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Salinity Discharge Mapping for the South West Sands and Tertiary Gravels and Sands in the Glenelg Salinity Region

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Victoria ON THE MOVE

SUMMARY

The objective of this study was to determine the area, severity and location of secondary saline discharge in the South West Sands and Tertiary Gravels and Sands LMU and present it in map and database form.

Aerial photos were used for the location of saline sites and an extensive ground truthing program was carried out using ISCON techniques for the classification of salt severity.

A total of 360 hectares was found to be salt affected with sites varying in size from 0.1 to 66.7 hectares. The majority of sites were affected by a low level of salinity, although some were moderately or severely saline. Most of the discharge sites appeared in drainage lines, with some in depression, flats, slopes and lake margins.

Considering the vast area that these LMUs cover, the saline sites are few and scattered and most are not of a severe nature. Landholder awareness was minimal and this was likely to be due to the low severity rating and small area affected.

CONTENTS

ACKNOWLEDGMENTS

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Likewise, Peter Dixon (NRE, Hamilton) gave advice for field assessment and mapping.

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1. INTRODUCTION

1.1 The Glenelg Salinity Strategy & Previous Studies

Salinity is one of the most serious forms of land degradation in Victoria and its extent and severity continues to increase (Govt. Victoria, 1988). In the Glenelg Salinity Region alone it has been estimated there are 19,970 hectares of land affected by salt (Ward, 1992). The symptoms of salinity cost the Glenelg Regional community over $2 million each year in lost agricultural production (Glenelg Salinity Forum, 1993).

The Glenelg Region Salinity Forum was set up in 1991 to prepare a strategy to combat the problem of dryland salting in the region. Preliminary estimates of salinity were used to help formulate the strategy. Several studies have been carried out in the region in the past that involved the mapping and measurement of salinity, Fisher (1991), Whitworth (1991) and Jerinic & Dahlhaus (1994). These took place in the south-west of Victoria and north of Hamilton respectively. By no means however, did they cover the whole of the Glenelg Region. Due to the subjective nature of some of the salinity discharge data, it was decided in 1993 that a mapping program should begin to improve the accuracy of information.

Salinity discharge mapping reports to date include;

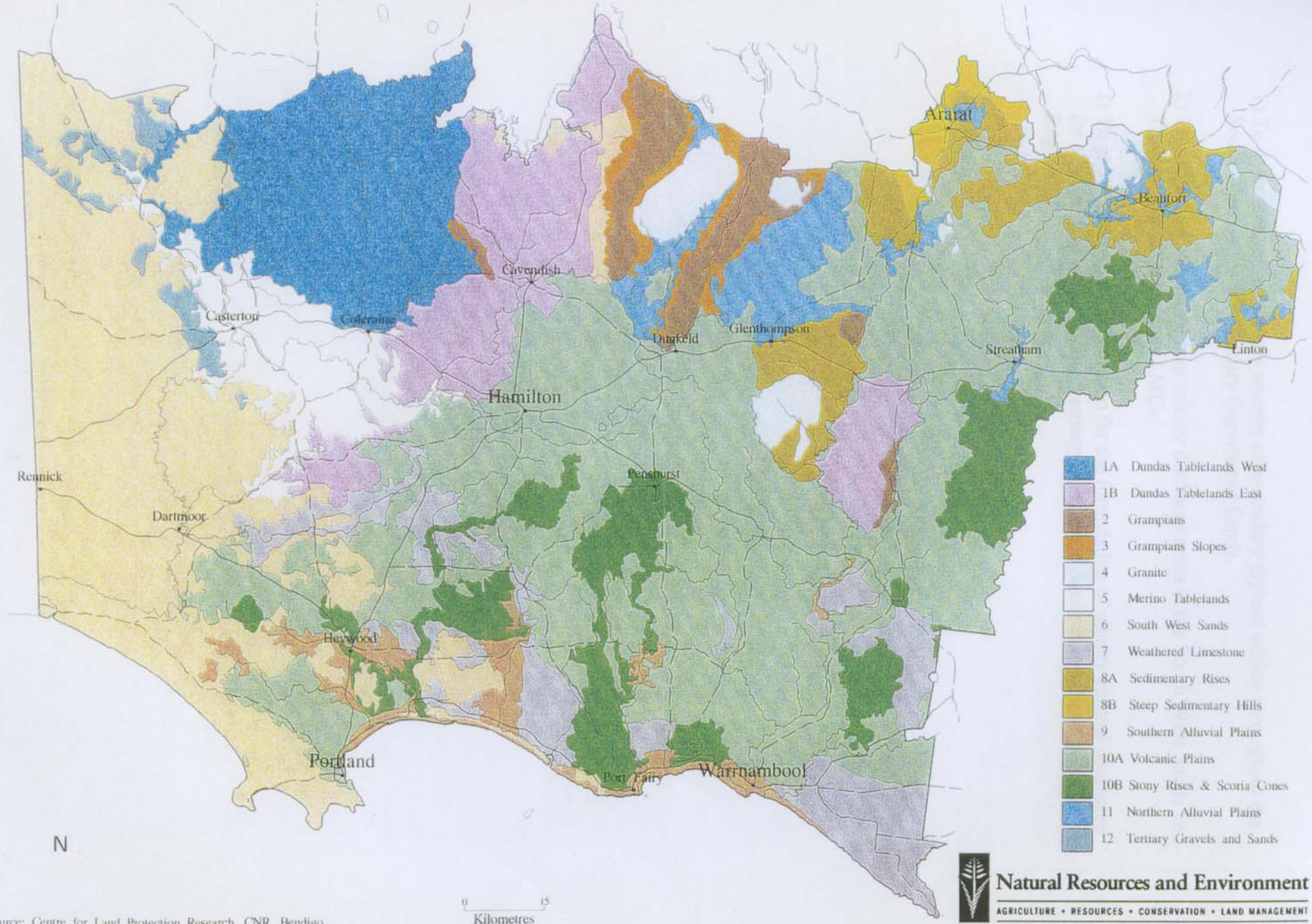
- More, Rosalind (July, 1994) *Salinity Discharge Mapping for the Merino Tablelands in the Glenelg Salinity Region;* DNRE.

