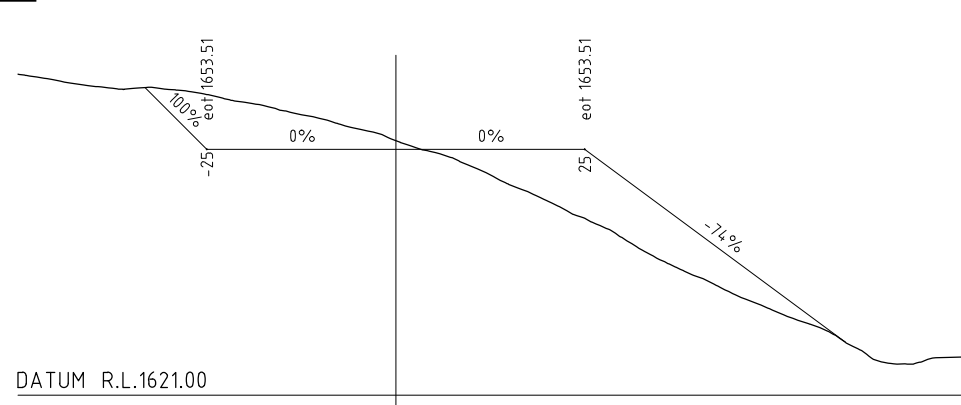
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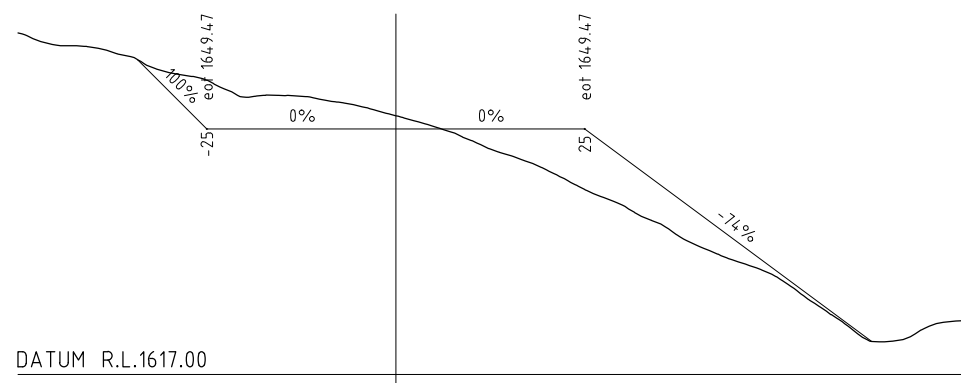
Rev.	Date	Revision Details	By

REMARKABLES SKI FIELD SUGAR STASH TRAIL CROSS SECTIONS

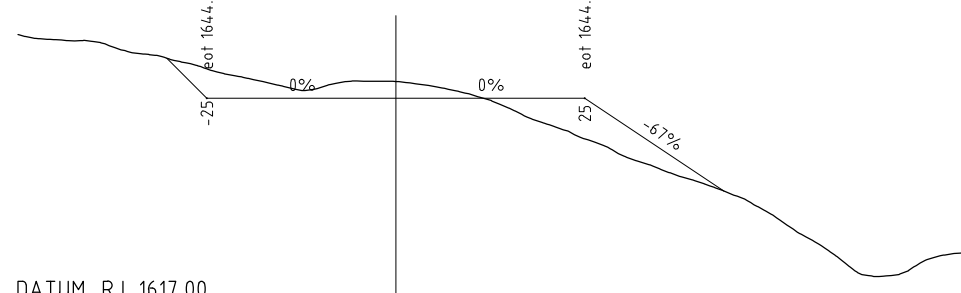
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- Using the drawings and other data in electronic form without requesting and checking them for accuracy against the original hard copy versions.	- Ensuring the information is the most recent issue.		EM		11.06.18		
- Copyright on this drawing is reserved.			Designed	Signed	Date	Datum & Level	
			CFM w NZSKI		2018	NZMG & MSL	-



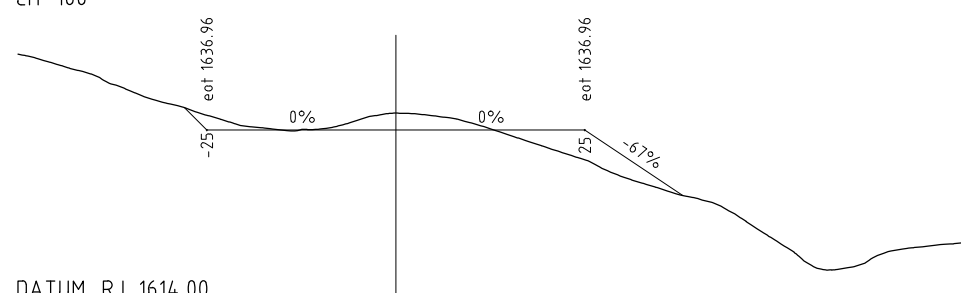
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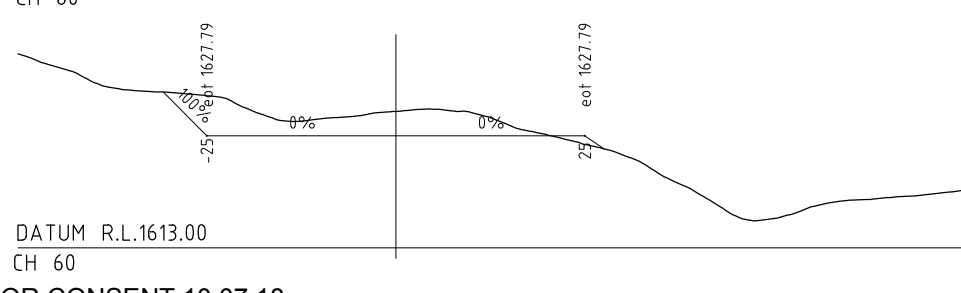
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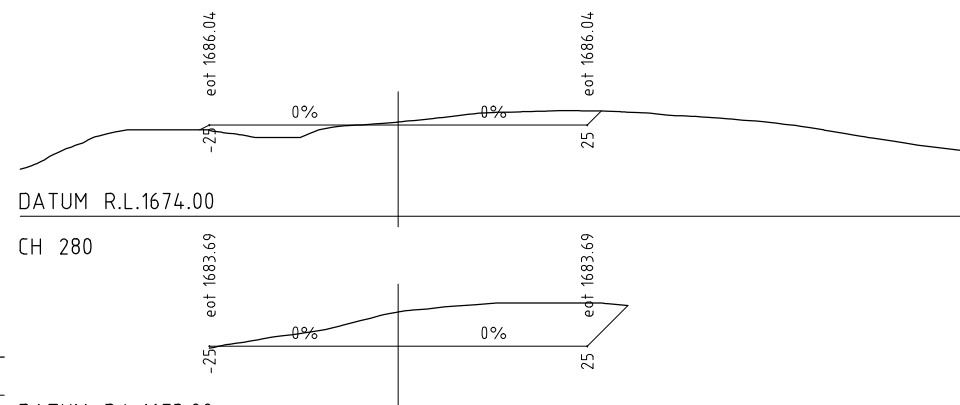
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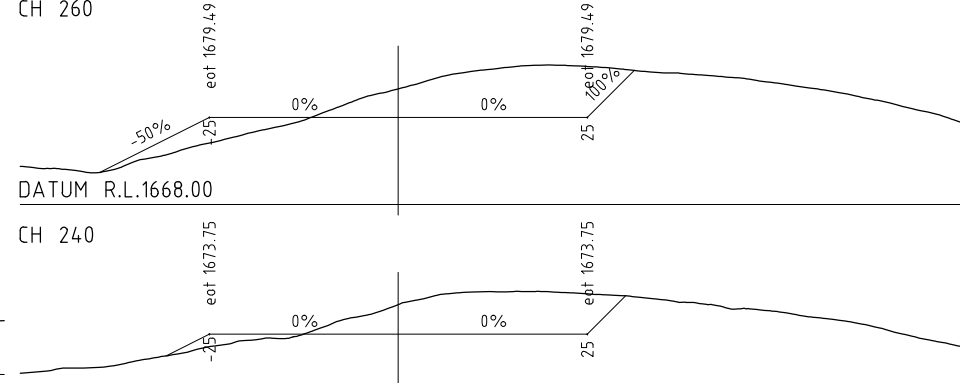
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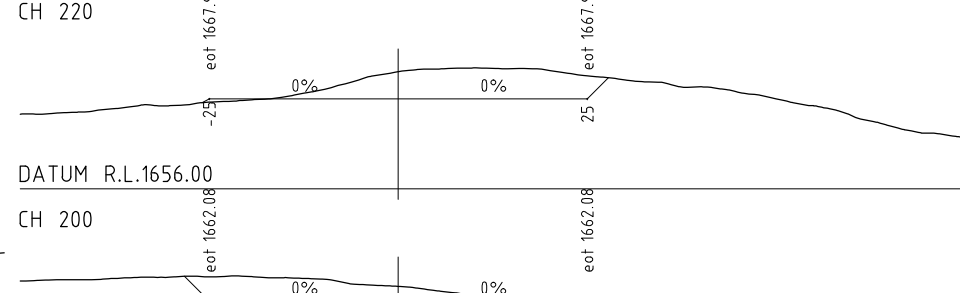
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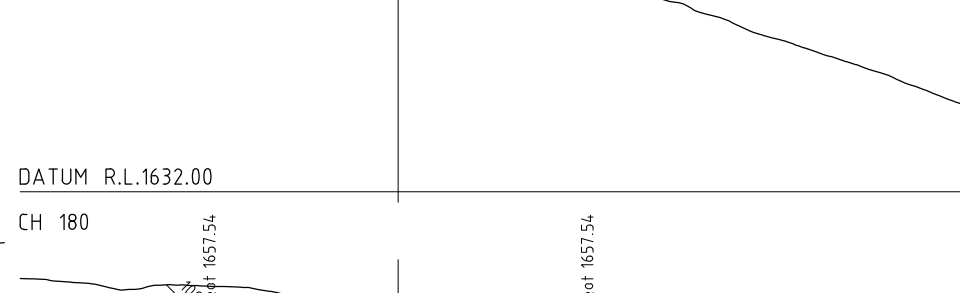
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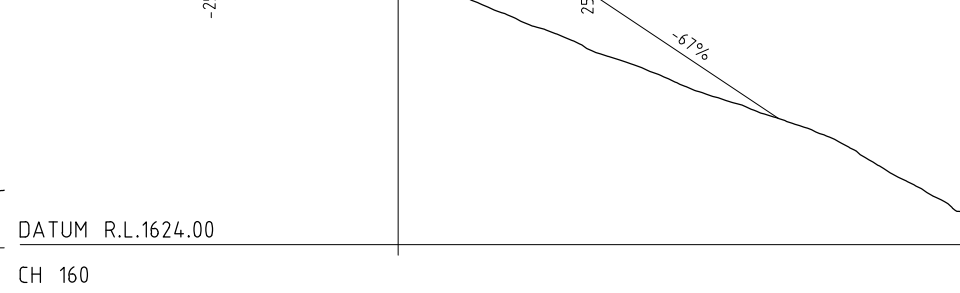
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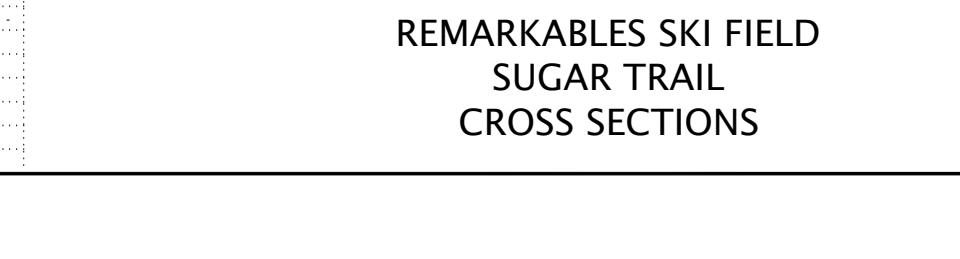
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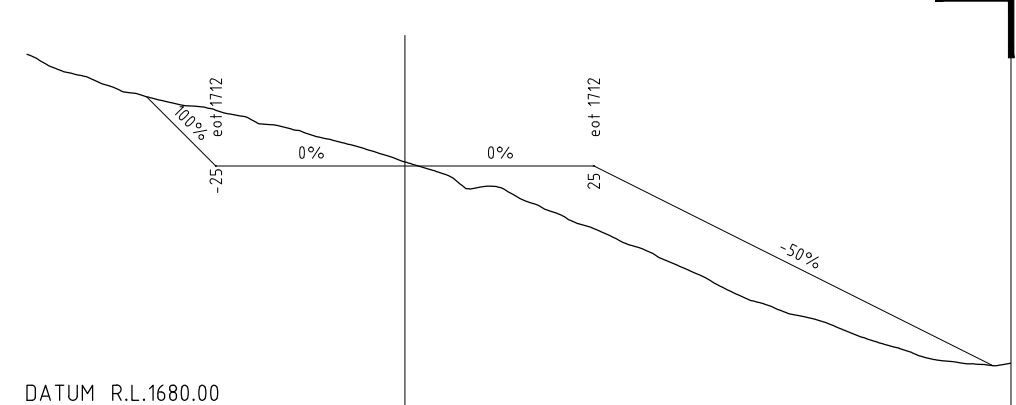
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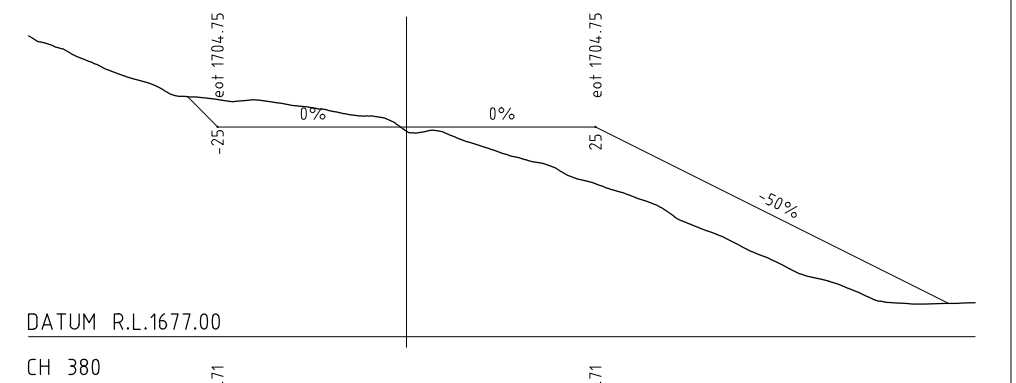
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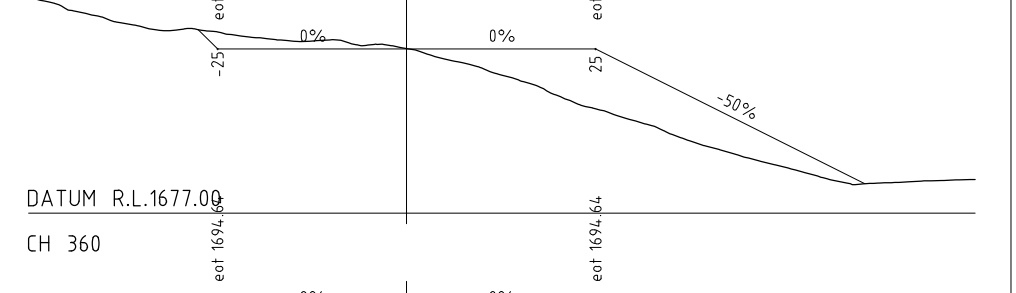
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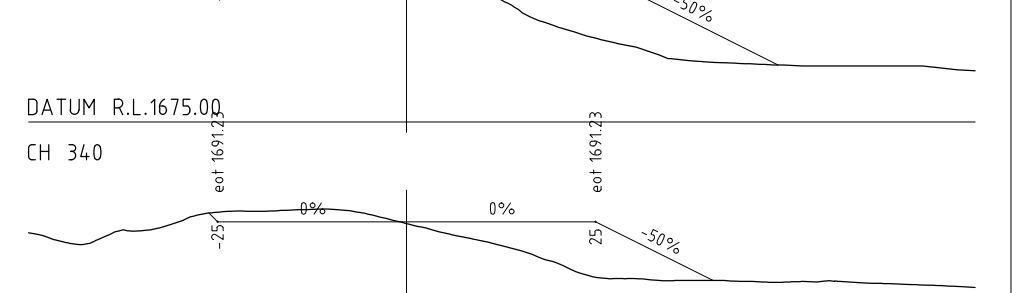
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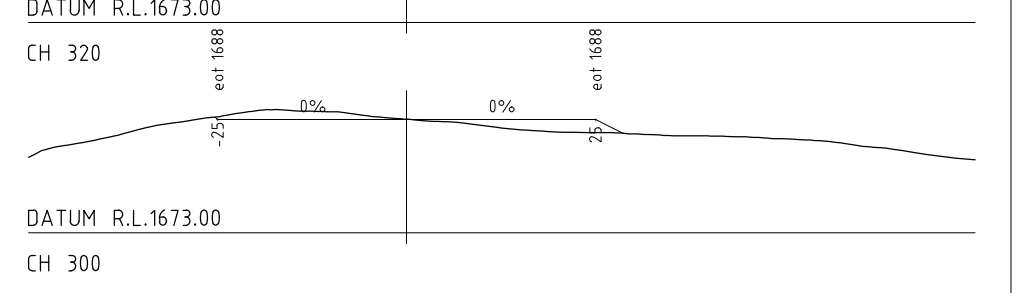
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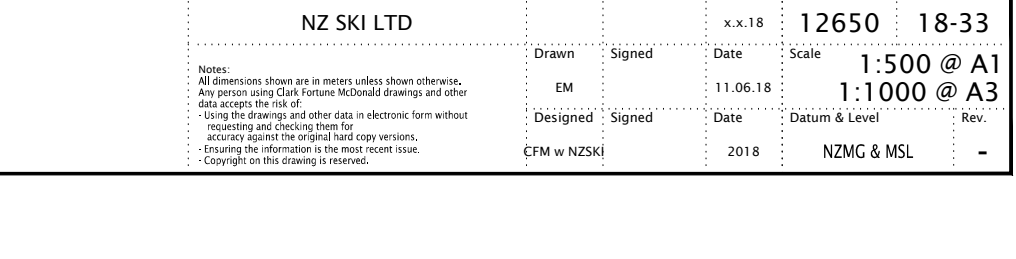
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DATUM R.L.1675.00



