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THE IMPACT OF BELL BAY PULP MILL

0N

TAMAR RIDGE ESTATES,
KAYENA VINEYARDS

By

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28 August 2007

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1. The background to this report

I am an independent viticultural consultant with over 40 years experience in the wine sector. Tamar Ridge Estates is my principal client, and I spend approximately 50% of my time working with their vineyard and winery staff in Tasmania. I report to Tamar Ridge Estates CEO Dr Andrew Pirie. My principal consultancy role is vineyard management to improve wine quality. I am also very much involved in the supervision of two Tamar Ridge PhD scholars at the University of Tasmania. Both are involved with research into effects of Pinot Noir vineyard management on wine quality. I also manage a microvinification facility used in research to improve wine quality.

The balance of my time is spent with other clients in Australia and throughout the world, in recent years primarily in Europe, China, the USA and New Zealand. I have visited many of the worlds wine regions. I attach a brief CV as appendix 1 to this report.

This report has been written in response to a request from the Tamar Ridge Estates CEO Andrew Pirie. In view of the involvement by the local association of vignerons Wine Industry Tasmania ("WIT") and recent concern about chlorophenol emission from the proposed mill, it was deemed prudent to investigate these issues as they might impact Tamar Ridge Estates. Chlorophenols are known to cause taints in wine and so the local wine sector is particularly sensitive about the fact that they may cause spoilage to Tamar Valley wines. Apart from bushfire smoke taint and eucalyptol pollution, there is little evidence that atmospheric constituents can be taken up by vines and cause juice/taint problems.

This report is the result of my independent investigations. Where other sources are used these are listed in the report and acknowledgements. I have not attached a list of references, but I have a file of these available should there be need for any more information.

2. The issues of a pulp mill in the vicinity of Tamar Ridge Estates, Kayena

Over the last several months there have been various reports in the media that the development of the Bell Bay pulp mill will impact on the local wine industry. These reports have been picked up by national newspapers and other media.

The Tamar Valley is not the first wine area to be faced with the issue of near by pulp mills. As I will show, there are pulp mills in wine areas throughout the world, many of them the older types of mills having a greater environmental impact. The proposed mill is a chemical pulp mill using the kraft process which uses chlorine dioxide for bleaching. There are other types of mills which use chemi-mechanical or the mechanical process, an example of this latter type is currently proposed to be built at Penola in the Coonawarra wine region.

There are approximately 470 listed chemical pulp mills in the world with a capacity greater than one thousand tons per annum, this figure does not include mechanical pulp mills and paper mills. The majority of mechanical pulp mills and paper mills are also equipped with power boilers burning wood waste etc, and so any issues regarding combustion by-products (as for chlorophenols) will apply to very many more than the 470 chemical mills indicated. In fact, in this respect, the same issue applies to any industry associated with timber, including saw mills and particle board mills etc. Further, vineyards nearby sources of combustion like coal-fired power stations and cement kilns may have similar potential concerns.

Wine Industry Tasmania made a submission to the President of the Legislative Council on the 15th of August 2007 (see Appendix 2) outlining some concerns regarding the proposed pulp mill project. Their concerns were in three categories. The first was the possibility of foul odours from the mill which may impact on cellar doors sale for adjacent wineries. The second point of concern regarded emissions from the mill, in particular those known as chlorophenols, which are causative in wine taints. WIT acknowledged that there had been no recorded evidence of a causal relationship between wine taints and pulp mill emissions but requested monitoring of these compounds. Thirdly, WIT noted possible impact of increasing log truck traffic on the Tamar Valley Wine Route.

As is shown in Figure 1, the Tamar Ridge Estate Vineyards are dissected by the radius of 5 km from the stack. There are 8 other small vineyards in the 5 km radius. Tamar Ridge Estate is one of the closest vineyards in the State to the proposed pulp mill site, and by far the largest in the near vicinity. Tamar Ridge Estates has at Kayena 136ha of vineyard expected to produce 1,240t of wine grapes in 2008.

Therefore I consider that these issues need to be investigated from the point of view of Tamar Ridge Estate's property and commercial operations. All of these potential points of concern will be discussed in what follows.

3. Potential problems for Tamar Ridge Estate, Kayena

3.1 Increased road traffic

I have made no independent research on this issue. I note that the proponents Gunns claim that traffic will not be increased beyond that which presently exists to serve the existing wood chipping facilities adjacent to the proposed pulp mill site.

3.2 Sulphide odours impacting cellar door sales

The WIT submission raised particular concerns about two reduced sulphur compounds. These are hydrogen sulphide, called "rotten egg gas" and methyl mercaptan, called "rotten cabbage gas". There are no limits for these individual compounds in pulp mill emission guidelines but together with other sulphurous compounds are measured as total reduced sulphur ("TRS"), for which a specified limit applies.