- More, Rosalind (November, 1994) *Salinity Discharge Mapping for the Grampians Slopes in the Glenelg Salinity Region;* DNRE.

- Munro, Melinda (May, 1998) *Salinity Discharge Mapping for the Dundas Tablelands in the Glenelg Salinity Region;* DNRE.

The South West Sands and Tertiary Gravels and Sands LMUs were chosen to be mapped because of their large area and the low level of reliable existing information on the extent of salinity in the area.

Glenelg Salinity Region – Land Management Units



Source: Centre for Land Protection Research, CNR, Bendigo

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1.3 Objectives of this study are:

1) To determine the extent and severity of secondary dryland salting throughout the South West Sands and Tertiary Gravels and Sands.

2) To define and accurately map salinity discharge areas in the South West Sands and Tertiary Gravels and Sands LMUs.

3) To provide base data information for the formulation of salinity control strategies for the South West Sands and Tertiary Gravels and Sands in the Glenelg Salinity Region.

2. DESCRIPTION OF THE AREA

2.1 Geology and Soils

Windblown sands have formed a thin veneer over older marine sediments. Linear calcareous and siliceous dune systems have developed. Soils profiles are mostly sandy and uniform. In the north the alkaline soils are brown or reddish sandy loam dominate, or dark clays on flats. Extensive areas are poorly drained leading to the formation of wetlands systems. (Salinity Forum, 1993)

Both regional and perched local groundwater systems occur in the South West Sands. The Tertiary Gravels and Sands probably support a regional groundwater system. In regional groundwater systems, the groundwater occurs in unconfined aquifers where there is relatively free movement of groundwater. It is difficult to target salinity control methods for regional groundwater systems and the systems are slow to respond to treatment. (Salinity Forum, 1993)

2.2 Topography

Landform is mostly gentle slopes off the western margins of the Dundas Tablelands. (Salinity Forum, 1993) with many small to medium sized swamps.

2.3 Climate

The rainfall varies from 500 to 750 mm in the north (south of Apsley) and 800 to 900 mm in the south (Strathdownie, Dartmoor region) (Bird, Kearney and Jowett, 1996). Most rain comes with westerly winds and cold fronts that dominate in winter (Bourke, 1986). The mean annual temperature is 13.3 °C, the mean January temperature being 26.6°C and the July temperature being 8.3°C (LCC, 1976).