DATUM R.L.1673.00



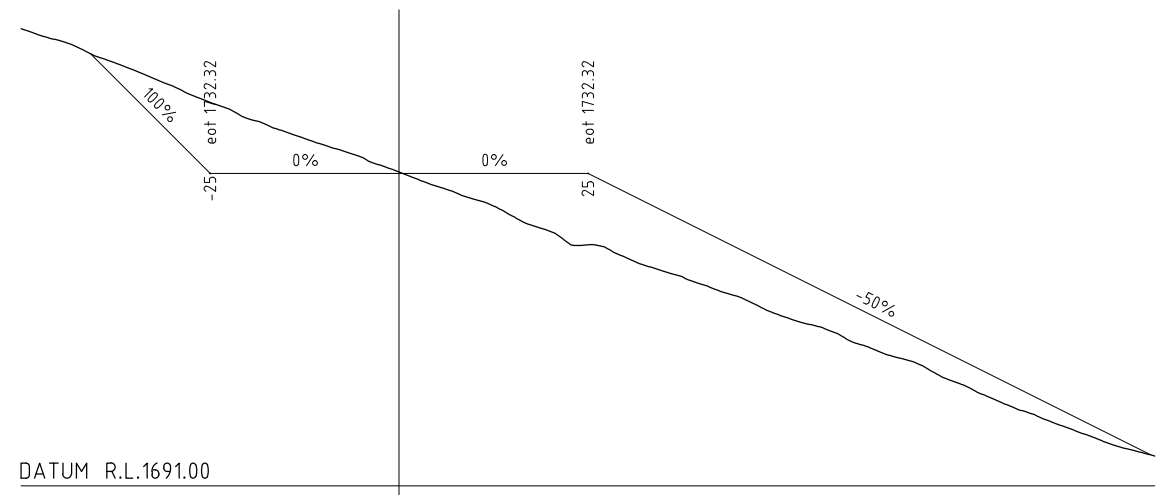
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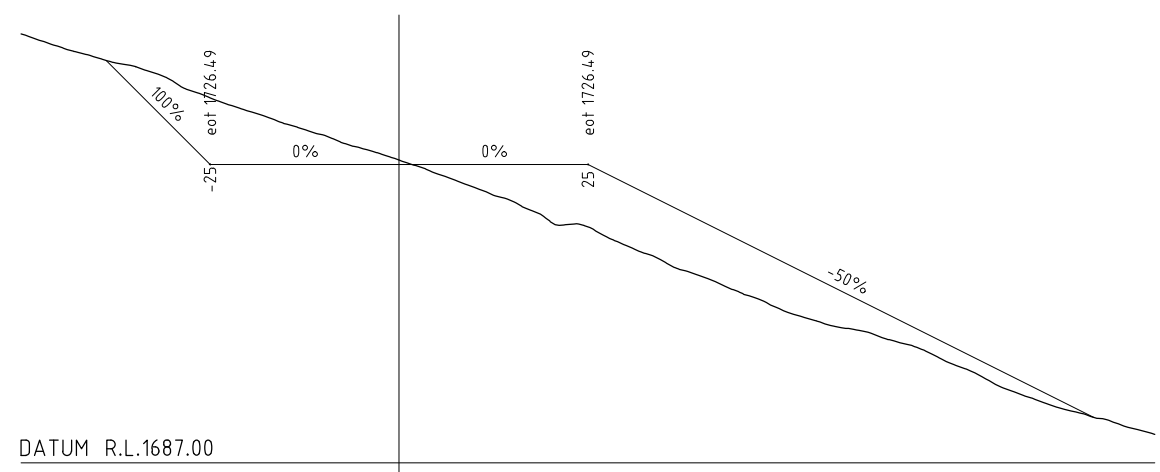
REMARKABLES SKI FIELD SUGAR TRAIL CROSS SECTIONS

Client	NZ SKI LTD		Surveyed	Signed	Date	Job No.	Drawing No.
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Notes:	Drawn	Signed	Date	Scale			
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	Designed	Signed	Date	Datum & Level	Rev.		
	CFM w NZSKI		2018	NZMG & MSL	-		



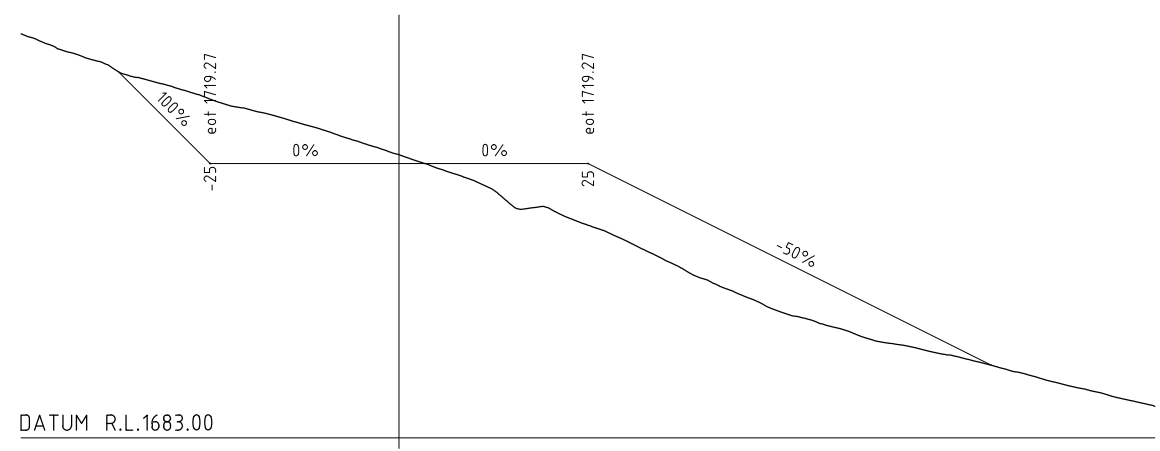
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CH 460



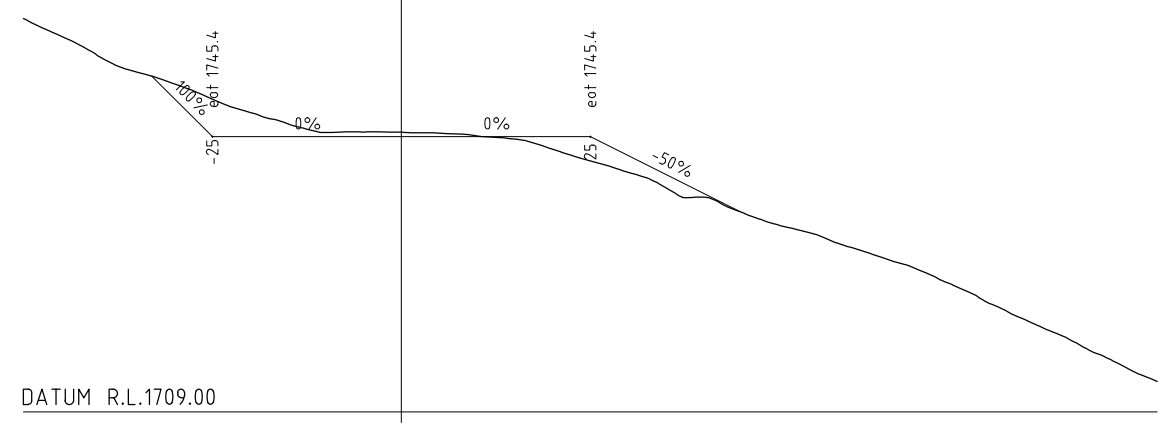
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CH 440



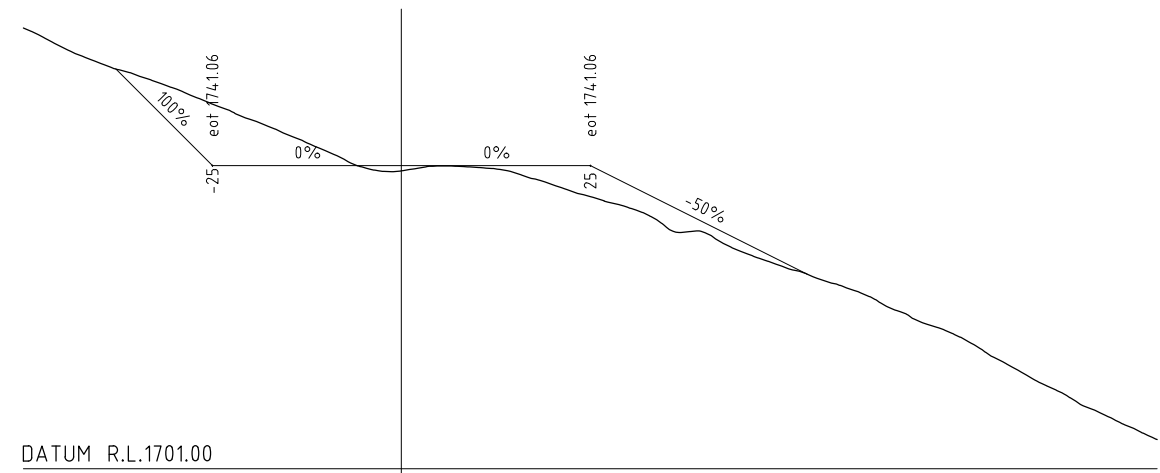
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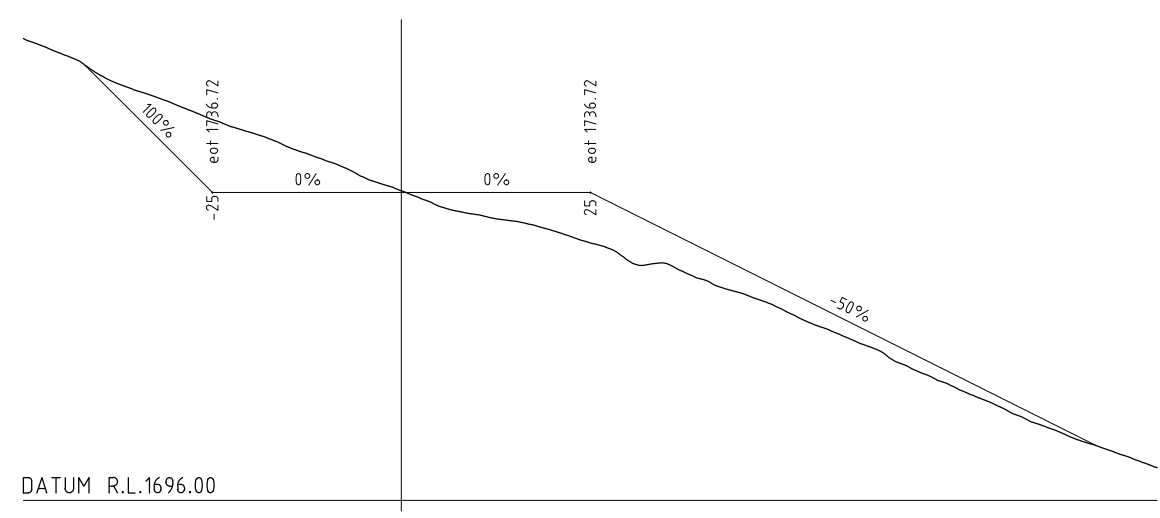
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CH 520