The WIT concern in particular is that hydrogen sulphide and methyl mercaptan will make up a high proportion of TRS levels, and so their presence may be noted by clients at cellar door operations for those wineries near the mill site.

Hydrogen sulphide is a naturally occurring gas, being produced in geothermal regions, by swamps and by decaying organic matter. The threshold of detection is very variable within the human population. It is likely because of estuaries near Tamar Ridge Estates that there are some small background levels of hydrogen sulphide, but I have not noticed these nor have they been reported on the Estate.

There have been significant advances in pulp mill technology over the last several decades aimed at reducing sulphur emissions. Old pulp mills, for example the one at Burnie, Tasmania, had a reputation for being smelly, which was often deserved. I have found data reviewing sulphur emissions from Swedish pulp mills showing how they have been reduced to less than 10% of the levels occurring in 1978. Similar studies in Finland have shown that by

2007 emissions have dropped to less than 10% of the 1998 values. The Bell Bay pulp mill is promoted by Gunns as using world best technology and this will include specific technology to reduce sulphur emissions. The RPDC documents list on page 13 "Accepted Modern Technology" AMT for the reduction of emissions to the atmosphere

The RPDC guidelines for total reduced sulphur compounds (TRS) are set at 1.5 µg/m3 over a 3 minute moving average, outside the mill boundary. The footnote to this value (page 27, RPDC Vol 2 Recommended Environmental Emission Limit Guidelines for any New Bleached Eucalypt Kraft Mill in Tasmania) says " *at these low levels, emission controls exist primarily so that ambient concentrations are below those levels which humans can detect (*The underlining is due to the author of this report, RES*) The Australian Government has been advised that the most sensitive humans can detect hydrogen sulphide at 0.2- 2.0 µg per m3, and that concentrations which average 7 µg per m3 and in a 30 minute period could cause annoyance."* Recall that hydrogen sulphide is but one of several reduced sulphur compounds measured as TRS.

Therefore only the most sensitive humans will be able to detect reduced sulphur odours at the mill boundary. With dilution over distance to the vineyards, no sulphur emissions will be discernible at Tamar Ridge nor indeed any nearby vineyard. The emission modeling carried out by GHD for the Draft Integrated Impact Statement has shown a dilution factor of 6,000:1 from the stack to around 5 km distance.

I therefore think that the concerns of WIT relating to the makeup of the TRS constituents vis-à-vis hydrogen sulphide is unnecessary, as the total reduced sulphur compound level will be below the threshold for hydrogen sulphide, one of the constituents of total reduced sulphide.

3.3 Chlorophenol emissions, and possibility of wine taints

There is a single reason why the wine sector is interested in these particular emissions from pulp mills. That is because it has been known for some time that they are exceedingly powerful odourant compounds in causing taints in wine, with sensory perception levels in the range of nanograms per litre. They have been identified in causing "cork taint" and other off odours in wine.

a) Chlorophenols in nature and human society

Chlorophenols (generically organohalogens) are widespread in the environment and while most would say they are anthropogenic in origin, cases have been made for their presence due to natural combustion as in forest fires. One reason for their being so widespread is their efficiency as biocides. Since the 1930s the pentachlorophenol PCP has been widely used as preservative of wood and leather etc and are important constituents of herbicides, fungicides and insecticides and even household disinfectants. These products have been now banned in some countries.

Chlorophenols are also formed by industrial emissions including combustion of municipal waste, wood (including pulp mills), coal and natural gas. Inorganic chloride in the substrate is combined with phenols. Chlorophenols have been shown to be produced in domestic wood burning fireplaces, and are of course produced by forest fires. Chlorophenols are the chemical precursor of dioxins and furans which are formed during combustion, and from this point of view have been well studied. Chlorophenols can be present in food and even in drinking water, as in Sydney.

Investigations of food and wine taints have shown that chlorophenols may originate from products treated with chlorophenols as preservatives, for example the wood of pallets or shipping container floors, or of winery walls. They can also be found in packaging materials like cardboard and paper.

Chlorophenols are subject to a series of physical, chemical and biological transformations in the environment. Their fate and transport depends on processes of sorption, volatilization, degradation and leaching. In the atmosphere chlorophenols are degraded by hydroxyl attack and photolysis. Atmospheric levels of chlorophenols are typically very low. For example measurements made in Portland, Oregon in 1984 showed average concentration during rain events to be 0.02 parts per trillion for trichlorophenols.

b) Chlorophenols and wine taints

Chlorophenols and in particular trichloroanisole TCA have been recognized since 1982 as a major cause of cork taint in bottled wine. TCA is produced from chlorophenols by fungal metabolism, which can occur in cork manufacture and even in the cellar environment from treated wood. It is the presence of this taint in up to 10 per cent of bottled wines where cork stoppers have been used which has led to the recent resurgence of metal wine closures, which are now very widely used in Australasia and are increasing in use elsewhere. Cork contamination with chlorophenols has been associated with spraying trees with insecticides containing these pentachlorophenol PCP. Shipping containers have also been found to be the source of contamination of champagne corks.