2.4 Vegetation

Much of the vegetation on the LMUs remains as native forests, woodlands and wetlands, predominately in the lower Glenelg National Park and Dergholm State Park, a total of 228,800 hectares or 46% of the LMU. Clearing of privately owned native vegetation has continued until recently (Salinity Forum, 1993). The major tree species on the sand is brown stringy bark *(Eucalyptus baxteri)* and manna gum *(Eucalyptus viminalis).* Swamp gum *(Eucalyptus ovata)*, shining peppermint *(Eucalyptus nitens)* and river red gum *(Eucalyptus camaldulensis)* occur on wetter areas in the south; yellow gum *(Eucalyptus leucoxylon)* and pink gum *(Eucalyptus fasiculosa)* occur in the north. The vegetation in the south is a combination of the above and wet heath with stunted trees. (Bird, Kearney and Jowett, 1996)

2.5 Landuse

A relatively large proportion of this LMU remains in public ownership, 228,800 hectares. A substantial area in south of the LMU, near Portland is used for pine plantations. Grazing is the major agricultural land use (Salinity Forum, 1993), comprising 251,820 hectares.

Table 1. Landuse in the Dundas Tablelands

Landuse	South West Sands	Tertiary Gravels and Sands
Total LMU Area (ha)	445,000	49,000
Agricultural Area (ha)	213,600	38,220
Existing Forest Cover (ha) (Parks, Reserv. etc)	218,000	10,800

3. METHODOLOGY

3.1 Aerial Photographs

Coloured aerial photos of the area taken in 1991-92 at an approximate scale of 1:25,000, were used in the study. Those photos that included sections of the South West Sands and Tertiary Gravel's and Sands were selected. Sites that were possibly saline were marked on plastic overlay material on the photos for field checking.

3.2 Field Assessment

3.2.1 *Location of Possible Saline Sites*

Extensive and detailed ground truthing for the positive identification of possible saline areas was carried out. The farmers who owned the land where each site fell were approached for permission to inspect the area.

3.2.2 *Assessment of sites for Salinity Indicators*

Each site was assessed in accordance with the Inventory of Soil Conservation Needs (ISCON) techniques description in detail by Matters (1987) and Matters & Bozon (1995). In brief, a site was inspected for the presence of three or four salt indicator species and other symptoms of salinity. These included the appearance of bare ground, ground water seepage, salt crystals and scalds, erosion as a result of deterioration in soil structure and deterioration or eventual death of trees. Each site was given a severity rating, low (Class 1), medium (Class 2) or severe (Class 3), with the presence of the more salt tolerant species and the increasing appearance of bare ground, salt and the other symptoms of salinity indicating a more severely affected area. Where the site was not purely one class, an estimate of the percentage of each class was made and the overall classification given as the one with the greatest percentage. In some cases it was difficult to tell whether the drainage line was salt affected or simply waterlogged. If two or more salt tolerant species were present the site was considered to be salty (Matters 1987). Indicator species were found and their severity class listed in Appendix 1. The severity classes, Cl, C2 & C3 are described in Table 1 on Page 6.

3.2.3 *Defining and Recording Areas*

Areas were marked directly onto the photo overlays. Where seeps were too small too be seen on the photo (for example 10m square) a point or dotted line was used to mark their position. E.g. Narrow drainage lines were marked with a line onto photos.

Areas were assessed as being primary or secondary salting. Primary salinity is a natural occurrence and is often evident in the form of saline lakes and wetlands. Secondary salinity, on the other hand, is induced as a result of human activity and occurs when water-tables rise, bringing dissolved salts to the surface of the land (Glenelg Salinity Forum, 1993).

Table 2. Salinity Class Characteristics

Class	Severity of salting	Site characteristics
1	Low	- patchy growth in paddock - reduced vigor of crop or pasture - pastures thin or die out, replaced by more salt tolerant species - no salt crystals or bare patches seen
2	Medium	- species of higher salt tolerance replace Cl indicators - salt stress causes change in leaf shape & color - salt stains & scalds may appear - bare areas up to 1 square metre
3	High	- only highly salt tolerant plants present - 2 or 3 species dominant - large areas of bare ground - trees may be dead or dying

Matters & Bozon (1995)

Additional information about position of salinity in the landscape, evidence of salinity and treatment of discharge was noted. Each site was given an individual identification number. One number was used for several areas if they were located close together and had similar seventies of salting and class indicator species.