DATUM R.L.1701.00

CH 500



DATUM R.L.1696.00

CH 480

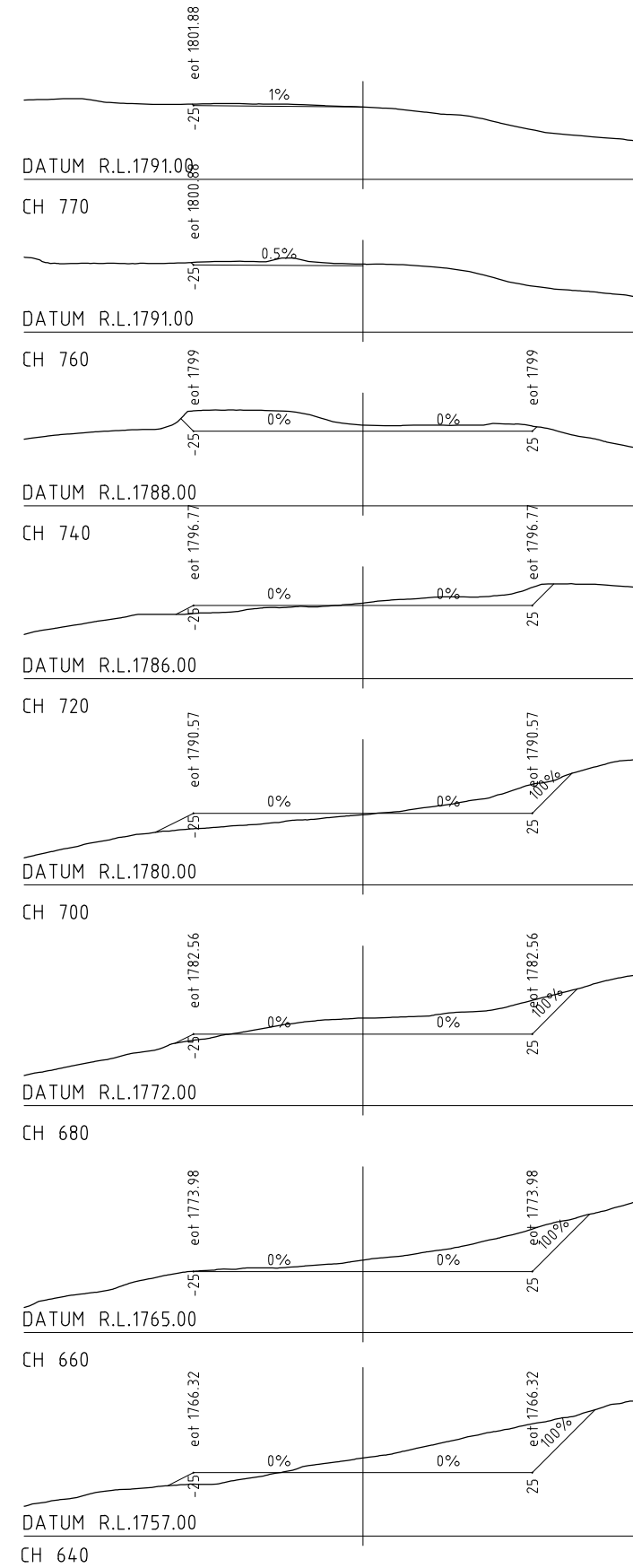
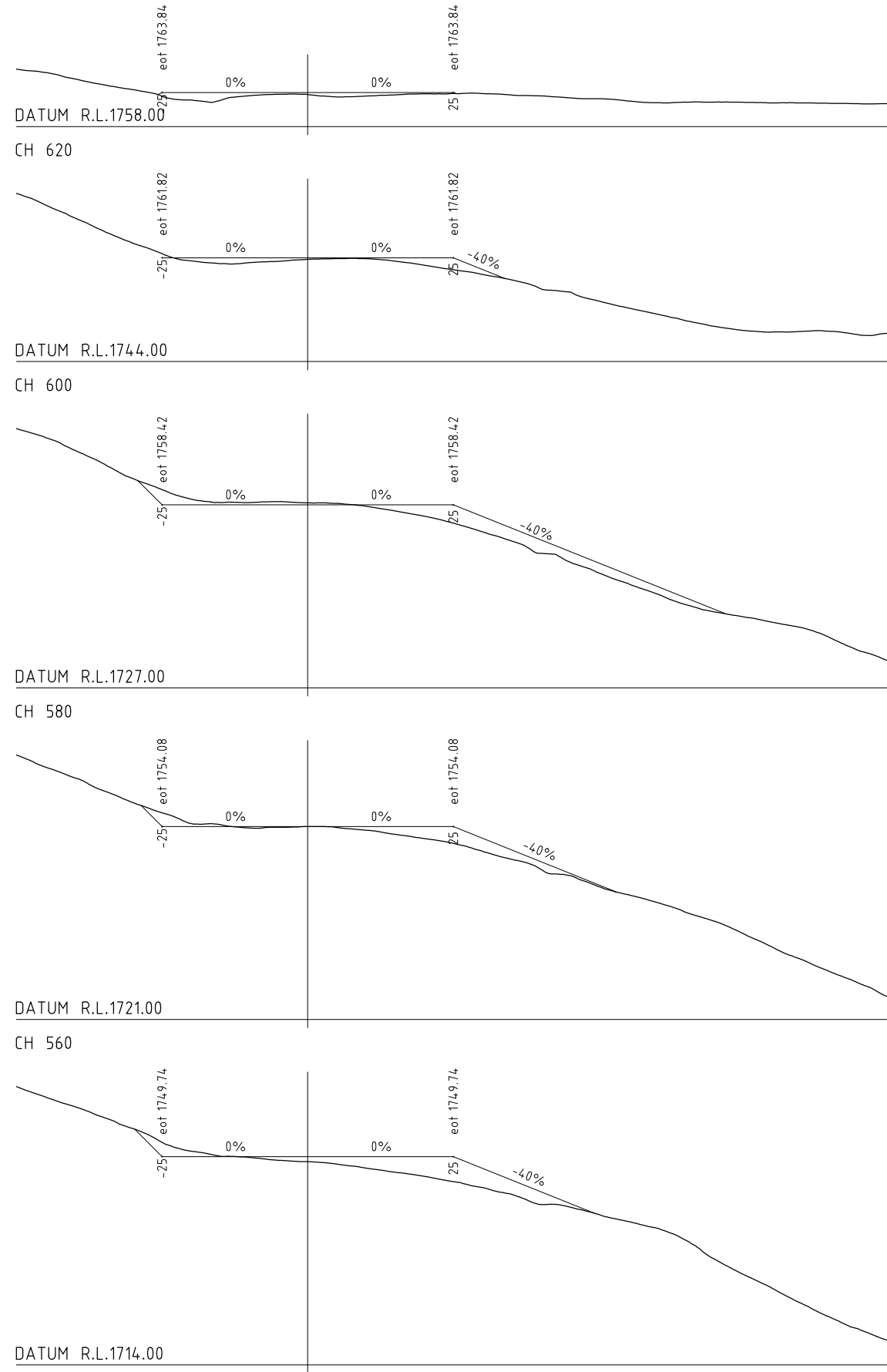
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Rev.	Date	Revision Details	By

**REMARKABLES SKI FIELD
 SUGAR TRAIL
 CROSS SECTIONS**

Client	NZ SKI LTD	Surveyed	Signed	Date	Job No.	Drawing No.
				x.x.18	12650	18-34
Notes:	All dimensions shown are in meters unless shown otherwise. Any person using Clark Fortune McDonald drawings and other data accepts the risk of:					
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	Designed	Signed	Date	Datum & Level	Rev.	
	CFM w NZSKI		2018	NZMG & MSL	-	



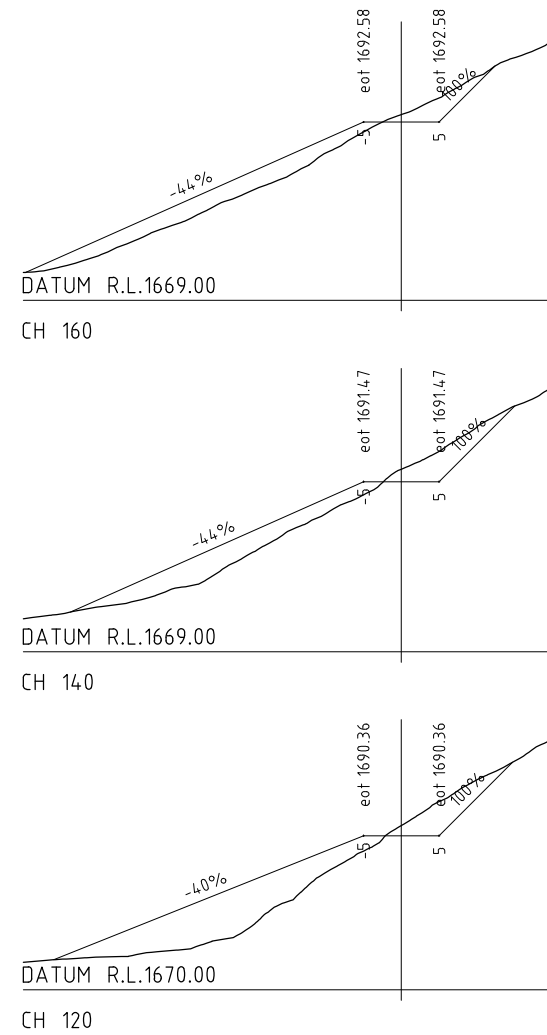
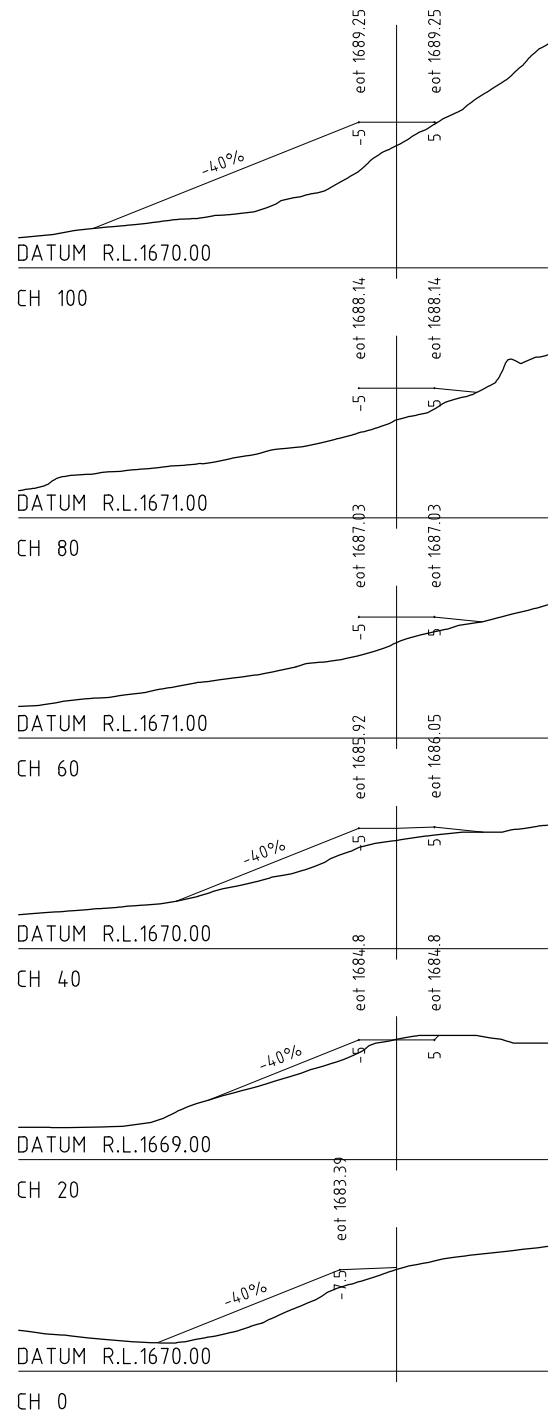
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REMARKABLES SKI FIELD SUGAR TRAIL CROSS SECTIONS

Client	Surveyed	Signed	Date	Job No.	Drawing No.
NZ SKI LTD			x.x.18	12650	18-35
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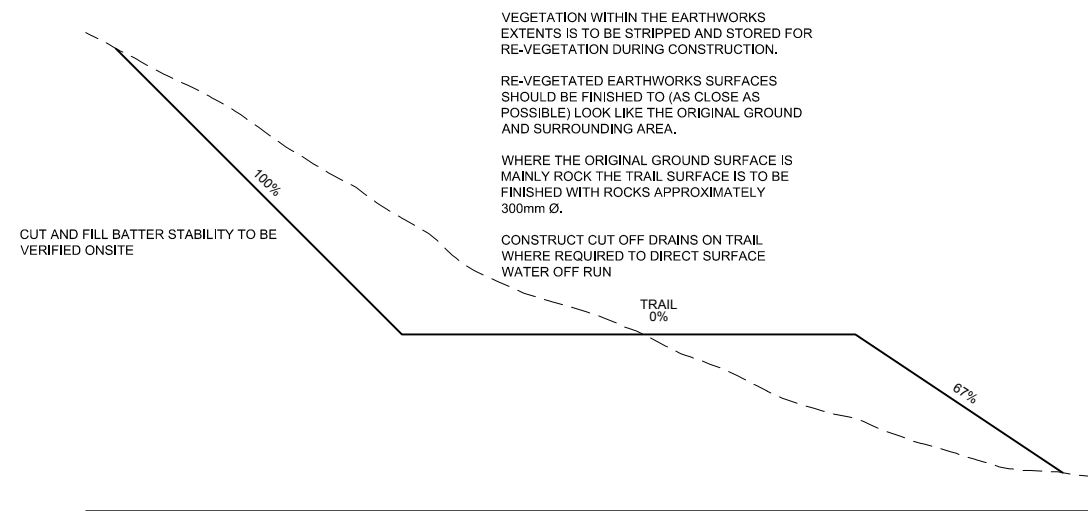
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Rev.	Date	Revision Details	By

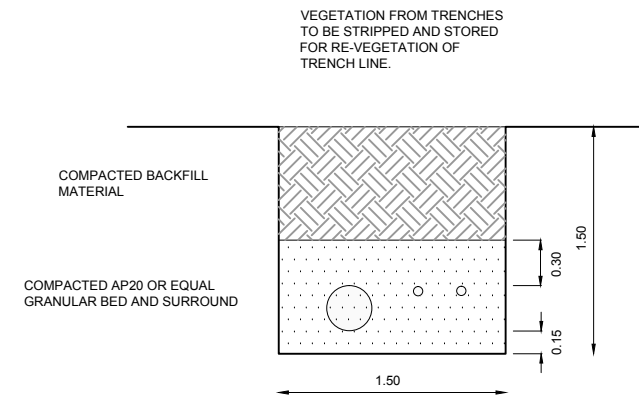
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Client	Surveyed	Signed	Date	Job No.	Drawing No.
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	EM		11.06.18	1:500 @ A1 1:1000 @ A3	
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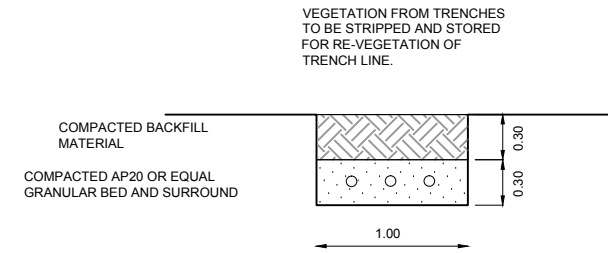
TYPICAL EARTHWORKS SECTION - CURVEY BASIN RUN 1 CH 150

SCALE 1:500 @ A1
SCALE 1:1000 @ A3



TYPICAL SNOWMAKING LINE TRENCH

SCALE 1:25 @ A1
SCALE 1:50 @ A3



TYPICAL SERVICES TRENCH

SCALE 1:25 @ A1
SCALE 1:50 @ A3

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REMARKABLES SKI FIELD TYPICAL SECTION DETAILS

Client	NZ SKI LTD	Surveyed	Signed	Date	Job No.	Drawing No.
				x.x.18	12650	18-40
Notes:	All dimensions shown are in meters unless shown otherwise. Any person using Clark Fortune McDonald drawings and other data accepts the risk of:					
	Drawn	Signed	Date	Scale	@ A1	
	EM		11.06.18	AS SHOWN	@ A3	
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	CFM w NZSKI		2018	NZMG & MSL	-	

PROTOCOL FOR THE REHABILITATION OF NATURAL ALPINE ENVIRONMENTS FOLLOWING SKI AREA DEVELOPMENT

Between

DEPARTMENT OF CONSERVATION and NZSKI LTD.