More recent research has identified other chlorophenols which can be involved in wine taint especially 2, 4, 6 –TBA (tribromoanisole). French researchers have shown that TBA comes from TBP which was used to treat wood in the winery, or wooden barrels. The winery environment in this instance is the cause of wine taints, not the corks. There have been studies of other chlorophenol compounds at the Australian Wine Research Institute (“AWRI”) relating to chemical or plastic taints involving 2,6-DCP. In one instance this taint has been traced to a contaminated wine additive which was perhaps picked up in transportation in a container with wooden floors.

Further research at the AWRI has identified a methoxy pyrazine as a source of a “fungal must” taint in wine. Therefore fungal odours are not restricted to chlorophenols. The AWRI has produced aroma and taste thresholds for a range of chlorophenol and bromophenol compounds in water and wine by literature survey and their own studies.

I am unaware of any studies showing that chlorophenols which taint wine have grape origin. I have been unable to find any references to a grape source of chlorophenols using “Google” and “Google scholar”.

c) Are studies of bushfire smoke taints of relevance?

Prior to the recent bushfire studies in Australia, I knew of only one instance where grapevines were known to be affected by atmospheric pollution. I became aware of this when a graduate student at Cornell University NY in the early 1970s. Apparently vineyards beside the New York State Expressway were known to be affected by lead emissions from motor cars. With a reduction in the use of leaded fuels this ceased to be a problem.

Over the last several years AWRI has been involved with studies of bushfire taints of grapes and wine. This work commenced in 2003 - 2004 growing season and continued in 2007 vintage. When smoke concentrations are high in vineyards the berries become contaminated by two odoriferous phenolic compounds in particular which are present in wood smoke. These are guaiacol and 4-methyl guaiacol. These compounds can also be found in smoked food and have known sensory properties.

These compounds have a low sensory threshold, being detectable at 6 µg per litre in white wines and 15 to 25 µg per litre red wine. Various experiments have shown that washing of the vines does not remove the taint nor apparently does removing the waxy covering on the grape berries. Various studies have indicated that these contaminants are concentrated in the grape skin and are not in the pulp.

Studies have indicated that the smoke taint effects are additive, that is continual exposure causes higher concentration. It is not known at which period the smoke taint accumulates in the grape berry skin but it would appear that this could happen as early as veraison.

There are many unknowns in this situation. Could the smoke taint move through the berry wax and accumulate in the skin without passing into the pulp? Alternatively could the taint be taken up by the leaves (perhaps through the stomata) and be translocated to the grape berry skin. I think diffusing into the soil and uptake by the roots is most unlikely to result in any significant concentration in the plant.

In any event, the bushfire taint studies have demonstrated that these guaiacol compounds at least can be can be transmitted from the atmosphere to the grape berries and subsequently cause wine taints. It is noteworthy that this happens only under very high concentrations of bushfire smoke for more prolonged periods. Many vineyards will have been affected by short-term smoke events in the past with no noticeable problems.

Very recently I learned of another potential atmospheric contaminant of grapes and wine. A Californian laboratory has shown that eucalyptol (1,8-cineole) has a major role in the occurrence of a eucalyptus character in wine with an aroma threshold of 3.2 mg per litre. There is empirical evidence to suggest that this contaminant may be picked up from volatile eucalyptus oils arising from the trees adjacent to the vineyard but this has not been proven.

Studies in Bulgaria have also shown that airborne dust containing lead can contaminate grapes and also wine, where the vineyards were near a metal works.

The smoke taint studies in particular indicate that atmospheric contamination of grape berries is possible under special conditions of very high concentrations of pollutants in the atmosphere. This begs the question as to whether such might take place from very much lower atmospheric concentrations of chlorophenols.

d) Calculations of chlorophenol concentrations at Kayena, and impacts for wine

There are no Emission Limit Guidelines for chlorophenols to which the proposed mill must adhere. Guidelines are given for inorganic chlorinated compounds, total reduced sulphur, dioxins and furans, sulphur dioxide, nitrogen oxides and particulate matter.

There are specific technologies to remove inorganic chlorinated compounds which presumably will also reduce organic chlorine containing compounds like chlorophenols. The

Bell Bay Pulp Mill is claimed to be designed to the world's best available technology. The Stockholm Convention on Persistent Organic Pollutants (POP's), to which Australia is a signatory, lists the requirements to which the Bell Bay pulp mill must obey. It will have modern technology including cooking, oxygen delignification, elemental chlorine free bleaching, efficient brown stock washing and maximized knot removal to name some of the processes.