All of the information for each site was recorded onto an individual site assessment sheet. A copy of a typical site assessment sheet can be seen in Appendix 2 on Page 15. Completed sheets for each site identified in the study are held at the NRE office in Hamilton.

3.3 Maps and Database

Areas were transferred from the aerial photos onto 1:25000 map sheets using a Sketchmaster. Sites that were not able to be drawn onto the aerial photos because they were too small, and therefore shape not recorded, were marked as dots or dotted lines on the map sheets. Maps where then sent to Bendigo for digitising where area and coordinates were recorded. Additional site information from the site assessment sheets was then entered for inclusion on the Statewide database. The database and maps are held at the Hamilton NRE office.

3.4 Limitations of the Study

Salt indicator species were identified though not recorded. The identification was only to identify if the site had a presence of two or more indicator species to enable classification of the site as saline. Time constraints prevented a botanical survey from being carried out.

Salinity was not extensively searched for in forested areas. No saline sites were identified from aerial photos in forested areas of the LMUs. A systematic search of the entire forested area would be required to determine if salinity existed. This was not considered feasible given the inaccessibility of most of these areas. It was expected that the hydrology under large blocks of remnant vegetation e.g. (Tullich State Forest) would not have changed significantly enough to develop sites of secondary salinity.

The complete length of drainage lines was not surveyed, due to limited time. Drainage lines were checked for salinity at as many accessible crossings as possible. If a drainage line was saline along a number of lengths and at a number of checkpoints along its course, the whole drainage line was considered salt affected.

4. RESULTS - SOUTH WEST SANDS

Information about the saline sites identified in this study are shown in a printout of the database in Appendix 3 on page 16.

4.1 Summary Information

The South West Sands Land Management Unit is comprised of 213,600 hectares of agricultural land. Of this 277.3 hectares are saline, affecting 0.13% of Agricultural Land in the South West Sands.

There were a total of 79 sites with an average of 3.5 ha. Of all the sites, 42% were less than 1 ha and 58% greater than 1 ha. The largest site measured was 66.7ha and the smallest site 0.1 ha.

4.2 Indicators of Salinity

Vegetation and bare ground served as the main indicator of salinity at all sites. Salt encrustations, scalds, tree deterioration and tree death were less common indicators.

Plant species commonly found throughout the study area were Buck's Horn Plantain *(Plantago coronopus),* Australian Salt Grass *(Distichlis distichophylla),* Water Buttons *(Cotula coronepifolia),* Strawberry Clover *(Trifolium fragiferum),* Swamp Weed *(Selliera radicans),* Annual Beard Grass *(Polypagon monspeliensis),* Sea Barley Grass *(Critesion marinum)* and Spiny Rush *(Juncus acutus).* Must common in the South West Sands are the wet depressions where Spiny Rush, Water Buttons and on the parameter Buck's Horn Plantain were commonly found.

4.3 Severity Classes

The results in Table 2 show that most of the area of salt affected land was of a low severity, (Class 1). Less area was affected by moderate salting, (Class 2) and less still by severe salting, (Class 3).

Table 3. Area of Land in Each Severity Class

Severity Class	Area (hectares)
1	216.6
2	58.0
3	2.7

4.4 Position of Salinity in the Landscape

The majority of saline land was found in drainage lines and depressions. Less affected area was found in flats. The least was seen on slopes and around lake (dam) margins. These results are shown in Table 3.

Table 4. Position of Salinity in the Landscape

Position in landscape	Number of sites	Area (hectares)
Drainage Line	32	92.9
Depression	21	150.5
Flat	20	29.5
Slope	4	4.2
Lake Margins	2	0.2

4.5 Treatment of Salinity

Sites were assessed according to their level of treatment: Completely treated, partly treated or not treated. "Completely treated" sites were defined as sites where the whole saline area had been treated using one of the recognised salinity management options. For example fencing or fencing and sowing a trees or a salt tolerant pasture species. "Partly treated" sites were defined as sites where some salinity management option had been used, but the whole site had not been treated. "Partial treatment" of a site may have occurred due to the size of the site or because of changes in landownership where discharge areas were transected by boundary fences. "Not treated" were defined as those sites where no salinity management options had been initiated.

No sites had been completely treated and only four partly treated. By far the majority of discharge sites are not treated as can be seen from the results in Table 4. The total area not treated is 268.5 hectares, or 97% of the total saline area in the LMU.