1. Introduction

The protocol sets out practical means of achieving a high standard of environmental rehabilitation during and following development works at either Coronet Peak or The Remarkables Ski Areas. NZSki will require its staff and contractors to act in accordance with the protocol.

The scope includes any work that results in any environmental disturbance including (not not limited to) the indigenous vegetation, native fauna, soil, wetlands, streams, lakes and natural landforms of the ski area. Works may only be exempted from the protocol with prior agreement from DOC.

DOC staff will conduct regular monitoring to observe progress and assess effectiveness of the measures. This will include providing advice, troubleshooting unexpected problems, adjusting management approaches and, if necessary, require corrective action to ensure the objectives of the protocol are met.

2. Objectives of the protocol

To ensure that during the course of ski area developments there is a minimum of interference with the natural environment, and avoidance of disturbance to areas outside approved work areas;

To ensure that any indigenous vegetation disturbed by development is restored as near as possible to its original density and diversity, within the shortest practical timeframe;

To minimise the erosion and sedimentation of exposed soils (and soil among transplanted vegetation), optimising the longer term regeneration of indigenous vegetation through natural dispersal;

To otherwise replicate a high standard of natural appearance to any ground not occupied by permanent structures or required to regularly bear mechanised traffic; and

To establish a clear understanding between the staff and contractors of both the Department of Conservation (DOC) and NZSki on the required standards for:

- Work site control measures;
- Removal and replacement of vegetation and top soil;
- Management of soil erosion and sediment control;
- Ongoing monitoring and maintenance of rehabilitated areas;
- Contracted monitoring; and
- DOC's ability to suspend works.

3. Work Site control measures:

- a. Only machinery operators with a demonstrated ability in low impact earthworks and vegetation rehabilitation in an alpine setting are to undertake construction;
- b. Prior to works NZSki shall ensure that a briefing occurs between its staff, contractors and DOC to ensure a common understanding of how works will be conducted;

- c. NZSki must minimise disturbing non target areas when accessing and working within development sites. If machinery is required to move off existing tracks the least damaging route must be used and any disturbed vegetation must be rehabilitated when works are completed;
- d. The risk of soil erosion over denuded areas must be carefully managed until rehabilitation works are undertaken and soil is no longer exposed;
- e. Works must be conducted to ensure no contaminants are discharged onto the land or into watercourses (directly or indirectly). All vehicles, machinery, equipment and aggregate material must be cleaned of weeds, seeds and soils before entering the works area. Refuelling must be undertaken on hard surfaces away from watercourses and vegetation.
- f. Sensitive natural features including streams, wetlands, tarns, lakes and rare habitats are not to be disturbed, either for development works or access to development sites. Where disturbance is unavoidable prior approval must be sought and additional environmental protection measures may be required;
- g. All development and rehabilitation works impacting the natural environment must be completed by the 1st May. Any unfinished work must be stabilised to prevent soil erosion until works can recommence.

4. Removal and replacement of vegetation and top soil:

- a. Vegetation must be carefully removed in a manner to minimise damage to both the above ground plant and to protect as much soil material around the roots as possible;
- b. The remaining topsoil must also be removed before excavation of rock material may commence. If not used quickly with the replanting of vegetation this topsoil may be stockpiled for later use;
- c. All vegetation removed should be quickly replanted into areas where works have already been completed. This will usually occur through progressive reinstatement on completed formations behind the main work “face”;
- d. Priority for replanting shall be given to areas prone to erosion;
- e. Individual plants or clumps of vegetated material (“sod”) shall be reinstated by careful use of a digger bucket. Spacing should be no greater than 1 metre, unless directed otherwise by DOC.
- f. Final positioning of transplanted vegetation and sods should be conducted by hand tools, with top soil packed around each plant or sod to maximise survivorship and to achieve a result that closely resembles the surrounding natural areas;
- g. When transplanted plants and sods are insufficient to cover the disturbed area additional vegetation may be sourced through splitting indigenous vegetation from adjacent areas. This should only be done where there is sufficient plant and humic material to allow survival of both ‘parent’ and ‘split’ plants.
- h. Nursery reared plants (usually tussocks) may also be used to supplement transplanted vegetation and sods. Only locally sourced seeds may be used to grow plants for the ski area. Nursery reared plants are susceptible to rapid die off and browsing and must be handled carefully as follows:
 - Fertiliser is to be placed in the root well prior to planting;
 - Plants must be well bedded to lessen risk of uprooting by feral animals; and
 - Plants may be treated with suitable chemicals to deter browsing by feral animals.

- i. Locally sourced seed of appropriate species may be broadcast to promote vegetation growth between transplanted vegetation and sods. Exotic seeds may be spread only with prior approval;
- j. Special care must be taken when replanting on steep slopes between 30 and 45 degrees:
 - Plants should be transplanted quickly, steep slopes require plants to be in the healthiest possible condition;
 - Indented troughs or depressions should be formed to create “bedding” for the tussocks or sods to be transplanted. Replanting should not occur on sheer surfaces;
 - Replanting should be as close together as practical, leaving little exposed ground;
 - Large heavy plants and sods should be staked for support where possible;
 - Steep slopes should be closely monitored and any plants or sods released from the slope quickly retrieved, split into smaller, lighter clumps and replanted back into the slope as described above;
 - Consideration should be provided to planting small nursery reared plants where possible;
 - Attempts at replanting vegetation on slopes steeper than 45 degrees should only proceed with prior approval;
- k. The vegetation removed at one site may be used at another development site within the ski area only with prior approval;
- l. If no areas are available for a quick reinstatement, vegetation may be temporarily stored in designated areas with prior agreement;
 - All handling of vegetation for longer term storage must be done with great care to minimise cumulative damage to plants;
 - Vegetation may only be stockpiled up to one metre high to avoid die off resulting from smothering and crushing; and
 - All vegetation temporarily stored must be watered when protracted dry conditions may impact on survivorship.
- m. If NZSki expects to have a surplus of vegetation and/or topsoil at the end of works, this must be replanted /spread over other areas of rehabilitation, under direction from DOC.
- n. Any surplus rock material must not be stockpiled and/or spread over nearby terrain without prior approval.
- o. NZSki will actively eradicate any noxious weeds from all development and rehabilitation areas; and
- p. No rock landscaping may be used as a substitute for vegetation unless by prior agreement.

5. Management of soil erosion and sediment control

- a. The surface of vehicle tracks, formed ski trails and any other disturbed ground without a cover of indigenous vegetation will be managed to improve water infiltration, minimise rilling and sheet erosion, reduce suspension of sediment and provide micro sites for wind borne seed to settle. Control measures include;
 - shaping / crowning the surface;
 - applying an appropriate gravel surface in problem areas;
 - forming of earth, rock or vegetation bunds;

- Ripping or roughening soils perpendicular to the slope angle; and
 - Constructing water tables/swale drains to intercept and divert surface flows.
- b. Where the slope angle exceeds 30 degrees natural features such as rocks could be incorporated into the slope where this lends to the stability of the site; this would require prior approval from DOC and potentially the support of geotechnical experts. This solution would be considered on a site by site basis.
 - c. Water tables/swales must have a catchment area no greater than 2,000m². Ski trails must have functioning swales no less than 60m apart. All water tables/swales must be clear of sediment and able to convey water.
 - d. Water tables and swales must lead to an appropriately designed and armoured settlement pond to capture sediment so only clear water disperses into the surrounding landscape.
 - These ponds must be large enough to ‘settle’ the flow and allow sediment to be deposited, particularly from heavy rainfall events. Precise dimensions will depend on the area and erosion potential of catchment above, however, these may be graduated areas 1m wide x 2m long x 1m deep. They should be armoured with rocks or surrounded by soil mounds and tussocks or geotextile materials.
 - Sediment captured by settlement ponds are to be redistributed to assist re-vegetation of disturbed areas, whether previous or planned earthworks e.g. used to fill gaps between transplanted tussocks or to improve the mineral soil content when planting nursery tussocks.
 - Settlement ponds must be maintained such that they provide a means of monitoring the effectiveness of control measures thereby assist adjusting management approaches to reduce the potential for recurrent erosion.
 - e. To protect wetlands and wetland vegetation from sediment no surface water carrying sediment must be allowed to run into wetland areas. Settlement ponds must not exit onto wetland areas. Water tables and swales must be designed to maintain the hydrological integrity of adjacent seepages and wetlands.
 - f. Areas requiring erosion control measures are to be prioritised based on the following criteria:
 - Vulnerability to erosion (e.g. slopes > 20 degrees, unconsolidated soils, disturbed ground adjacent to compacted soils)
 - Saturated soils on cut faces where seepages have been intercepted,
 - Remediation of slips or slumped land and stabilisation of land to prevent further or repeated slope failures.
 - Settlement areas that require armouring or treatment in order to filter water,
 - Stabilisation works required to facilitate revegetation.
 - g. Areas identified for erosion control and soil conservation work may vary from year to year as revegetation occurs and slope and soil stability is achieved. Areas prioritised for erosion control in the 2015 – 2016 works programme are outlined in **Attachment A** below.
 - h. Significant developments will have a soil conservation and erosion control plan in place prior to the commencement of works. This plan will demonstrate how the objectives of this protocol will be achieved.

6. Ongoing monitoring and maintenance of the rehabilitated area

- a. The purpose of the monitoring is to assess the progress of rehabilitation and advise NZSki how to prevent or minimise risks to re-growth becoming self sustaining;

- b. All development and rehabilitation works will be monitored at least once prior to the commencement of work and again at completion of works. Interim monitoring may be required, depending on the nature of work. Following completion, regular monitoring will continue until DOC resolves, at its sole discretion, that the rehabilitation of the natural environment can progress unaided;
- c. Additional monitoring of erosion and sediment control measures will be made during or following significant periods of rainfall.
- d. Where monitoring establishes significant risks to rehabilitation, DOC will require NZSki to take any reasonable steps to rectify the situation and return the area to its desired condition. Any additional work required will be carried out at the cost of NZSki;
- e. In the event that an area is not rehabilitated following works, monitoring will continue until rehabilitation works have begun. Attention will be paid to preventing erosion during any lay period;
- f. DOC should reserve the right to recover the actual and reasonable costs of monitoring work.

7. Contracted monitoring:

DOC may contract monitoring to an external person/s. This approach not only provides time savings, but can also source specialist expertise on how to rehabilitate the sensitive alpine vegetation. This expertise is also vital to advise on appropriate remedial actions for any issues, and to provide expert input to planning processes. Contracted monitoring will take place as follows;

- a. The contractor is generally tasked to monitor the implementation of this protocol during any ski area development work that disturbs the natural environment;
- b. The monitor is to resolve any concerns of a routine nature directly with NZSki. Issues should be referred to DOC when problems are recurrent, significant in scale, unconventional or if a mutual agreement cannot be reached;
- c. To advise both DOC and NZSki whenever their action (or inaction) may present a problem for ski area environment, whether related to a specific development or any other activity;
- d. The monitor is to immediately advise DOC and NZSki if unauthorised works may be occurring, of significant risks to the natural environment that warrant suspension of works, and of any concerns with geotechnical hazards and/or public safety;
- e. Monitoring visits are to be scheduled in consultation with NZSki and DOC at a frequency of no more than once a week and no less than three times a summer (depending on nature of works over summer);
- f. If agreement on scheduling cannot be reached, DOC will make a final decision and notify NZSki of when monitoring is to occur;
- g. A brief written report of each monitoring visit is to be forwarded to DoC and NZSki in a timely manner. Reports should take a broad approach to assess overall performance, record agreements reached on site and highlight unresolved issues. Reports should take advantage of photo monitoring where possible;
- h. The time required for visits (and reports) are to be appropriate to the works in progress. The monitor is to notify and seek agreement from NZSki on where the combined time required for site visits and reporting is likely to exceed 5 hours;
- i. Support tasks supplementary to monitoring and reporting (eg research and meetings) are to be agreed with DOC and NZSki prior work occurring;

- j. The time spent on monitoring visits, reporting and support work will be billed directly to NZSki at a rate equivalent to DOC's current hourly rate for field staff, plus gst. Disbursements are to be billed separately.
- k. All monitoring reports and discussions between the contractor, NZSki and DOC will be kept confidential.

8. Right to suspend works

- a. DOC will, at its sole discretion, suspend any development work or activity should contracted monitoring, public feedback or DOCs own observations determine there are unexpected and/or significant impacts on the natural environment that are not being adequately rehabilitated.
- b. Any suspension shall remain in place until a response plan is agreed with NZSki.

ATTACHMENT A

The Remarkables: Priority Areas for erosion control measures and monitoring 2015 - 2016:

In the 2013 – 2014 and 2014 – 2015 substantial development occurred at the Remarkables Skifield. As a result, the following areas have been prioritised for soil erosion control works in 2015 – 2016 growth season (November – April).¹

Curvey Basin Trail

- Curvey A trail from chainage 60m through to 360m.
- Curvey B trail from chainage 60m through to 360m.
- Curvey main trail chainage 360m through to 600m.
- Curvey main trail chainage 600m through to 800m.
- Curvey main trail triangle at 820m through to 860m.
- Curvey main trail 'old road' 860m through 1040m.
- Curvey main trail 'Ford' 1040m through 1072m.

Lower Alta Green trail

- Trail chainage 0m through to 72m

Summer access road

- Road on Alta Green trail elevation 1,660m asl down to 1,640m asl.
- Road up Turquoise trail including elevations 1,660m asl to 1,726m asl.

Learners Area

- Elevations between 1,607m asl and 1,624m asl.

Description of Planned Soil Conservation Measures (2015 – 2016)

Curvey Basin Trail

- Curvey A trail from chainage 60m through to 360m.
 - 4 swales crossing the trail left to right (looking downhill)
 - Settlement area at the end of the swale
 - Swales need to be maintained in good working order
- Curvey B trail from chainage 60m through to 360m.
 - 2 swales in the lower section of this area. The trail material is very porous here as it was all fill in course aggregate
 - Swales need to be maintained in good working order
- Curvey main trail chainage 400m through to 640m.
 - 3 swales running right to left²
 - 1 swale running left to right at the 640m chainage
 - All have settlement areas at their terminals
 - Swales need to be maintained in good working order
- Curvey main trail chainage 640m through to 800m.