In the proposed mill design, both the power and recovery boilers emit through a common smokestack. It will be 130 m high and 200 m above sea level. Peter Ryder is a senior consultant with Poyry, consultant engineers to Gunns, and at Andrew Pirie's request provided some data on chlorophenol emissions from pulp mills. (I have been unable to find any such data by googling).

This data is from KCL, the Finnish Pulp and Paper Research Institute, and is published in TAPP 1994 International Environmental Conference, pp 49-56. The study was conducted in Finland and investigated burning biosludge mixed with bark in different types of converted old boilers, none of which were equivalent to modern designs. Peter Ryder advised me that the chloride content of the combined waste in this study (11,500 mg/kg) is much higher than the chloride content of waste to the Bell Bay Mill (200 mg/kg) and where debarked logs will be burnt. Therefore the emissions measured in this experiment will be a worst case scenario.

The Bell Bay Mill will use a bubbling fluidized bed power boiler which in the study caused the lower emission of 0.46 (say 0.5) µg/m3. Based on the air dispersion modeling done by GHD and submitted in the Draft Integrated Impact Statement (Vol.9, A16) the dilution factor at 5 km from the stack is approximately 6,000:1. Therefore, within an approximate 5 km radius, the concentration at ground level will be approximately 0.000083 µg/m3 or 0.083 ng/m3, or 0.000083 ng/L, or 0.83×10^{-4} ng/L.

At my request, Pacific Air and Environment (a Brisbane environmental consulting company who have made studies of stack emissions in the Tamar valley, see Book E, Supplementary Information, Draft Integrated Impact Statement), made model predictions of the ground-level chlorophenol concentrations. They assumed an in stack concentration of 0.5 µg/m3. They studied the annual average concentrations, February concentrations and maximum 1-hour concentrations.

The PAE modeling found that the highest concentrations of 0.16×10^{-4} ng/L would be around the mill, to the north and towards Rowella to about the 3 km zone. This is a very low figure, and around 1/5 of the value approximated from the GHD dilution factor.

This concentration can be compared to the sensory threshold value in wine as determined by AWRI experiments. For the 8 chlorophenols investigated in a Chenin Blanc white wine the panel average best estimate threshold ranged from 32 to more than 296 ng/L. Therefore, the lowest of these concentrations in wine (32 ng/L) are 2 million-fold the maximum predicted ambient atmospheric concentration. While no information is available on the extent to which chlorophenols may be absorbed and concentrated in the juice of the grape, such a bio-concentration effect seems most unlikely, if not impossible.

I have googled for and found no reference for wine taint caused by grape juice sources of chlorophenols. All wine taints have been associated with the wine environment, not that of the vineyard or grapes.

My research therefore leads me to the conclusion that chlorophenol taint of wine in the Tamar Valley is not at all likely from operation of the proposed Bell Bay pulp mill.

Indeed my research has led to the awareness that other sources of combustion in a wine region may be more likely to cause taint problems, where the combustion is not regulated.

e) Pulp mills, winegrowing and agriculture in the rest of the world

Viticulture has been practiced now for over half a millennia within discrete vineyards. Over the last several centuries, manufacturing industries have operated sometimes in close proximity to vineyards, especially in parts of Europe. It would seem to me that if industrial emissions were a cause of wine taints then this would have been documented previously.

In this instance we are concerned about industrial emissions from Kraft pulp mills. I have therefore sought information about pulp mill locations around the world in some wine producing countries. I have had prepared maps of some wine regions around the world taken from the www.kobrandwines.com web site, and these have been checked by reference to Oz Clarke's Wine Atlas, They have generally shown good agreement, apart from the case of France listed below. .Superimposed on these wine region maps are the location of the known Kraft paper mills obtained by Peter Ryder from the Poyry data bank. Note that these maps do not show all pulp and paper mills but only pulp mills of a similar type to the proposed Bell Bay mill. This analysis was carried out for France, Portugal, Spain, Germany, Chile and Oregon, USA. Note that pulp mills are generally located in wet and cool regions, near the supply of timber, while vineyard regions may range from cool to hot and typically are of lower rainfall.

Note that the maps of wine regions are ambiguous, as will be explained for each. In Europe there is a formalized system of wine region classification, called for example AOC in France, DOC in Spain etc. These regions are those which are generally the most famous, but cannot be interpreted as the limit of grape growing. Further, we cannot assume that vineyards are grown everywhere within these delimited regions. Some maps, like those of Chile and Oregon, show the general limit of grape growing in the wine regions. Vines are not grown everywhere in these regions.

For example, Figure 2 shows a map of France with the AOC regions marked in colours and other vineyards marked in grey stipple. While the AOC regions are well defined, the 'Other vineyards" region is likely less accurate. I have found this map to be in slight error, as it shows the vineyard regions of Bordeaux stretching south west to the coast, which is not the case. It would indicate that the pulp mill at Biganos is in a wine region, whereas in fact it is near the border. Note that there is one kraft pulp mill in an AOC wine region near Avignon, north of Montpellier in the southern Rhone. Another mill is north west of Limoges in "other vineyards" areas.