Table 5. Treatment of Salinity

Treatment of site	Number of sites	Area (hectares)
Completely treated	0	0.0
Partly treated	4	8.8
Not treated	75	268.5

5. RESULTS - TERTIARY GRAVELS AND SANDS

Information about the saline sites identified in this study are shown in a print out of the database in Appendix 4 on page 20.

4.1 Summary Information

Tertiary Gravels and Sands Land Management Unit is comprised of 38,220 hectares of agricultural land. Of this 82.62 hectares is saline, affecting 0.2% of Agricultural Land in the Tertiary Gravels and Sands.

There were a total of eighteen sites with an average size of 4.6 ha. Of all the sites, six were less than 1 ha and twelve greater than 1 ha. The largest site measured was 37.6 ha and the smallest site 0.17 ha.

4.2 Indicators of Salinity

Vegetation and bare ground served as the main indicator of salinity at all of the sites. Salt encrustations, scalds, tree deterioration and tree death were less common indicators.

Plant species commonly found throughout the study area were Buck's Horn Plantain *(Plantago coronopus),* Australian Salt Grass *(Distichlis distichophylla),* Water Buttons *(Cotula coronepifolia),* Strawberry Clover *(Trifolium fragiferum),* Swamp Weed *(Selliera radicans),* Annual Beard Grass *(Polypagon monspeliensis),* Sea Barley Grass *(Critesion marinum)* and Spiny Rush *(Juncus acutus).* Must common in the Tertiary Gravels and Sands is the wet depressions where Spiny Rush, Water Buttons and on the parameter Buck's Horn Plantain were commonly found.

4.3 Severity Classes

The results in Table 2 show that most of the area of salt affected land was of a low severity, (Class 1). Less area was affected by moderate salting, (Class 2) and less still by severe salting, (Class 3).

Table 6. Area of Land in Each Severity Class

Severity Class	Area (hectares)
1	76.0
2	2.1
3	4.5

4.4 Position of Salinity in the Landscape

The majority of saline land was found in drainage lines and depressions. Very little salt affected area was found on slopes and flats. These results are shown in Table 6.

Table 7. Position of Salinity in the Landscape

Position in landscape	Number of sites	Area (hectares)
Drainage Line	7	50.9
Depression	4	10.0
Slope	3	9.7
Flat	4	12.1

4.5 Treatment of Salinity

Sites were assessed according to their level of treatment: Completely treated, partly treated or not treated. "completely treated" sites were defined as sites where the whole saline area had been treated using one of the recognised salinity management options. For example fencing or fencing and sowing of trees or a salt tolerant pasture species. "Partly treated" sites were defined as sites where some salinity management option had been used, but the whole site had not been treated. "Partial treatment" of a site may have occurred due to the size of the site or because of changes in landownership where discharge areas were transected by boundary fences. "Not treated" were defined as those sites where no salinity management options had been initiated.

No area had been completely treated and only one partly treated. By far the majority of discharge sites are not treated as can be seen from the results in Table 7. The total area not treated is 76 hectares, or 92% of the total saline area in the LMU.

Table 8. Treatment of Salinity

Treatment of site	Number of sites	Area (hectares)
Completely treated	0	0.0
Partly treated	1	6.6
Not treated	17	76.0

6. DISCUSSION

The overall area of land in the South West Sands and Tertiary Gravels and Sands affected by saline discharge is relatively low. Sites were predominantly less than 5 ha in size and contained low levels of salinity.

None of the areas of saline discharge were been completely treated. Salinity was generally not considered to be a concern by the land owners and therefore treatment was not a priority.

REFERENCES

Bird, P.R., Dickmann, R.B., Cumming, K.N., Kearney, G.A. & Jowett, D.W. (1992). *Trees and shrubs for south west Victoria.* Technical Report Series No. 205, Dept. Ag., Victoria.

Dahlhaus, P. & Woof, C., (1995) *Bulart Salinity Study II Groundwater and Soils.* Project for study at University of Ballarat., Univ. of Ballarart (unpubl.).

Fisher, C.N., (1991). *An analysis of dryland salinity in south west Victoria.* Project for Bachelor of Nat. Resourc., Univ. of New England, New South Wales (unpubl.).