¹ Where chainage details are provided, refer to the approved Cut and Fill Plans prepared by Clark Fortune McDonald for the development of the Curvey Trail.

² Orientation – facing down the trail/ track

- 3 swales running left to right
- All have settlement areas at their terminals
- Swales need to be maintained in good working order
- Curvey main trail triangle at 800m through to 860m.
 - Once the slope was reshaped it was roughened across the exposed area to mitigate downhill run off.
 - Tussocks have been planted / transplanted here, although currently sparse these will mature to provide ground cover over the next 5 years.
- Curvey main trail 'old road' 860m through 1040m.
 - The road has been reinstated back to natural landscape with areas of rock scree where vegetation was scarce.
 - Ground slopes and the seepage flows were reinstated as near as practicable to pre-development condition.
- Curvey main trail 'Ford' 1040m through 1072m.
 - Surface water from the development of Curvey trail has been contained within a swale drain and flows into the Rastus Burn immediately upstream of the Ford.
 - Scoured land east of the Ford to be smoothed over/ re-contoured by hand and planted.
 - The access road to the base of Sugar Bowl chair requires another 300mm depth of surface material on it to help control surface flow and reduce scouring of the ford in this area. Raising the access track level will enable water to drain into the swale above the Rastus Burn Ford.

Lower Alta Green trail

- Trail chainage 0m through to 72m
 - Natural drainage from Turquoise trail and the tank farm runs across the summer access road and into depression north of Tower 6 of the Curvey Chairlift. A bund was formed using earth and tussocks to prevent sediment carrying beyond this point. The bund has suffered a minor breach with sediment extending down slope which requires repair and maintenance.
 - The area needs to be monitored to make sure run off is still retained and sediment settles within the intended area.
 - Build up of sediment in this area may require removal to retain the integrity of the structure until such time as surface runoff and sediment flow are reduced.
 - Water tables and Swales on the Turquoise trail need to be maintained in good working order, this will follow maintenance of the summer access road – see below.

Summer access road

- Road on Alta Green trail elevation 1,660m asl down to 1,640m asl.
 - 2 water tables are in place to remove surface water from the track.
 - Currently there are no effective settlement areas to capture/ retain sediment flows. These need to be introduced in a manner that prevents sediment from entering the Alta Green wetland.
 - Roading material about 300mm deep is to be placed, compacted and shaped on the road with a design that will eliminate any transfer of sediment from the road to the off- site areas in the future.

- Swales designed to reduce the erosive potential of water carried off the access road need to be maintained in good working order; these may require rock armouring. These need to be designed such that they prevent sediment from entering the Alta Green wetland.
- Road up Turquoise trail including elevations 1,660m asl to 1,726m asl.
 - 3 water tables exist across the road access running left to right.
 - The outflow runs into tussock
 - Minimal transfer of sediment occurs here since road surfacing has been laid, shaped & compacted.
 - Swales need to be maintained in good working order

Learners Area

- Elevations between 1,607m asl and 1,624m asl.
 - Once final landscaping is complete the area, roughly 16,000m², will be ripped and roughened across the trail.
 - A seed mix of Chewing Fescue (*Festuca rubra*) will be broadcast to secure short term cover. Sowing rates should be light such that Fescue does not form a competitive thatch that inhibits natural regeneration of native herbs.
 - Additional broadcasting of native seed harvested from site will also occur.
 - Consideration is being given to applying a spray on mulch to assist in protecting the soil until such time as grasses and native cover can be established.

Summary:

The protocol and prioritised soil conservation works are intended to prevent loss of soil from site and enable the successful revegetation of disturbed areas.

Soil erosion control measures additionally aim to avoid or minimise sedimentation of adjacent wetlands and tussock grasslands during and following earthworks.



Lower Sugar Bowl Trails Ecological Assessment

NZ Ski Limited

May 2018



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Lower Sugar Bowl Trails
Ecological Assessment

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1 Introduction

1.1 Overview

NZ Ski Limited (NZ Ski) is currently seeking resource consent to undertake earthworks and clear native vegetation to develop new trails and a new lift line to the north of the existing Sugar Bowl Chairlift as part of an expansion to their Remarkables Ski Area operations (see Figure 1). The proposed development will require cut and fill earthworks to create trails with slope angles that are suitable for beginner and intermediate users. Clearance of indigenous vegetation is proposed, however the majority of the vegetation that is present within the study area is to be uplifted and relocated back onto the side batters once the trails have been established. The proposed activities will trigger indigenous vegetation clearance rules in the Queenstown Lakes District Council (QLDC) District Plan.

To assess the potential impacts of the proposed vegetation clearance on the local ecological values, NZ Ski commissioned e3Scientific Limited (e3s) to undertake an ecological assessment of the proposed areas to be cleared. This ecological assessment describes the ecological values of the areas to be disturbed and reviews the ecological implications of the proposal. e3s understands this report will be lodged with both the QLDC and the Department of Conservation (DOC) for their review.





Figure 1: Site Location Plan.

1.2 Ecological Report Structure

The report is structured as follows:

- Section 2: Description of the environmental context and the proposed vegetation clearance and associated earthworks.
- Section 3: The methodology employed during the ecological assessment.
- Section 4: Description of the flora and faunal values present within the subject areas.
- Section 5: Assessment of the significance of the ecological values within the development footprint
- Section 6: Ecological Impact Assessment.
- Section 7: Conclusions and recommendations.



1.3 Limitations

e3s performed the services in a manner consistent with the normal level of care and expertise exercised by members of the environmental science profession. No warranties, express or implied, are made. The confidence in the findings is limited by the Scope of Work, and limited data due to the site visits being at one time of year. A full range of biota that are present at this site may not have been seen or recorded, however, desktop research was utilised to aid the assessment.

The results of this assessment are based upon site inspections conducted by e3s personnel, and information provided in scientific literature. All conclusions and recommendations regarding the properties are the professional opinions of e3s personnel involved with the project, subject to the qualifications made above. While normal assessments of data reliability have been made, e3s assumes no responsibility or liability for errors in any data obtained from regulatory agencies, statements from sources outside e3s, or developments resulting from situations outside the scope of this project.



2 Description of the Activity and Existing Environment

2.1 Environmental Context

The proposed Lower Sugar Bowl works are situated on the western facing slope of the Remarkables Ski Field. The proposed trails are predominately to the north of the Sugar Bowl Chairlift and will intersect the Fall Line, Cross Fall and Upper and Lower Gallery ski trails. The proposed trails will cross the Rastus Burn and finish near the new medical facility building (Figure 1). The site is located in the Rastus Burn Recreation Reserve, within the Remarkables Ecological District of the Lakes Ecological Region (DOC, 2018). Under the operative and proposed Queenstown Lakes District Plan the area is zoned Remarkables Ski Area Sub-Zone (QLDC, 2009; QLDC, 2017).

The area for the ecological review is presented in Figure 2 and henceforth referred to collectively as the 'study area' or as 'Trail 1 – Proposed Sugar Trail', 'Trail 2 – Proposed Sugar Stash Trail' and the 'Connecting Trail – Proposed Sugar Trail Link'. The Sugar Trail is proposed to be 50 m wide, the Sugar Stash Trail is proposed to be 30 m wide and the Sugar Trail Link is proposed to be 10 m wide. The cuts and batters will be additional to these widths (see Appendix A for the earth works plans).



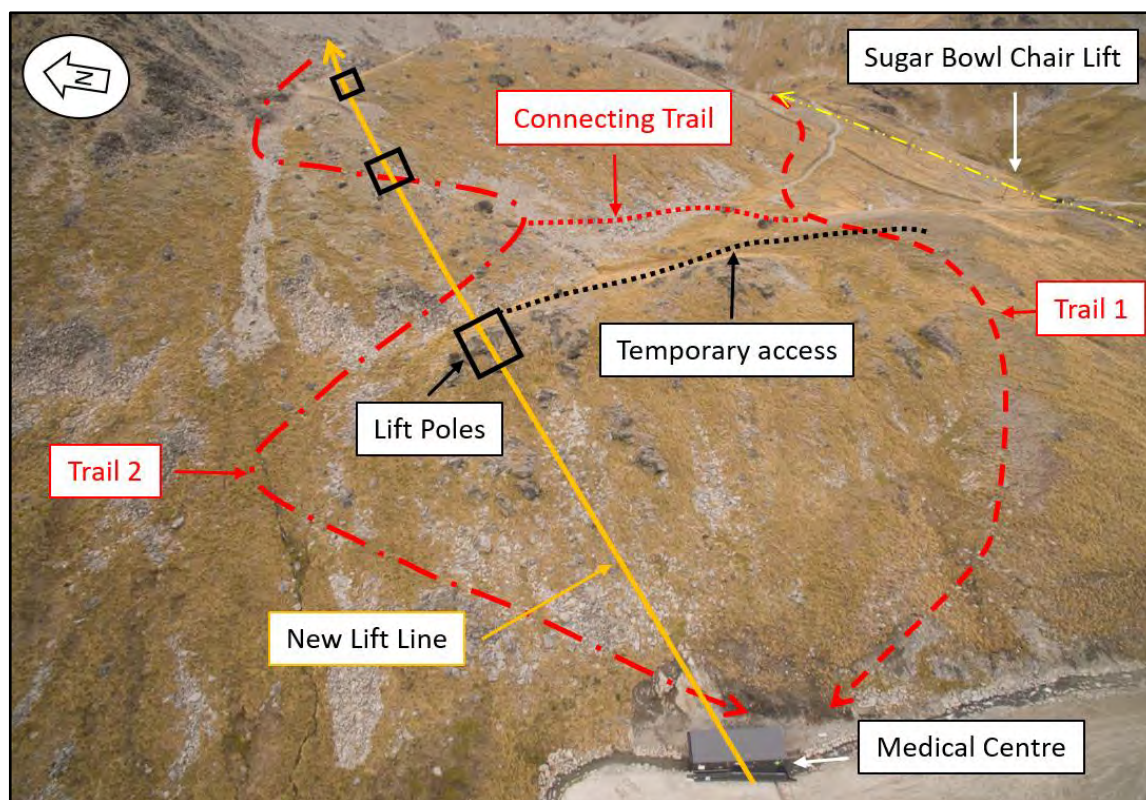


Figure 2: Schematic of the proposed works in the study area – note the area of disturbance is 25 m either side of the centre line for Trail 1, 15 m for Trail 2 and 5 m for the Connecting Trail (photo: R. Lawrence – NZ Ski).

2.1.1 Physical Environment

The study area is located on a western facing slope in the alpine zone of the Remarkables Ski Field, at an elevation of approximately 1610 m to 1850 m above sea level. The geology of the area is undifferentiated volcanoclastic sandstone and siltstone (Turnbull, 2000). The study area covers a variety of geographical features including steep scree slopes, fellfield as well as snow tussock grassland faces and plateaus, cushion field, the Rastus Burn and tributaries of the Rastus Burn (see Figure 3).



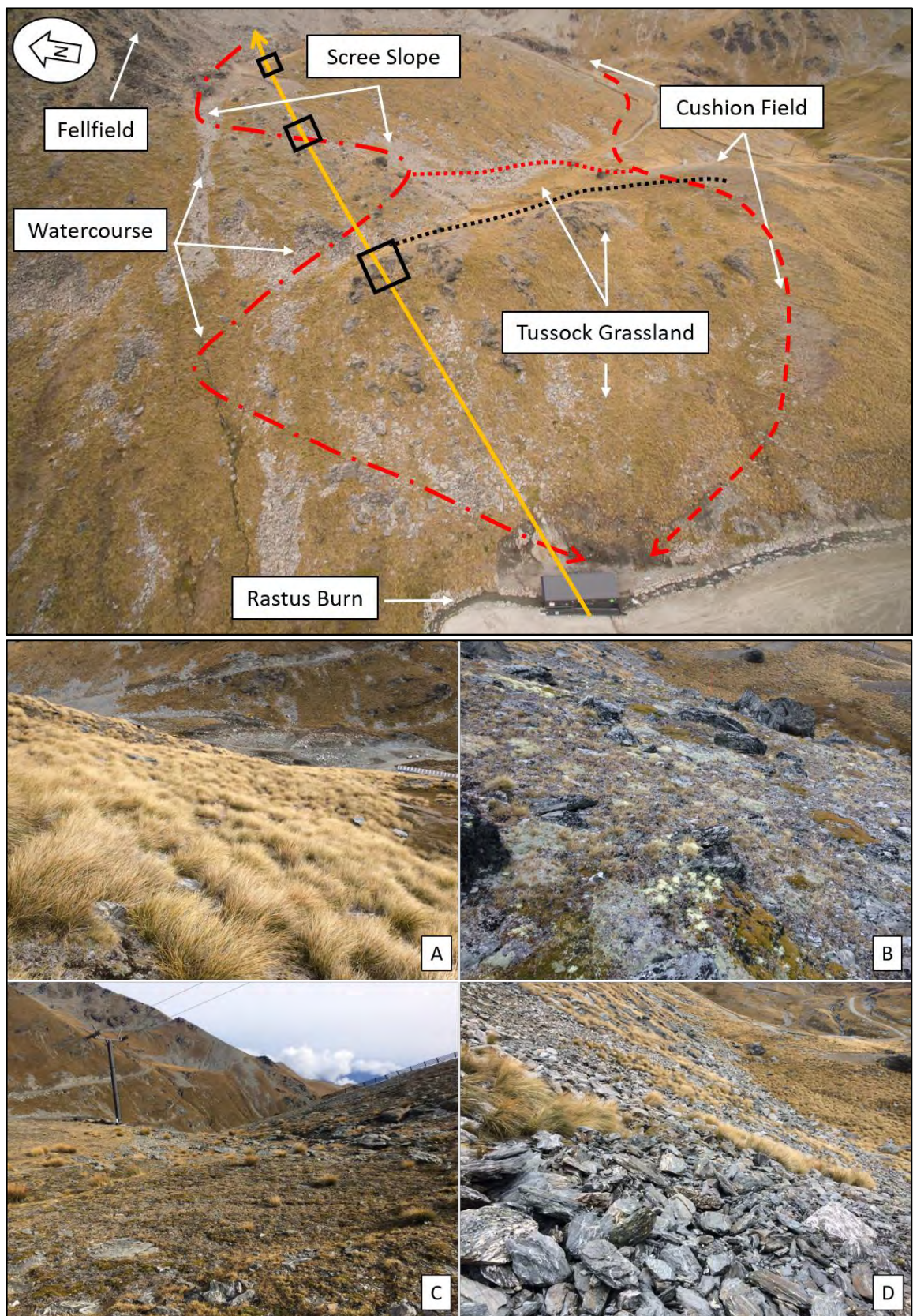


Figure 3: Top - Examples of the habitats on the site. A – Tussock grassland. B and C – Cushion field. D – Scree slope.



2.1.2 Biological Environment

Flora

The vegetation and habitats present within the study area are similar to those surrounding the study area and found throughout the Remarkables Ski field area. The study area consists predominantly of snow tussock grassland and cushion fields as well as scree slopes, fellfield, the Rastus Burn, watercourses and wet areas (Figure 3). Although the ski field basin and part of the study area have already been modified for ski field activities the pre-European vegetation cover would have been similar to that at the time of this survey (Leathwick, *et al.*, 2003).