Figure 3 shows the DOC and IPR wine regions of Portugal. There are pulp mills in two regions, near Setubal south of Lisbon and in the northern Vinho Verde. There are also mills in the IPR regions of Bieras in the north east, and adjacent to the Ribatejo region north of Lisbon.

The DO and DOC wine regions of Spain are shown in Figure 4. There are pulp mills in Galicia DO in the north west , Navarra in the central north and Hueva in Andulucia in the south west. There is a mill at the eastern boundary of the Rioja, the most famous wine region of Spain.

Figure 5 shows the quality wine regions of Germany, mostly in the southern part of the country. There are pulp mills in the Rheingau and Rheinhessen wine regions along the Rhine river, again which are among the most famous wine regions of.Germany

Figure 6 shows the wine regions and pulp mills of Chile. There are three mills in the Bio Bio/ Itata valley wine regions. Based on my visits to Chile, I assume that vineyards are scattered within the marked wine regions.

The wine regions of Oregon USA and pulp mill locations are shown in Figure 7. There are three pulp mills in the Willamette Valley wine region; vineyards are scattered within the boundaries of these regions.

My interpretation of this data is that pulp mills and wine regions have co-existed in other countries, with no apparent problems. This fact in itself would reinforce the claim that the Bell bay pulp mill is unlikely to have any impact.

My google searches have not produced any evidence of grapes in vineyards being tainted by pulp mill emissions, nor the wine produced from them.

Conclusion

My independent investigations lead me to the following conclusions:

- Reduced sulphur odours will not be discernible at the Tamar Ridge Estates nor indeed at other nearby vineyards.
- The exceedingly low concentrations of chlorophenols from the flue gas emissions predicted in Tamar Ridge Estates vineyards will preclude any possibility of wine taint by grape, vine or wine sorption at Tamar Ridge and nearby vineyards.
- My conclusions are reinforced by the fact that older pulp mills, some with presumably less strict emission guidelines, are located in wine regions overseas (France, Portugal, Spain, Germany, Chile and Oregon, USA), and have not been reported to cause problems for vineyards and wine.

Therefore I am confident that the presence of the Bell Bay pulp mill will have no impact on Tamar Ridge Estate operations nor wine quality reputation. Nor do I believe the proposed mill will have any impact on neighbouring vineyards or wineries.

Acknowledgements

I have benefited from discussions with Natalie Fryar of Yalumba wines, and Con Simos of the Australian Wine Research Institute. Peter Ryder , senior consultant with Poyry has helped by providing information about the location of mills and with finding information about chlorophenol output. Mark McRostie and Emily Tys of Gunns provided GIS maps used in this report.

APPENDIX 1

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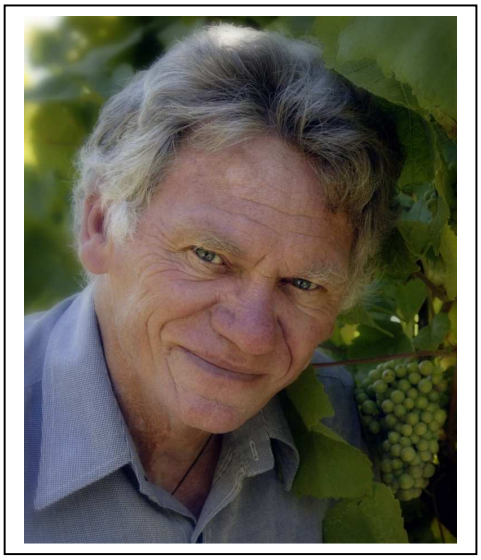


CURRICULUM VITAE of DR RICHARD E. SMART

March 2007

Date and place of birth: 6 March, 1945, Windsor, N.S.W.

Citizenship: Australian

Qualifications obtained:

1966 **B.Sc. Agr. (Hons II)**, Sydney University, N.S.W. Full time, 1962-1965.

1973 **M.Sc. (Hons.)**, Macquarie University, N.S.W. External, 1968-1971. Thesis: *Aspects of light use by vineyards*

1976 **Ph.D**., Cornell University, N.Y. Full time, 1970-1975. Thesis: *Implications of the radiation microclimate for the productivity of vineyards*

1995 **D.Sc. Agric**. University of Stellenbosch, South Africa This degree is by submission of published papers. Thesis: *The effect of manipulating grapevine vigour and canopy microclimate on yield, grape composition and wine quality.*

Relevant Career Appointments:

1966	**Viticultural Research Officer**, N.S.W. Department of Agriculture, Griffith. N.S.W.
1970	**Traveling Fellowship** to Israel to study drip irrigation.
1971	**Graduate student**, Pomology Department, Cornell University, Ithaca. N.Y.
1974	**Lecturer in Viticulture, Senior Research Fellow**, and **Dean, Faculty of Oenology**, Roseworthy Agricultural College, Roseworthy, S.A.
1982	**National Viticultural Scientist**, Ministry of Agriculture and Fisheries, Ruakura Research Centre, New Zealand
1990	**Viticultural Consultant**, Smart Viticulture, Port Macquarie, N.S.W.
2002-3	**Visiting Professor of Viticulture**, Cal Poly State University, San Luis Obispo (March till June)
2003	**Viticultural Consultant,** Smart Viticulture, Launceston, Principal client Gunns Ltd and Tamar Ridge Wines
2003	**Honorary Research Associate**, University of Tasmania

Publications:

- Authored or co-authored over 340 technical publications in viticulture.
- These include 3 theses, 27 research papers in refereed journals including 4 reviews; 1 book, 11 chapters in books, 1 major conference proceedings, 76 papers at scientific conferences or industry seminars with proceedings, and 11 written reports.
- Over 210 popular articles in Australian and American trade journals.
- Viticulture Editor for the "Oxford Companion To Wine", edited by Jancis Robinson MW, published in 1994 and 1999, responsible for about 140,000 words per edition.
- Author of bi-monthly columns in major wine industry publications. *Australian and New Zealand Wine industry Journal,* and *Practical Winery and Viticulture.*
- Publication list is available

Professional Societies:

- Member, Australian Institute of Agriculture Science.
- Member, Australian Society for Horticulture Science.
- Member, American Society of Enology and Viticulture, and former member of Editorial Panel.
- Founding President and Life Member, New Zealand for Viticulture and Oenology.
- Member, Australian Society of Viticulture and Oenology, and former member of Editorial Panel.

Awards:

- 1970 N.S.W Public Services Board Traveling Fellowship, for research in Israel.
- 1971 Auscott Postgraduate Scholarship, NSW, for graduate study in USA.
- 1980 French Government Scholarship, for study in France.
- 1983 Walter and Carew Reynell Fellowship, Roseworthy College.
- 1983 Honorary Research Lecturer, American Society of Enology and Viticulture.

- 1989 New Zealand Wine Industry Personality of the Year.
- 1989 Honorary Research Lecturer, South African Society of Enology and Viticulture.
- 1990 Honorary Life Membership, New Zealand Society for Viticulture and Oenology.
- 2001 Honorary Research Lecturer, South African Society of Enology and Viticulture.
- 2004 For contributions to New Zealand wine industry, personal award.
- 2004 Wine and Spirits Magazine (US) October, One of world's 50 most influential winemakers
- 2004 Wine Industry "Personality of the Year" for Innovation, Wine magazine, UK.
- 2005 Among "50 Most Powerful Names in Wine", Decanter magazine, UK
- 2007 Inducted to New Zealand Wine Hall of Fame

Research Interests:

- Grapevine whole-plant physiology especially solar radiation effects.
- Light stimuli affecting grapevine processes regulating yield, growth and fruit composition.
- Grapevine water relations and irrigation practice.
- Fruit composition implications for wine quality.
- Canopy architecture effects on grapevine growth, yield and quality.
- Vineyard mechanisation.
- Climate studies of vineyard regions, and effects on wine style and quality.
- Microvinification to evaluate wine quality
- Vineyard factors affecting quality of Pinot Noir and Sauvignon Blanc
- Zonal viticulture effects on yield and quality, using ground and aerial infrared imagery, and GPS and GIS.

Consulting Experience:

- Smart Viticulture has over 200 clients in 26 countries, including all grape growing states of Australia.
- Consulting expertise is particularly in the arena of canopy management as a means of manipulating grape yield and wine quality.
- Other factors affecting wine quality are also included, such as choice of variety, clone and rootstock, vine spacing, trellis system, pruning and training.
- Consulting expertise covers all aspects of viticulture from site selection to harvest.
- Dr Smart has a particular skill in vineyard climatology, including homoclime searches and matching variety to climates.
- Smart Viticulture also provides intensive viticulture courses, and educational vineyard and winery tours throughout the world.

Managerial Experiences:

- Richard Smart was a popularly elected Graduate Student Senator to Cornell University Senate 1972.
- He was also Head of Viticulture Department and Dean of Faculty of Oenology, Roseworthy Agriculture College 1975-1982, involving about 15 academic staff and 100 students.

- During the period at MAF Ruakura Agricultural Research Centre, New Zealand, he supervised 5 technicians on three research stations, and was also Department Head of Horticulture (ca. 10 scientists) for a year.
- Dr Smart served one term as member of the Australian Wine Research Institute Board.