Glenelg Salinity Forum (1993). *Salt assault! The Glenelg region salinity strategy.*

Govt. Victoria (1988). *Salt action: Joint action. Victoria strategy for managing land and water salinity.* Govt. of Victoria.

Hill, S. & Day, C. (1993). *Land management units of the Glenelg salinity region.* Glenelg region Salinity Strategy Background Paper. Vol. 1. Dept. conserv. & Nat. Resourc., Victoria (unpubl.).

Jerinic, F.L. & Dahlhaus, P. (1994). *Bulart Salinity Study.* Project for studys at University of Ballarat., Univ. of Ballarat (unpubl.).

LCC (1979). *Report on the southwestern area, district 2.* Land Conservation Council, Melbourne.

Matters, J. (1987). *Method of assessment of dryland salinity.* Land Protection Division. Part of the Inventory of Soil Conservation Needs, National Soil Conservation Program (unpubl.).

Matters, J & Bozon, J. (1995). *Spotting Soil Salting. A Victorian guide to salt indicator plants.* Dept. Conserv. For. & Lands, Victoria (unpubl.).

Ward, H. (1992). *Salinity discharge estimates Glenelg salinity region.* Background Paper for the Glenelg Salinity Forum. Dept. Conserv. & Nat. Resourc., Victoria (unpubl.).

Whitworth, David. (1991). *A Salinity study of the Dundas River Catchment, Western Victoria.* Third Year Project, Ballarat University College, Victoria (unpubl.).

Appendix 1. Plant Species found in Saline Areas

Salt Indicator Species

Grasses		**Salinity Class**
Sea Barley Grass	*Critesion marinum*	*1* - 2
Tall Wheat Grass	*Agropyron elongatum*	*1* - 2
Annual Beard Grass	*Polypogon monspeliensis*	*1* - 2
Australian Salt Grass	*Distichlis distichophylla*	2
Small Plants and Shrubs		
Buck's Horn Plantain	*Plantago coronopus*	*1* - 2
Swamp Weed	*Selliera radicans*	*1* - 2
Water Buttons	*Cotula coronopifolia*	2
Strawberry Clover	*Trifolium fragiferum*	2
Rushes		
Spiny Rush	*Juncus acutus*	*1* - 2
Toad Rush	*Juncus bufonius*	*1* - 2
Trees		
Swamp Paperbark	*Melaleuca ericifolia*	*1* - 2

from Matters & Bozon (1995)

Salt Tolerant Species

Cumbungi	*Typha orientahs*

Appendix 2. Site Assessment Sheet

GLENELG REGION SALINITY MAPPING - Site Information

Photo	Run / No.	P.S. No.	% Cl	% C2	% C3	Position	Treated	Site No.	Notes

P.S. No. Site Number given on the aerial photo % Cl, C2, C3: Percentage of salinity classes present

Treated(has the site been treated): N -Not Treated, F - Fenced, P -Sown with Salt Tolerant Pasture, T - Trees Planted, R -Recharge Control (perennial pasture, trees)

Position (in the Landscape): S -Slope, BS -Break of Slope, DL -Drainage Line, LM -Lake Margin, L -Lunette, F -Flat, D -Depression, G -Gully, SR -Sandridge / Dune

Site No. - Consecutive regional number.

Appendix 3. SALINITY DISCHARGE SITES FOR THE SOUTH WEST SANDS

Site Number	Map Name	Class 1	Class 2	Class 3	Total Area (ha)	Severity	Treatment Discharge	Landscape Position
030670	DERGHOLM CHETWYND	2.13	0	0	2.13	1	N	F
030671	DERGHOLM CHETWYND	3.04	0.34	0	3.38	1	N	F
030672	DERGHOLM CHETWYND	2.75	0	0	2.75	1	N	F
030673	DERGHOLM CHETWYND	2.5	0	0	2.5	1	N	F
030674	DERGHOLM CHETWYND	0.08	0.05	0	0.14	1	N	LM
030675	DERGHOLM CHETWYND	0.06	0.02	0	0.08	1	N	D
030676	DERGHOLM CHETWYND	3.68	1.58	0	5.25	1	N	F
030677	DERGHOLM CHETWYND	0.38	0	0	0.38	1	S	F
030678	DERGHOLM CHETWYND	0.1	0	0	0.1	1	N	F
030679	DERGHOLM CHETWYND	0.75	0	0	0.75	1	N	F
030680	DERGHOLM CHETWYND	0.03	0	0	0.03	1	N	F
030681	DERGHOLM CHETWYND	2	0	0	2	1	N	S
030682	DERGHOLM CHETWYND	0.15	0.35	0	0.5	2	N	D
030683	DERGHOLM CHETWYND	0.8	0.2	0	1	1	N	DL
030684	DERGHOLM CHETWYND	1.05	0.45	0	1.5	1	N	F
030685	DERGHOLM CHETWYND	0.2	0	0	0.2	1	N	F
030686	DERGHOLM CHETWYND	0.75	0	0	0.75	1	N	S
030687	DERGHOLM CHETWYND	0.25	0	0	0.25	1	N	F
030688	DERGHOLM CHETWYND	0	0.9	0.23	1.13	2	N	DL
030689	DERGHOLM CHETWYND	0.8	0.34	0	1.14	1	N	DL
030690	DERGHOLM CHETWYND	0.53	0.35	0	0.88	1	N	DL