Fauna

The fauna within the Remarkables range includes lizard, invertebrate and avifaunal species. Invertebrate species include native moth, beetle, weevil, cicada, weta, grasshopper, and snail species. Lizard species include both geckos and skinks. The bird species found within the Remarkables alpine environments include the eastern falcon, paradise shelduck, kea, black-backed gull, and New Zealand pipit (DCG, 2017; DOC, 2006).

2.2 Description of Activity

The proposed earthworks will include both cut and fill activities totalling approximately 173,000 m³ and 172,000 m³ respectively, over an area of approximately 122,000 m². Of this area, approximately 77,678 m² is covered by indigenous vegetation. Excavation and modification of the existing topography will be required to reduce or increase the slope angles of the proposed trails to that suitable for beginner and intermediate users. The earthwork activities will therefore include cut to fill to create the proposed trails and lift pole platforms. The Sugar Stash Trail is proposed to be 30 m wide, the Sugar Trail will be 50 m wide and the Sugar Trail Link will be 10 m wide. The trail batters will be additional to these proposed widths. Appendix A provides the earthworks plans prepared by Clarke Fortune McDonald & Associates.

The watercourse that flows from the bottom of The Stash to the Rastus Burn will be crossed twice. These crossings are below the Stash Hut and at the last corner on the Sugar Stash Trail. At the crossing near the Stash Hut the water is flowing below the surface through scree. Very little earthworks and modification of the area is required. The crossing at the last corner on the Sugar Stash Trail will require fill



material to be placed over the watercourse in order to allow a trail to be created. Clean rock material will be layered over the watercourse to provide a platform for the trail. No modification to the flow path or flow direction will occur. The outflow from a wetland is also proposed to be crossed by the Sugar Stash Trail. As with the other crossings, clean rock material will be layered over the watercourse to provide a platform for the trail, and no modification to the flow path or flow direction will occur. No works are proposed in the wetland areas. The proposed trails do not cross the Rastus Burn and no earthworks or modification of the Rastus Burn is proposed.

A temporary access track is proposed to allow for machinery to install the lower lift pole platform. All other lift pole platforms can be accessed from the proposed trails. This route will require earthworks and vegetation clearance to enable heavy machinery to access the area. The proposed route will be through tussock grassland and cushion field. The tussock grassland is already proposed to be disturbed as part of the Sugar Trail. Access over the mixed tussock grassland is relatively flat, with only one side of the track requiring a small shelf to be excavated for a level access route. Platforms will be placed to spread the load of the machinery on the cushion plants as no excavation is required. These platforms will also prevent the cushion plants from being damaged by the tyres. The material excavated for the access route and around the lift pole platform will be stored and reinstated once the works are complete.

Indigenous vegetation communities in the study area proposed to be cleared or modified include snow tussock grassland, cushion field, watercourses, fellfield, a seepage and scree slopes. These communities are described in section 4.1.

e3s understands that all tall tussock grassland vegetation will be excavated, stored upright and relocated back onto the exposed cut and fill batters once the trails have been completed. The excavated material, cushion field and tussocks that will be removed for the temporary access route will also be reinstated. Threatened plant species will be relocated prior to the start of the earthworks.



3 Methodology

The ecological assessment of effects for the proposed Lower Sugar Bowl trails is based on a desktop study, and site visits completed on 9 April 2018 and 18 May 2018.

The identification of alpine vegetation is best undertaken during the months where flowers, fruits or other reproductive structures are present. This survey was undertaken outside of these months. Therefore, the identification of some plant species is based on vegetative features. Identification to species level was not possible in some cases due to the lack of flowers, fruits, or other reproductive structures.

3.1 Desktop Research and Site Visit

The desktop and site visits included:

- Review of existing ecological information to determine ecological habitats and species likely present on the site; and,
- Site visits to survey the vegetation communities and faunal habitats. The site survey involved walking through the study area that is proposed to be disturbed to record the species observed. Representative photographs of the proposed area were taken and are provided within this report.

3.2 Assessment of Information

An assessment of the species and ecological habitats present was conducted by undertaking the following steps:

- Establishing the representativeness of the ecological habitats present and significance through a site visit and a review of the expected pre-disturbance vegetation and Land Environments of New Zealand (LENZ) classification (Leathwick, *et al.*, 2003).
- Establishing the presence and significance of plant species through a site visit and the Department of Conservation's threat classification for New Zealand vascular plants (de Lange, *et al.*, 2012).



- Establishing the possible presence and significance of invertebrate and lizard species through a review of existing scientific knowledge, and the Department of Conservation's threat classification for New Zealand lizards (Hitchmough, *et al.*, 2016).
- Establishing the likely presence and significance of native avifauna species through a site visit, existing scientific knowledge and the Department of Conservation's threat classification for New Zealand birds (Robertson, *et al.*, 2017).



4 Ecological Values

4.1 Vegetation and Flora

The study area includes snow tussock grassland, cushion field, scree slopes, fellfield, watercourses, the Rastus Burn and a seepage area. The study area is shown in Figure 1 and Figure 2 and is described in the following sections.

4.1.1 Vegetation Cover & Ecological Habitats

The main vegetation types that are proposed to be cleared include indigenous snow tussock grassland, cushion field, scree slope and a seepage area.

The snow tussock grassland habitat (see Figure 4) was dominated by indigenous snow tussock (*Chionochloa macra*), with blue tussock (*Poa colensoi*), *Carex gaudichaudiana*, *Acaena saccaticupula*, *Aciphylla kirkii*, *Pimelea notia* and *Raoulia grandiflora* present throughout. The At Risk – Naturally Uncommon *Aciphylla lecomtei* and the Not Evaluated – Data Deficient *Brachyscome "montana"*, was present through the tussock grassland in the proposed Sugar Trail and the proposed Sugar Stash Trail (see Figure 5). Cushion fields are present in small patches within the tussock grassland.

The cushion field habitat (see Figure 4) included *Dracophyllum muscoides*, *Abrotanella inconspicua*, *Kelleria childii*, *Hectorella caespitosa*, *Rytidosperma pumilum*, *Luzula pumila*, *Gaultheria nubicola*, *Phyllachne colensoi*, *Chionohebe thomsonii*, *Raoulia hectorii* var. *hectorii* and *Carex pyrenaica* var. *cephalotes*. The At Risk – Naturally Uncommon *Anisotome lanuginosa* was present in the cushion field on the ridge in the lower portion of the proposed Sugar Trail, the temporary access route and near the middle lift pole (see Figure 5).

Scree slope (see Figure 4) is the predominant habitat on the proposed Sugar Trail Link. There were very few plants present within the scree with only scattered snow tussock and *Hectorella caespitosa* noted. The fellfield in the upper half of the Sugar Stash Trail was not surveyed, however the vegetation is presumed to be the same.



The watercourse that flows from the bottom of The Stash to the Rastus Burn will be crossed twice, once near the Stash Hut and once on the last corner of the Sugar Stash Trail. The outflow from the upper wetland is also proposed to be crossed (see Figure 4 and Figure 5). No excavation or modification of the flow path and flow direction is proposed for any crossing, as clean rock material will be layered over the watercourses.

Between the proposed trails are regionally significant wetlands (see Figure 4 and Figure 5) which have been identified as wetlands 10, 11 and 12 in the 2011 Wildlands Assessment of Wetlands in the Remarkables Ski Area. No works are proposed in these wetland areas, however, works are proposed in a seepage area at the bottom of the Sugar Trail (see Figure 4). This seepage area contained *Schoenus pauciflorus*, *Carex gaudichaudiana*, *Abrotanella caespitosa*, *Carex petriei*, *Anaphalioides bellidioides* and *Raoulia subsericea*. A small number of the At Risk – Naturally uncommon *Carex berggrenii* was present (see Figure 5).

Within the study area five exotic species were noted. These included tussock hawkweed (*Hieracium lepidulum*), mouse-ear hawkweed (*Pilosella officinarum*), sheeps sorrel (*Rumex acetosella*), broad-leaved dock (*Rumex obtusifolius*) and white clover (*Trifolium repens*). All species observed during the site visit are listed in Appendix B.



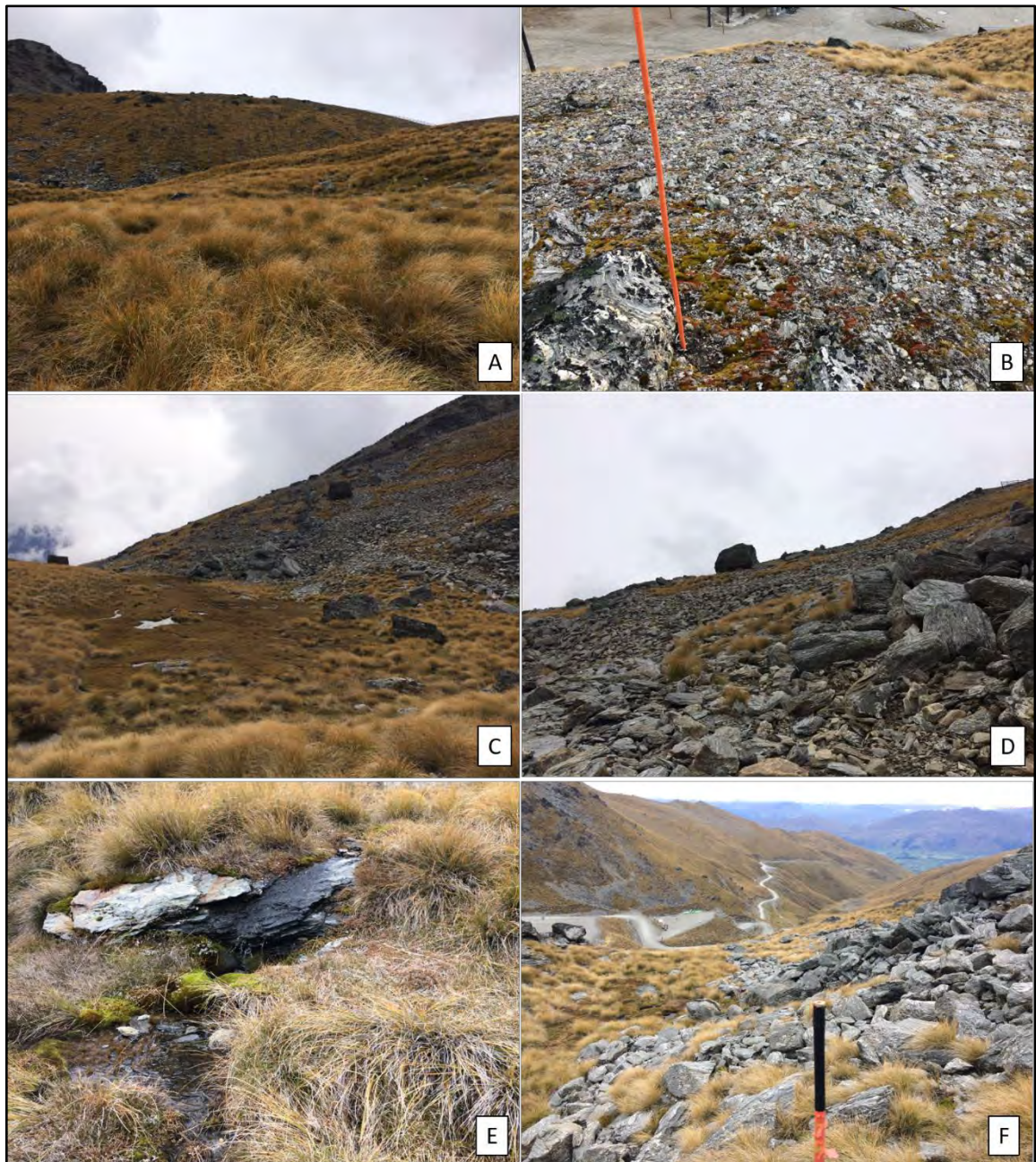


Figure 4: A – Tussock grassland. B – Cushion field. C – Wetland area. D – Scree field with patches of tussock. E. Seepage area. F. Outflow from Wetland to be crossed.





Figure 5: Location of the key habitats within the study area and surrounding wetlands (Background image provided by CFMA). Note: areas are indicative only and no wetlands will be disturbed during construction.

4.2 Fauna

4.2.1 Invertebrates

The only invertebrate species that were observed during the site visits were alpine grasshoppers (*Sigaus* species). The cooler temperatures that were present during the site visits, may account for the lack of invertebrate activity. Previous surveys completed in similar habitats, suggest that the following invertebrates could be expected within and surrounding the study area (DCG, 2017; e3Scientific, 2017).

- Speargrass weevil (*Lyperobius* sp.)
- Ground weta (*Hemiandrus* sp.)
- Cicadas (*Maoricicada* sp.)
- Wolf spiders (*Anoteropsis* sp.)
- Moths (*Paranotoreas* sp.), grass moths (*Orocrambus* sp.)
- Ground beetles (*Bembidion* sp.), chafer beetle (*Scythrodes squalidus*), leaf beetle (*Chrysomelidae* sp.)
- Flies (*Diptera* sp.) including hover fly (*Syrphidae* sp.)
- Exotic eleven-spotted ladybird (*Coccinella undecimpunctata*)



Another previous study on Lepidoptera (moths and butterflies) within the Rastus Burn Basin further highlights the range of invertebrate species within this environment, with 186 Lepidoptera species recorded, along with Coleoptera (beetles and weevils), Trichoptera (caddisflies), Hemiptera (true bugs including cicadas, shield bugs, aphids), Orthoptera (grasshoppers, weta, crickets), Plecoptera (stoneflies), and Neuroptera (net-winged insects) (Patrick, *et al.*, 1992).

4.2.2 Lizards

Lizard habitat is present on site, within the exposed rock, scree and snow tussock grasslands. However, based on multiple previous lizard surveys within the surrounding Rastus Burn Recreation Reserve, it is unlikely that lizard species are present within the study area. The only lizard species that might be present within the study area is the non-threatened McCann's skink (*Oligosoma maccanni*) (DCG, 2017; Hitchmough, *et al.*, 2016).

4.2.3 Avifauna

No birds were observed during the site visit. Species that have been recorded within the Remarkables Conservation area and could be found within or surrounding the study area include the New Zealand pipit (*Anthus novaeseelandiae*), kea (*Nestor notabilis*), eastern falcon (*Falco novaeseelandiae novaeseelandiae*), paradise shelduck (*Tadorna variegata*), harrier hawk (*Circus approximans*) and southern black-backed gull (*Larus dominicanus dominicanus*) (DCG, 2017; DOC, 2006) (see Table 1).

Table 1: Bird species potentially found within the study area and their associated threat status.

Common Name	Scientific Name	Threat Status (Robertson <i>et al.</i> , 2017)
Eastern falcon	<i>Falco n. novaeseelandiae</i>	At Risk - Recovering
New Zealand pipit	<i>Anthus novaeseelandiae</i>	At Risk - Declining
Kea	<i>Nestor notabilis</i>	Nationally Endangered
Harrier hawk	<i>Circus approximans</i>	Not threatened
Southern black-backed gull	<i>Larus d. dominicanus</i>	Not Threatened
Paradise shelduck	<i>Tadorna variegata</i>	Not Threatened



4.3 Summary of Ecological Values

The existing ecological values within the Lower Sugar Trails are associated with the tussock grassland, cushion fields, threatened plant species and avifauna habitat. The At Risk – Naturally Uncommon *Anisotome lanuginosa*, *Aciphylla lecomtei* and *Carex berggrenii* as well as the Not Evaluated – Data Deficient *Brachyscome "montana"* were present. A summary of the ecological values on site are provided in Table 2 below.