Commercial Experiences:

- Richard Smart and family operated a 16 ha commercial vineyard at Williamstown in the Barossa Valley from 1976-1982.
- Richard Smart has always had a strong interest in commercial applications of research findings.
- He was involved in developing scientific support for mechanical pruning while at Roseworthy Agricultural College, which is now widely established in Australia.
- In the 1970s in New Zealand, the Government adopted a system of “user pays”, and the opportunity was taken to develop a part time consultancy business in canopy management. This was the early beginning of the present international consulting business Smart Viticulture, begun in 1990 from Port Macquarie, NSW.
- Smart Viticulture has clients throughout Australia and in 26 countries of the world, and so is well aware of “world best practices” in viticulture.
- Smart Viticulture is the vineyard consultant to Gunns Tamar Ridge winery, which is the largest vineyard in Tasmania. Dr Smart is advising on all aspects of viticulture, from site selection to harvest procedures. He has been involved in vineyard development of 150 ha per year for the last two years, including site, variety and clone selection.
- A management plan has been developed for Tamar Ridge vineyard, to optimize quality. This involved aerial infrared imagery, and vintage planning with vineyard manager and enologist.

Training:

- Smart Viticulture conducts training courses in the form of one day Canopy Management Workshops, which are typically at the invitation of regional Grapegrower associations. These have been held in many countries and wine regions.
- As well Dr Smart has developed a three-day intensive viticulture course called “College in a Coach” which has been offered in Australia at least once a year since 1995 and in California in 2002.
- Dr Smart and Smart Viticulture also offer educational grape and wine tours to wine regions of the world. These have been to Australia, New Zealand, South America, California and Oregon, Spain, Portugal and Italy.
- Dr Smart taught classes “Grapevine Physiology” and “Growing Quality Winegrapes” at Cal Poly in 2002 and 2003.

Other Experiences

- As founding President of New Zealand Society for Viticulture and Oenology, Dr Smart was instrumental in organizing the Second International Cool Climate Viticulture and Oenology Symposium, January 1988 with 600 attendees.
- Dr Smart can write and speak technical French.

- Dr Smart has an extensive network of viticulture science and wine industry colleagues throughout the world.
- Dr Smart was a member of the inaugural New Zealand Government mission to the OIV in 1998.
- Dr Smart has had wide involvement with industry bodies in Australia and New Zealand.
- Dr Smart has traveled extensively, often to deliver lectures at international meetings or at industry workshops, and more recently for consulting. He has visited many of the worlds wine regions, including those of Argentina, Austria, Australia, Canada, Chile, China, England, France, Germany, Greece, Hungary, India, Israel, Italy, Japan, New Zealand, Portugal, Slovenia, Spain, South Africa, Uruguay, U.K and the USA.
- Dr Smart makes six or more overseas trips a year, often as invited speaker at wine sector conferences. In this way he has a wide network of international colleagues, and he has a contemporary knowledge of the world wine business.
- Dr Smart is supervising two PhD students the University of Tasmania, beginning 2005. Thesis topics are “Vineyard management effects on Pinot Noir wine quality” and “ Vine physiology and fruit ripening effects on grape and wine composition and quality in cool climates”.

Appendix 2 Wine Industry Tasmania letter to Legislative Council

WINE INDUSTRY TASMANIA

15 August 2007

Copy

The Hon. D.G. Wing MLC
President;
Legislative Council
Parliament House
HOBART TAS 7000

Dear Mr Wing

SUBMISSION REGARDING THE PROPOSED PULP MILL PROJECT

I am writing on behalf of the Board of Wine Industry Tasmania and our 90 members, being the vineyards and winemakers located throughout Tasmania.

While the wine industry is endeavouring to work co-operatively with the pulp mill proponents and the Tasmanian Government on this issue, Wine Industry Tasmania's members, in particular our members located in the Tamar Valley, have identified three issues of concern. We believe that particular measures must be included as part of the permit conditions to address these concerns.

The three areas of concern are summarised as follows:

1. ODOURS

The possibility of foul odours produced by the mill interfering with the operation of nearby vineyards businesses, particularly cellar door operations where visitors come to purchase wine, is a major issue of concern. The two main odour gases of concern are hydrogen sulphide ("rotten egg" gas), and methyl mercaptan ("rotten cabbage" gas).

The Environment Protection Policy 2004 ("EPP"), permits atmospheric levels of hydrogen sulphide up to 0.00014 mg/m3 (or 0.0001ppm) and levels of methyl mercaptan up to 0.00084 mg/m3 (or 0.00042ppm). For eucalyptus kraft pulp mills, such as the Gunns proposed pulp mill, these limits do not apply and are replaced instead by a permitted level of 0.0015mg/m3 for Total Reduced Sulphur (TRS).

Specifically, our concern centres around the likelihood that hydrogen sulphide and/or methyl mercaptan will make up a significant portion of TRS and in so doing, exceed the otherwise accepted levels for these gases individually, by up to ten times for hydrogen sulphide and up to one and a half times for methyl mercaptan.