Site Number	Map Name	Class 1	Class 2	Class 3	Total Area (ha)	Severity	Treatment Discharge	Landscape Position
030691	DERGHOLM CHETWYND	0	1.5	2.25	3.75	3	N	DL
030692	DERGHOLM CHETWYND	0	0.4	0.1	0.5	2	S	DL
030693	DERGHOLM CHETWYND	2.13	0	0	2.13	1	N	F
030694	DERGHOLM CHETWYND	0.08	0	0	0.08	1	N	DL
030695	DERGHOLM CHETWYND	0.88	0	0	0.88	1	N	S
030696	DERGHOLM CHETWYND	0.68	0.15	0	0.83	1	N	DL
030697	DERGHOLM CHETWYND	5.08	2.18	0	7.25	1	S	DL
030698	DERGHOLM CHETWYND	2.6	0.65	0	3.25	1	N	DL
030670	DERGHOLM-CHETWYND	2.47	0	0	2.47	1	N	D
030671	DERGHOLM-CHETWYND	3.204	0.356	0	3.56	1	N	D
030672	DERGHOLM-CHETWYND	3.15	0	0	3.15	1	N	F
030673	DERGHOLM-CHETWYND	2.83	0	0	2.83	1	N	F
030683	DERGHOLM-CHETWYND	0.92	0.23	0	1.15	1	N	DL
030684	DERGHOLM-CHETWYND	1.155	0.495	0	1.65	1	N	D
030685	DERGHOLM-CHETWYND	0.56	0	0	0.56	1	N	D
030685	DERGHOLM-CHETWYND	0.21	0	0	0.21	1	N	D
030686	DERGHOLM-CHETWYND	0.6	0	0	0.6	1	N	S
030687	DERGHOLM-CHETWYND	0.17	0	0	0.17	1	N	F
030692	DERGHOLM-CHETWYND	0	0.56	0.14	0.7	2	S	DL
030695	DERGHOLM-CHETWYND	1.03	0	0	1.03	1	N	F
031975	DERGHOLM-CHETWYND	0.57	0	0	0.57	1	N	DL
031977	DERGHOLM-CHETWYND	1.494	0.166	0	1.66	1	N	DL
031978	DERGHOLM-CHETWYND	1.53	0	0	1.53	1	N	DL

Site Number	Map Name	Class 1	Class 2	Class 3	Total Area (ha)	Severity	Treatment Discharge	Landscape Position
031985	DERGHOLM-CHETWYND	0.91	0	0	0.91	1	N	D
031989	DERGHOLM-CHETWYND	1.11	0	0	1.11	1	N	D
031991	DERGHOLM-CHETWYND	1.03	0	0	1.03	1	N	DL
032016	DERGHOLM-CHETWYND	3.66	0	0	3.66	1	N	DL
032018	DERGHOLM-CHETWYND	0.65	0	0	0.65	1	N	DL
031416	DIGBY NORTH	0.6	0	0	0.6	1	N	DL
031423	DIGBY NORTH	1	0	0	1	1	N	DL
031433	DIGBY NORTH	1.79	0	0	1.79	1	N	DL
031434	DIGBY NORTH	2.28	0	0	2.28	1	N	DL
031435	DIGBY NORTH	2.02	0	0	2.02	1	N	DL
032721	KALADBRO	29	0	0	29	1	N	D
032721	KALADBRO	5.86	0	0	5.86	1	N	D
032722	KALADBRO	12.21	0	0	12.21	1	N	D
032722	KALADBRO	2.8	0	0	2.8	1	N	D
032722	KALADBRO	7.04	0	0	7.04	1	N	D
033046	LANGKOOP - EDENHOPE	40.026	26.684	0	66.71	1	N	D
033047	LANGKOOP - EDENHOPE	0.672	0.168	0	0.84	1	N	D
033048	LANGKOOP - EDENHOPE	0.96	0	0	0.96	1	N	D
033049	LANGKOOP - EDENHOPE	3.636	0.404	0	4.04	1	N	D
033049	LANGKOOP - EDENHOPE	4.149	0.461	0	4.61	1	N	D
033050	LANGKOOP - EDENHOPE	3.834	0.426	0	4.26	1	N	D
033061	LANGKOOP - EDENHOPE	1.61	0	0	1.61	1	N	DL
033061	LANGKOOP - EDENHOPE	9.71	0	0	9.71	1	N	DL