Table 2: Summary of Ecological Values.

Ecological Value	Description
Tussock grassland and cushion field habitat	The tussock grassland and cushion field within the study area has had little modification. The proposed trails are located within category 6 (the least threatened) of the threatened environment categories.
Seepage habitat	The seepage area contained the At Risk – Naturally Uncommon <i>Carex berggrenii</i> . This seepage area is located within category 6 of the threatened environment categories.
Presence of threatened flora	Four threatened plant species were observed along the proposed trails. These are the At Risk – Naturally Uncommon <i>Anisotome lanuginosa</i> , <i>Aciphylla lecomtei</i> and <i>Carex berggrenii</i> and the Not Evaluated – Data Deficient <i>Brachyscome "montana"</i> .
Habitat for threatened native bird species	The habitat present on site provides hunting, nesting and foraging habitat for eastern falcon, kea and the NZ Pipit.
Habitat for lizard species	Lizard habitat is present on site, however given the altitude of the proposed trails and the lack of lizards recorded during previous surveys undertaken in the wider area, it is unlikely that site supports herpetofauna.



5 Ecological Significance and Value

The assessment of the significance of the ecological values associated with the study area are based on the following:

- The Operative QLDC District Plan Criteria for assessing ecological significance (QLDC, 2009);
- The Ecological Impact Assessment (EclA) EIANZ guidelines for use in New Zealand: terrestrial and freshwater ecosystems (EIANZ, 2015); and,
- New Zealand's Department of Conservation threatened flora and fauna lists.

5.1 Queenstown Lakes District Plan Ecological Significance Criteria

Appendix 5 of the QLDC District Plan sets out criteria that an area of vegetation or habitat should be assessed against to determine ecological significance. The vegetation and habitat proposed for clearance are examined against these criteria.

Table 3: Assessment of the habitat using the ecological significance criteria in the QLDC District Plan.

QLDC Criteria	Satisfied	Reasoning
Primary Criteria		
<i>A. The Ecological Values of the Area – the values of the place itself.</i>		
(i) Representativeness	Yes	The vegetation that is proposed to be cleared contained a range of indigenous communities including snow tussock grassland, cushion field, watercourses, seepages, fellfield ad scree slope. These habitats are largely intact and have received little modification. These habitats are representative of the Remarkables Ecological District.
(ii) Rarity	Yes	The proposed trails and lift pole platform areas contained threatened plant



		<p>species and provides habitat for threatened bird species.</p> <p>The At Risk – Naturally Uncommon <i>Anisotome lanuginosa</i> is located in the cushion field near the bottom of the Sugar Trail, the temporary access route and under the lift pole platform.</p> <p>The At Risk – Naturally Uncommon <i>Aciphylla lecomtei</i> is located in the tussock grassland on the Sugar Trail and in the rocky cushion field near the middle of the Sugar Stash Trail.</p> <p>The At Risk – Naturally Uncommon <i>Carex berggrenii</i> is located in the seepage area at the bottom of the Sugar Trail.</p> <p>The Not Evaluated – Data Deficient <i>Brachyscome "montana"</i> is located throughout the tussock grassland and cushion field.</p> <p>The vegetation and habitat on site could be utilised by falcon, kea and the NZ pipit for hunting, foraging and nesting.</p>
(iii) Diversity and Pattern	Yes	The study area supports a diverse range of indigenous habitat types and species which are typical of the Remarkables area.
(iv) Distinctiveness/ Special ecological character	Yes	The vegetation that is proposed to be cleared is not distinctive nor has any special ecological character, when compared to the nearby habits in the Remarkables Basin. However, the habitats do support threatened plant species and provide habitat for threatened bird species as well as being healthy natural ecosystems that are intact.
Other Criteria		



<i>B. The Ecological Context of the Area including its relationship with its surroundings</i>		
(v) Size and Shape	Yes	The vegetation within the trails and study area is part of nearly continuous vegetation within the Remarkables Ski area. The habitat on site is ecologically self-sustaining.
(vi) Connectivity	Yes	The habitats present within the study area are part of the ecosystem that make up the Remarkables Ski area and the Rastus Burn Recreation Reserve.
<i>C. The Future Ecological Value of the Area</i>		
(vii) Long Term Sustainability	Yes	The habitats on site have received little modification, except for the presence of a small number of exotic plant species. The habitats on site will continue to maintain themselves in the absence of any management.

5.1.1 Summary of Ecological Significance Criteria

The habitat on the proposed trails included snow tussock grassland, cushion field, scree field, fellfield, watercourses and a seepage area. These habitats satisfy all significance criteria under the QLDC District Plan.

5.2 Assessment of Ecological Value following the EIANZ Guidelines

The EIANZ Guidelines set out evaluation criteria that can be used to determine the ecological values of a species or habitat. The assigned ecological value is then used along with the magnitude of the proposal to determine the ecological impact. The following sections use the EIANZ Guidelines to characterise the ecological value of the vegetation and faunal species that may utilise the area.



5.2.1 Vegetation and Habitat Ecological Values

Table 4: Assessment of the vegetative habitat using the ecological criteria in the EIANZ Guidelines.

Matter	Reasoning	Score
Representativeness	The habitats that are proposed to be modified include snow tussock grassland, cushion field, a seepage, watercourses, fellfield and scree slope, which are all typical and common habitats in the alpine zone of the Remarkables Ecological District. The habitats present on site are considered representative.	High
Rarity/distinctiveness	The habitats proposed to be cleared are common throughout the Ecological District, however they support three At Risk – Naturally Uncommon species and one Not Evaluated – Data Deficient species.	Moderate - High
Diversity and pattern	The level of diversity present within the vegetation that have been assessed is of moderate diversity. The species that are typically found in these habitats are present.	Moderate
Ecological context	The habitat within the proposed disturbance areas is part of a continuous tract of indigenous vegetation extending from the Kawarau River to the alpine zone of the Remarkables Range. The vegetation also provides hunting, feeding and breeding habitat for threatened fauna species.	Moderate
Overall Value		High



5.2.2 Bird Ecological Values

The areas that are affected by the proposal provide habitat for threatened indigenous bird species. The kea, NZ pipit and eastern falcon have a conservation status of Nationally Endangered, At Risk – Declining and At Risk – Recovering, respectively. The assigned ecological value under the EIANZ (2015) guidelines for species with these conservation statuses are Very High, High and Moderate-High. However, the habitats that these species utilise within the Rastus Burn Recreation Reserve are common and widely spread throughout the area. Under the EIANZ guidelines all other bird species that are classified as Not Threatened have a low ecological value.

5.2.3 Summary of Ecological Values

The ecological values within the footprint of the proposed trails have been determined using the criteria outlined in the 2015 EIANZ Guidelines. The overall ecological value of the vegetation that is proposed to be disturbed is High. The ecological value of the threatened avifauna ranges from Very High to Moderate-High. All other Not Threatened plant and bird species are considered to have Low ecological value.



6 Ecological Impact Assessment

6.1 Ecological Impact Assessment Methodology

The following ecological impact assessment (EclA) follows the EIANZ Ecological Impact Assessment Guidelines for New Zealand. The guidelines are based on the assessment of the ecological values present within the proposed disturbance areas (see Section 5) and the magnitude of the effect within the zone of influence and the wider context of individual species populations and extent of remaining vegetation and habitat.

The EclA guidelines provide a series of tables that assist with the assignment of value to the ecological features that will be disturbed and the magnitude of the activity. These tables are provided in Appendix C and referred to in the discussion below. A summary of the ecological effects and the measures NZ Ski has employed to avoid and mitigate the ecological effects of the proposed works are presented in Table 5.

6.2 Direct Effects

The construction of the proposed Sugar Trail, Sugar Stash Trail, Sugar Link Trail, temporary access trail and lift pole platform areas will result in the disturbance of 77,678 m² of indigenous vegetation. The snow tussock grassland, cushion field, a seepage area, fellfield and scree satisfy all significance criteria in the QLDC district plan and are common throughout the Remarkables area. The loss of these habitats will be permanent however, the snow tussock is proposed to be removed and relocated to the batters of the trails. In addition to the tussocks being relocated, the *Aciphylla lecomtei* and *Anisotome lanuginosa* plants will be relocated prior to the earthworks commencing. A small area of *Carex berggrenii* as well as *Brachyscome* “montana” will be removed, however many of the *Brachyscome* plants will be relocated with the tussock grassland. The magnitude of the effect of the proposed disturbance to the vegetation is High as the disturbance is on a permanent basis, and threatened plant species will be removed. The ecological effect on the vegetation (without mitigation) is therefore assessed as being Very High (a High ecological value and a High magnitude of effect).



The removal of the vegetation will result in permanent habitat loss for threatened native bird species that utilise the alpine environment. The kea, falcon and NZ Pipit have a Very High, High and Moderate-High ecological value, respectively, however there is abundant habitat that these species can use within the Remarkables area. The removal of the habitat will have a Low magnitude of effect, as there will only be a minor shift away from the base line conditions, in relation to habitat that these birds utilise. The ecological effect on the permanent removal of habitat will be Moderate for the kea and Low for the falcon and NZ Pipit.

The Sugar Stash Trail will cross a small watercourse that drains from below the Stash Hut to the Rastus Burn, twice, as well as crossing a small stream that flows from the wetland below the Sugar Link trail. No excavation of these watercourses is proposed however, NZ Ski propose to layer larger, clean rock material over the watercourse to provide a platform for the trail. No alteration to the flow path or flow direction will occur. The ecological impact of these works will be Low, as the existing flow path, flow direction and surface water connection will be maintained. The magnitude of these works will be Low as there is only a minor shift away from the baseline conditions.

Very High and High ecological effects represent an effect on ecological or conservation values that warrants avoidance and/or extremely high intensity mitigation and remediation actions. NZ Ski have a proven track record of relocating threatened plants as well as snow tussock grassland. NZ Ski propose to relocate all *Aciphylla lecomtei* and *Anisotome lanuginosa* plants to appropriate habitats as well as uplifting, storing and relocating the snow tussocks onto the batters when the trail is completed. NZ Ski also propose to re-instate the cushion field excavated for the temporary access route, and also protect the cushion field with platforms to spread the weight of the vehicles, when no excavation is required.

6.3 Indirect Effects

In addition to the direct effect of the earthworks on the vegetation and habitat it is possible that the earthworks for the proposed trails and lift pole platforms could result in the mobilisation of sediment onto neighbouring habitats. This effect is most prevalent during the construction phase and immediately following construction. The habitats that are the most sensitive to this potential effect are the regionally



significant wetlands that are located below the Sugar Link Trail and the Ratus Burn. Sediments have the potential to smother the vegetation and affect water quality. The potential ecological impact of the sedimentation on the wetlands, without management is Very High (Very High ecological value and Moderate magnitude of effect). This potential effect can be managed by requiring a specific sediment and erosion control management plan to mitigate the risk of runoff into wetlands or watercourses.

Another potential effect that could affect the ecology of the habitats is the further introduction and spread of exotic weed species. The ecological impact of this, without management measures is Very High (a High ecological value and a High magnitude of effect). The further introduction and spread of exotic weed species will result in competition for space and resources, resulting in a fundamental change in the ecology of the vegetation. This effect can be managed by ensuring that any machinery or equipment that is used during the proposed works is free of soil that could contain seeds or plants that could contaminate the area. No soil from outside the study area is to be brought onto the trails, and no soil from the lower portions of the trails is to be moved upslope. Restricting the movement of soil within the trails will help to reduce the spread of exotic weed species.



Table 5: Ecological Impact Matrix¹

Development Stage	Potential Effect / Impact	Specific Effect/Impact	Level of Effect ²	Recommended Impact Management Avoid/Mitigate/Remediate
Construction (earthworks)	Removal of native vegetation and natural unmodified habitat.	Clearance of a range of vegetation communities.	Very High	<ul style="list-style-type: none"> Vegetation clearance cannot be avoided due to proximity to the ski field. However, all tussock grassland will be uplifted and relocated back onto the batters once the trails have been established. Cushion field will be protected with platforms to spread the weight of the machinery along the temporary access route.
	Removal of threatened plant species.	Loss of Data Deficient and Naturally Uncommon species.	Very High	<ul style="list-style-type: none"> The Naturally Uncommon <i>Anisotome lanuginosa</i> and <i>Aciphylla lecomtei</i> will be relocated prior to earthworks commencing. A small number of the Naturally Uncommon <i>Carex berggrenii</i> will be removed in the seepage area. The Data Deficient <i>Brachyscome "montana"</i> will be removed from the cushion field areas, however many plants will be relocated as a result of the relocation of the tussock grassland.
	Removal of habitat for threatened fauna species.	Permanent loss of hunting, breeding and foraging habitat.	Moderate - Low	<ul style="list-style-type: none"> There is abundant habitat that these species can use within the Remarkables area.



	Modification of a watercourse.	Modification of a small watercourse that drains a regionally significant wetland.	Low	<ul style="list-style-type: none"> No disturbance to the flow of the watercourse is proposed. Additional clean rock will be located over the existing path to maintain flow paths and direction. The watercourse will be covered and flow under an artificial scree slope. No disturbance to the wetland is to occur.
	Soil erosion and sediment runoff into wetlands and watercourses.	Degrade water quality and habitat in a wetland and streams.	Very High	<ul style="list-style-type: none"> All earthworks will require a specific management and operation plan to mitigate the risk of runoff into wetlands or streams.
	Introduction of exotic plant species.	Introduction of exotic plant species that compete with indigenous plant species.	Very High	<ul style="list-style-type: none"> Avoid introduction of exotic species by managing machinery that enters the study area. All machinery should be cleaned and free of soil that could potentially contain seeds or plants that could contaminate the site. No soil from the lower portions of the trails is to be moved upslope, as this is where many of the weed species are currently located.

¹This table is based on 'Ecological Impact Assessment (EClA) EIANZ guidelines for use in New Zealand: terrestrial and freshwater ecosystems' (EIANZ, 2015). ² Based on ecological value and magnitude of impact (EIANZ, 2015).



6.3.1 Summary of Ecological Effects

The high ecological values and removal of habitat within the trails and lift pole platform areas could result in a Very High ecological effect. Ideally ecological impacts are avoided, however given the proximity of the vegetation to current ski field activities, this is unlikely. In a wider context, the effect of the disturbance is considered minor given the extent of similar snow tussock grassland, seepages, cushion field, scree and fellfield communities within the Rastus Burn and Remarkables Ski field area.

The restoration programme of work that NZ Ski has developed can help to ensure the ecological effects are mitigated effectively. NZ Ski propose to relocate all the individuals of two Naturally Uncommon plant species as well as the existing snow tussock grassland habitat which will include the Data Deficient *Brachyscome* species. The tussock grassland will be excavated and placed on the batters of the trails. NZ Ski has a track record of successfully restoring vegetation in similar recontouring projects across the ski area.