Site Number	Map Name	Class 1	Class 2	Class 3	Total Area (ha)	Severity	Treatment Discharge	Landscape Position
033062	LANGKOOP - EDENHOPE	8.26	0	0	8.26	1	N	DL
033063	LANGKOOP - EDENHOPE	4.424	6.636	0	11.06	2	N	DL
033063	LANGKOOP - EDENHOPE	1.504	2.256	0	3.76	2	N	DL
033063	LANGKOOP - EDENHOPE	0.24	0.36	0	0.6	2	N	DL
033063	LANGKOOP - EDENHOPE	0.352	0.528	0	0.88	2	N	DL
033064	LANGKOOP - EDENHOPE	2.7	0	0	2.7	1	N	DL
030609	MOORALLA	0.35	0.08	0	0.43	1	N	F
030610	MOORALLA	0.02	0.06	0	0.08	2	N	F
030611	MOORALLA	0.26	0.18	0	0.44	1	N	F
030612	MOORALLA	0.13	0	0	0.13	1	N	D
030613	MOORALLA	0.02	0	0	0.02	1	N	LM
033096	NARRAWONG	8.445	8.445	0	16.89	2	N	DL
Grand Total:		**216.635**	**57.955**	**2.72**	**277.3**			

Appendix 4. SALINITY DISCHARGE SITES FOR THE TERTIARY GRAVEL'S AND SANDS

Site Number	Map Name	Class **1**	**Class 2**	**Class 3**	**Total** Area (ha)	Severity	Treatment Discharge	Landscape Position
030676	DERGHOLM-CHETWYND	4.641	1.989	0	6.63	1	S	F
030677	DERGHOLM-CHETWYND	0.51	0	0	0.51	1	N	F
030678	DERGHOLM-CHETWYND	0.17	0	0	0.17	1	N	F
030678	DERGHOLM-CHETWYND	4.8	0	0	4.8	1	N	F
030679	DERGHOLM-CHETWYND	0.88	0	0	0.88	1	N	D
030680	DERGHOLM-CHETWYND	0.09	0	0	0.09	1	N	S
030681	DERGHOLM-CHETWYND	1.71	0	0	1.71	1	N	D
030682	DERGHOLM-CHETWYND	0.186	0.434	0	0.62	2	N	D
030688	DERGHOLM-CHETWYND	0	1.216	0.304	1.52	2	N	S
030689	DERGHOLM-CHETWYND	0.728	0.312	0	1.04	1	N	DL
030690	DERGHOLM-CHETWYND	0.666	0.444	0	1.11	1	N	DL
030691	DERGHOLM-CHETWYND	0	1.796	2.694	4.49	3	N	DL
030693	DERGHOLM-CHETWYND	0.48	0	0	0.48	1	N	DL
030693	DERGHOLM-CHETWYND	2.06	0	0	2.06	1	N	DL
030696	DERGHOLM-CHETWYND	4.872	3.248	0	8.12	1	N	S
031986	DERGHOLM-CHETWYND	4.07	0	0	4.07	1	N	DL
031987	DERGHOLM-CHETWYND	37.63	0	0	37.63	1	N	DL
031988	DERGHOLM-CHETWYND	6.69	0	0	6.69	1	N	D
	Grand Total:	**70.183**	**9.439**	**2.998**	**82.62**			