To minimise the effect of the habitat and vegetation clearance, such that it is no more than minor, e3s recommends the following consent conditions.

1. All *Anisotome lanuginosa* and *Aciphylla lecomtei* plants located within the area of disturbance are to be identified by a suitably qualified ecologist and relocated to an appropriate habitat nearby prior to earthworks commencing on site.
2. The snow tussock grassland (which contains the data deficient *Brachyscome* "montana" species) is to be uplifted, stored upright and reinstated onto the batters of the trails, as soon as possible after the earthworks are complete.
3. The relocated and reinstated areas of native plants, in particular the *Anisotome lanuginosa* and *Aciphylla lecomtei* is to be monitored for at least five years, to determine successful reinstatement and growth. Further mitigation measures are to be implemented if the cover and survival achieved is not sufficient.
4. The proposed temporary access trail for the installation of the lift pole is to be reinstated as soon as possible after works are complete. Platforms are to be placed over the cushion field along the access route to help minimise the damage in this area.



5. If lizards are observed within the study area at any time prior to, or during earthworks, a suitably qualified herpetologist must be immediately contacted to determine a management plan that NZ Ski will adhere to.
6. Prior to any vegetation clearance occurring, if relevant based on the time of the year earthworks are to occur, the site is to be checked for any avifaunal nesting or breeding activity (undertaken by a suitably qualified ecologist or ornithologist). Any subsequent requirements of this survey are to be adhered to by NZ Ski.
7. Prior to any machinery or equipment entering the ski field area it must be cleaned and checked for soil that could potentially contain seeds or exotic plants that could further contaminate the site.
8. No imported soil is to be bought onto the site. Where NZ Ski plan to deposit soil over the surface of the newly contoured trails or batters to enable faster recovery and growth of plants, this soil must be from the immediate site area to prevent further introduction of weed species.
9. To prevent further spread of weed species, no soil is to be moved upslope from the lower portions of the proposed trails.
10. All earthworks are to be managed to mitigate the risk of runoff and sedimentation into any wetlands or streams.
11. No alteration to the existing flow path, flow direction and the hydrological connection of any watercourse is to occur. The only permitted works around the watercourses is the layering of large clean rocks over the sections of the watercourses that are to be crossed.
12. No disturbance to any regionally significant wetlands is to occur.

6.4 Summary

The proposed area of clearance contains a relatively small area of native vegetation when compared with the vegetation in the surrounding ski area. NZ Ski propose to relocate all *Anisotome lanuginosa* and *Aciphylla lecomtei* plants to a suitable location, as well as excavate, store and reinstate the tussock grassland onto the newly contoured batters. The potential loss of vegetation and habitat requires the implementation of the mitigation measures outlined above, so that the impact from the proposed activities is considered no more than minor.



7 Conclusions and Recommendations

Based on the ecological assessment the following conclusions are made:

1. NZ Ski is currently seeking resource consent to clear indigenous habitat and undertake earthworks to develop new trails and a new lift line to the north of the existing Sugar Bowl Chair line.
2. The proposed earthworks will include both cut and fill activities totalling approximately 173,000 m³ and 172,000 m³ respectively. The extent of the works covers approximately 122,000 m², of which **77,678** m² is covered by indigenous vegetation.
3. The Sugar Stash Trail is proposed to be 30 m wide, the Sugar Trail will be 50 m wide and the Sugar Trail Link will be 10 m wide. Batters will be additional to these widths.
4. The study area includes snow tussock grassland, cushion field, scree slopes, fellfield, a seepage area and small watercourses.
5. The habitat and vegetation within the study area is representative of the Remarkables Ecological district, however, no threatened habitats are proposed to be disturbed.
6. The At Risk – Naturally Uncommon *Anisotome lanuginosa*, *Aciphylla lecomtei* and *Carex berggrenii* as well as the Not Evaluated – Data Deficient *Brachyscome "montana"* plant species were present within the study area.
7. The study area contains habitat for the Nationally Endangered kea, At Risk – Declining NZ pipit and At Risk – Recovering eastern falcon.
8. Lizard habitat is present on site, however, it is unlikely that lizard species will be present within the study area.
9. The vegetation and habitat in the study areas satisfy all the significance criteria under the QLDC District Plan.
10. The overall ecological value of the vegetation that is proposed to be disturbed is High. The ecological value of the threatened avifauna ranges from Very High to Moderate-High. All other Not Threatened plant and bird species are considered to have Low ecological value.
11. The high ecological values and removal of habitat within the trails and lift pole platform areas could result in a Very High ecological effect. NZ Ski have proposed mitigation measures to reduce the potential impacts.



12. Mitigation measures include relocation of threatened plant species, reinstating tussock grassland habitat and avoidance of regionally significant wetlands.
13. Overall, the proposed vegetation clearance is a relatively small area when compared with the extent of similar communities in the surrounding alpine environment.
14. The loss of habitat for native and threatened species however does require mitigation, therefore, e3s would require the recommended consent conditions in Section 6 be implemented for the impact from the proposed activities to be considered no more than minor.



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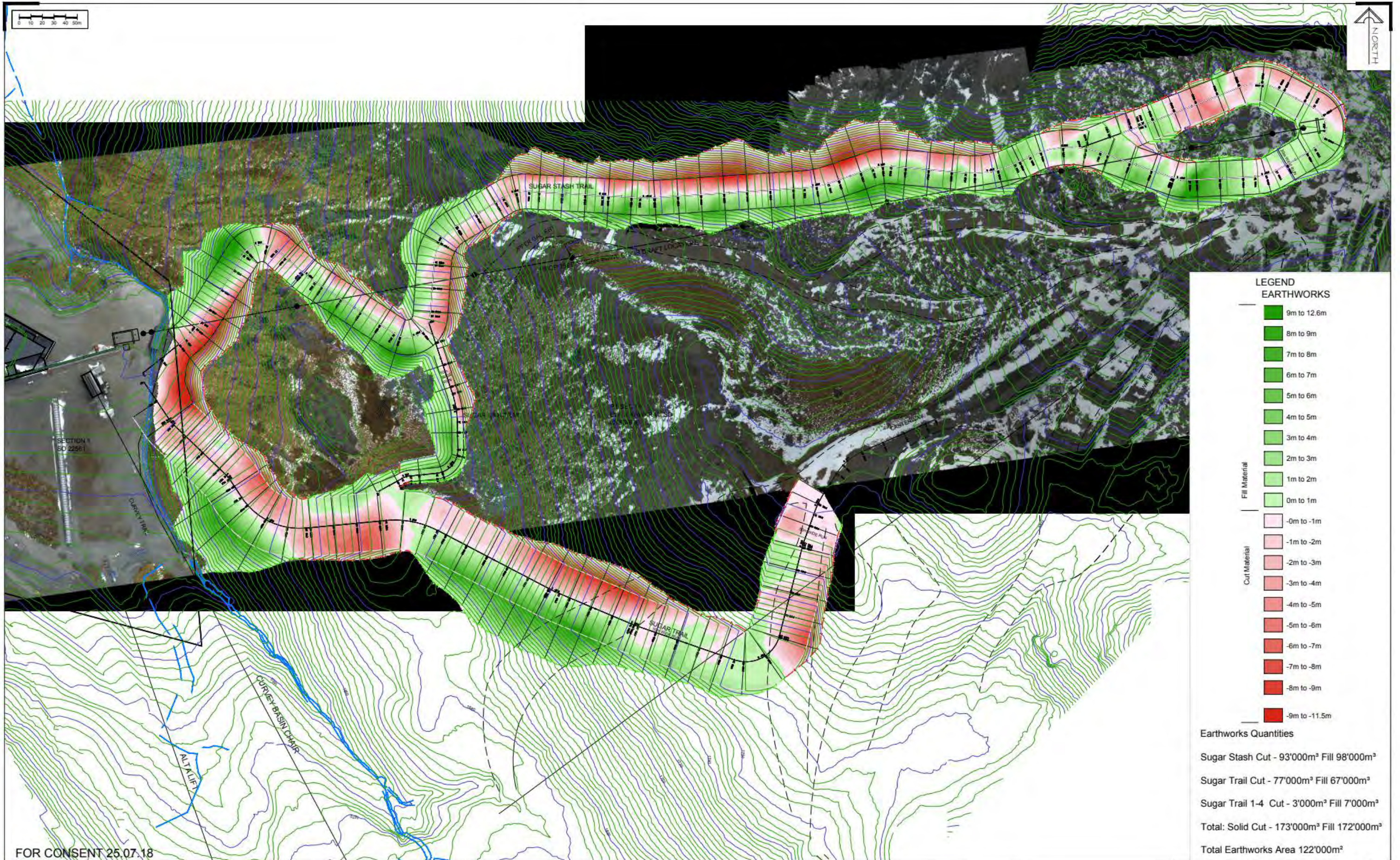
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Appendices

Appendix A:
Earthworks plans



**LEGEND
EARTHWORKS**

- | | |
|--|--|
| Fill Material | 9m to 12.6m |
| | 8m to 9m |
| | 7m to 8m |
| | 6m to 7m |
| | 5m to 6m |
| | 4m to 5m |
| | 3m to 4m |
| | 2m to 3m |
| | 1m to 2m |
| | 0m to 1m |
| Cut Material | -0m to -1m |
| | -1m to -2m |
| | -2m to -3m |
| | -3m to -4m |
| | -4m to -5m |
| | -5m to -6m |
| | -6m to -7m |
| | -7m to -8m |
| | -8m to -9m |
| -9m to -11.5m | |

Earthworks Quantities

Sugar Stash Cut - 93'000m ³	Fill 98'000m ³
Sugar Trail Cut - 77'000m ³	Fill 67'000m ³
Sugar Trail 1-4 Cut - 3'000m ³	Fill 7'000m ³
Total: Solid Cut - 173'000m³	Fill 172'000m³
Total Earthworks Area 122'000m²	

FOR CONSENT 25.07.18

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Rev.	Date	Revision Details	By

**REMARKABLES SKI FIELD
OVERALL LAYOUT & VOLUME PLAN WITH IMAGE OVERLAY**

Client:	NZ SKI LTD	Surveyed:	Signed	Date:	x.x.18	Job No.:	12650	Drawing No.:	18-09
Notes:	All dimensions shown are in meters unless shown otherwise. Any person using Clark Fortune McDonald's drawings and other data accepts the risk of: - Using the drawings and other data in electronic form without requesting and checking them for accuracy against the original hard copy versions. - Ensuring the information is the most recent issue. - Copyright on this drawing is reserved.								
Drawn:	EM	Signed:		Date:	11.06.18	Scale:	1:1500 @ A1		
Designed:		Signed:		Date:		Datum & Level:			
CFM w/ NZSKI				Date:	2018		NZMG & MSL		

Appendix B:
Plant species recorded during the site visit

Plant species list and associated threat status.

Common Name	Scientific Name	Threat Classification (de Lange et al., 2012)
	<i>Abrotanella caespitosa</i>	Not threatened
Bidibid/piripiri	<i>Acaena saccaticupula</i>	Not threatened
Golden spaniard	<i>Aciphylla aurea</i>	Not threatened
Spaniard	<i>Aciphylla kirkii</i>	Not threatened
	<i>Agrostis species</i>	Not threatened* ¹
	<i>Argyrotegium mackayi</i>	Not threatened
Alpine hard fern	<i>Blechnum penna-marina</i> subsp. <i>alpina</i>	Not threatened
	<i>Brachyscome montana</i> or <i>longiscapa</i>	Either spp.: Not Evaluated – Data Deficient
White caltha	<i>Caltha obtusa</i>	Not threatened
Cress	<i>Cardamine corymbosa</i>	Not threatened
Gaudichaud's sedge	<i>Carex gaudichaudiana</i>	Not threatened
Petrie's sedge	<i>Carex petriei</i>	Not threatened
Bastard grass	<i>Carex divaricata</i>	Not threatened
Haast's mountain daisy	<i>Celmisia haastii</i> var. <i>haastii</i>	Not threatened
False spaniard	<i>Celmisia lyallii</i>	Not threatened
White cushion mountain daisy	<i>Celmisia sessiliflora</i>	Not threatened
Slim snow tussock	<i>Chionochoa macra</i>	Not threatened
Snow hebe	<i>Chionohebe thomsonii</i>	Not threatened
	<i>Coprosma atropurpurea</i>	Not threatened
Creeping coprosma	<i>Coprosma niphophila</i>	Not threatened
Cushion inaka	<i>Dracophyllum muscoides</i>	Not threatened
	<i>Dracophyllum prostratum</i>	Not threatened
Willowherbs	<i>Epilobium species</i> * ¹	Not threatened
Snowberry	<i>Gaultheria depressa</i> var. <i>novae-zealandiae</i>	Not threatened
Snowberry	<i>Gaultheria parvula</i>	Not threatened
Short flowered cranesbill	<i>Geranium brevicaule</i>	Not threatened
Hebejeebie	<i>Hebejeebie densifolia</i>	Not threatened
	<i>Hectorella caespitosa</i>	Not threatened
	<i>Kelleria species</i> * ¹	Not threatened

	<i>Leptinella pectinata</i> subsp. <i>villosa</i>	Not threatened
Lichen	Lichen species* ¹	Not threatened
Red woodrush	<i>Luzula rufa</i> var. <i>rufa</i>	Not threatened
Alpine clubmoss	<i>Lycopodium fastigiatum</i>	Not threatened
	<i>Montia sessiliflora</i>	Not threatened
Comb sedge	<i>Oreobolus pectinatus</i>	Not threatened
Mountain tauhinu	<i>Ozothamnus vauvilliersii</i>	Not threatened
Pimelea	<i>Pimelea notia</i>	Not threatened
	<i>Plantago lanigera</i>	Not threatened
	<i>Plantago triandra</i>	Not threatened
	<i>Plantago uniflora</i>	Not threatened
Blue tussock	<i>Poa colensoi</i>	Not threatened
Mountain shield fern	<i>Polystichum cystostegium</i>	Not threatened
Prickly shield fern	<i>Polystichum vestitum</i>	Not threatened
Moss species	<i>Polytrichum</i> species* ¹	Not threatened
Buttercup	<i>Ranunculus gracilipes</i>	Not threatened
Buttercup	<i>Ranunculus royi</i>	Not threatened
Large-flowered mat daisy	<i>Raoulia grandiflora</i>	Not threatened
Mat daisy	<i>Raoulia hectorii</i> var. <i>hectorii</i>	Not threatened
Turf mat daisy	<i>Raoulia subsericea</i>	Not threatened
Mat daisy	<i>Raoulia youngii</i>	Not threatened
	<i>Rytidosperma pumilum</i>	Not threatened
Sedge tussock	<i>Schoenus pauciflorus</i>	Not threatened
Thamnolia Lichen	<i>Thamnolia vermicularis</i>	Not threatened
Tussock hawkweed	<i>Hieracium lepidulum</i>	Exotic
Mouse-ear hawkweed	<i>Pilosella officinarum</i>	Exotic
Sheeps sorrel	<i>Rumex acetosella</i>	Exotic
White clover	<i>Trifolium repens</i>	Exotic

*¹The plants observed were not of a species that are likely threatened.