The range for human odour detection of these compounds (outlined in the table below) is such that if hydrogen sulphide or methyl mercaptan constitutes a significant portion of TRS, then one or both of these will be readily detectable by our member's customers.

The data relevant to this issue is summarised in the table overleaf:

Wine Industry Tasmania Ltd, ABN 59 122 303 011, 147 Davey Street, Hobart Tasmania 7000.
T: (03) 6223 3770 F: (03) 6223 1770 E: mail@winetasmania.net.au

	H2S	Methyl Mercaptan	TRS (includes H2S and methyl mercaptan)
Odour Threshold –human (See below for source)	0.0007-0.014mg/m3 or 0.0005-0.010 ppm	0.0007-0.011 mg/m3 or 0.0005-0.008 ppm	
Environment Protection Policy (Air Quality) 2004	0.00014mg/m3 or 0.0001ppm	0.00084mg/m3 or 0.00042ppm	0.0015mg/m3
Pulp Mill Assessment Act 2007 pg 46 (3 min moving average 1.5 µg/NDm3)			0.0015mg/m3

Source for odour detection levels see http://gp.com/camas/pdf/MANUAL75.pdf

Our members also have concerns regarding the monitoring program for TRS. According to the Pulp Mill Assessment Act 2007, the proponent does not have to start monitoring odour until 12 months into full operation, exclude commissioning, and following this period has to reduce "nuisance" odour to not more than 10 days per year. If the proponent is unable to limit nuisance TRS odour emissions, within a further 12 months, they will have to employ "one or more recognized experts on industrial odour control to review the operation of the mill and to make recommendations".

Including commissioning time, plus the time taken for the odour expert(s) to make recommendations and for those recommendations to be implemented, it is possible that Wine Industry Tasmania's Tamar Valley members may be subjected to "nuisance" odours for several years. The outcome is potentially devastating to wine tourism operators in the region.

We accept that 0.00014mg/ m3 for hydrogen sulphide and 0.00084mg/m3 for methyl mercaptan are suitable levels for environmental concentrations of these compounds and recommend these limits apply to the Gunns Bell Bay Mill, and that they apply from commissioning onwards.

We also request that the results from the program of nuisance TRS monitoring at the mill boundary as referred to in the submission on the management of emissions to air (Clause D.4.12 in the Pulp Mill assessment Act 2007 made by Mr Omerod, Gunn's consultant) be made publicly available on a daily basis. For example, these reports could be displayed on an appropriate website.

2. EMISSIONS

Chlorinated phenols are known emissions from this style of mill. While the Gunns proposal does not contain any information on emission guidelines of chlorophenol, it is important to note that the wine industry is well aware of the damaging effects of these compounds; they are responsible for 'cork taint' (a potent "mouldy cardboard" smell). At this stage there is no recorded evidence of a causal relationship between taint and pulp mill emissions, but the issue does require further examination.

Chlorophenol compounds are produced from the action of chlorine on phenols (organic compound, component of wood) such as during the bleaching part of the pulping process. Investigations conducted by the Australian Wine Research Institute (AWRI) has discovered that wine taint due to chlorophenols (especially 2, 6 dichlorophenol) can be detected at levels

as low as 16 parts per trillion ("ppt"). In measurement terms, 1 ppt converts to 1000 ppb. In layman's terms this means that even the minutest quantity of this emission, the equivalent to one second in 31,797 years, can result in wine taint.

This is an extremely low level and well below the World Health Organisation's safety level. However, while these compounds at very low levels may pose no threat to human health, they have the potential to cause serious economic damage to our industry. Two chlorophenol compounds identified in the past two years by the AWRI at levels of 350ppt, and responsible for a strong plastic/chemical-like wine taint, rendered the wines unsaleable.

We recommend that the pulp mill proponents undertake an investigation into appropriate emission limits for these compounds, with the assistance of the AWRI.

3. TRANSPORT

The wine industry, in conjunction with the Tourism Industry Council of Tasmania, is also concerned about the impact of log trucks on the Tamar Valley region. As visitors are encouraged to "drive the Tamar Valley Wine Route", action must be taken to minimise visitors' exposure to log trucks. If a major investment in a rail system is not undertaken, Wine Industry Tasmania is concerned that it will impact negatively on our Tamar Valley members' businesses.

RECOMMENDED ACTION

To address the concerns relating to odour and emissions, Wine Industry Tasmania suggests that the following conditions be included in the permit conditions for the proposed project.

1. During both the construction and operational phase of this project, two Tamar Valley Wine Route vineyards (to be selected by the Tamar Valley Wine Route Inc) are provided with the necessary monitoring equipment to measure both odours and emissions, funded by the proponent or the Tasmanian Government. Furthermore the selected operators should also be trained in the operation of this equipment and interpretation of data. This will ensure that vineyard operators have accurate and up-to-date information available at all times.

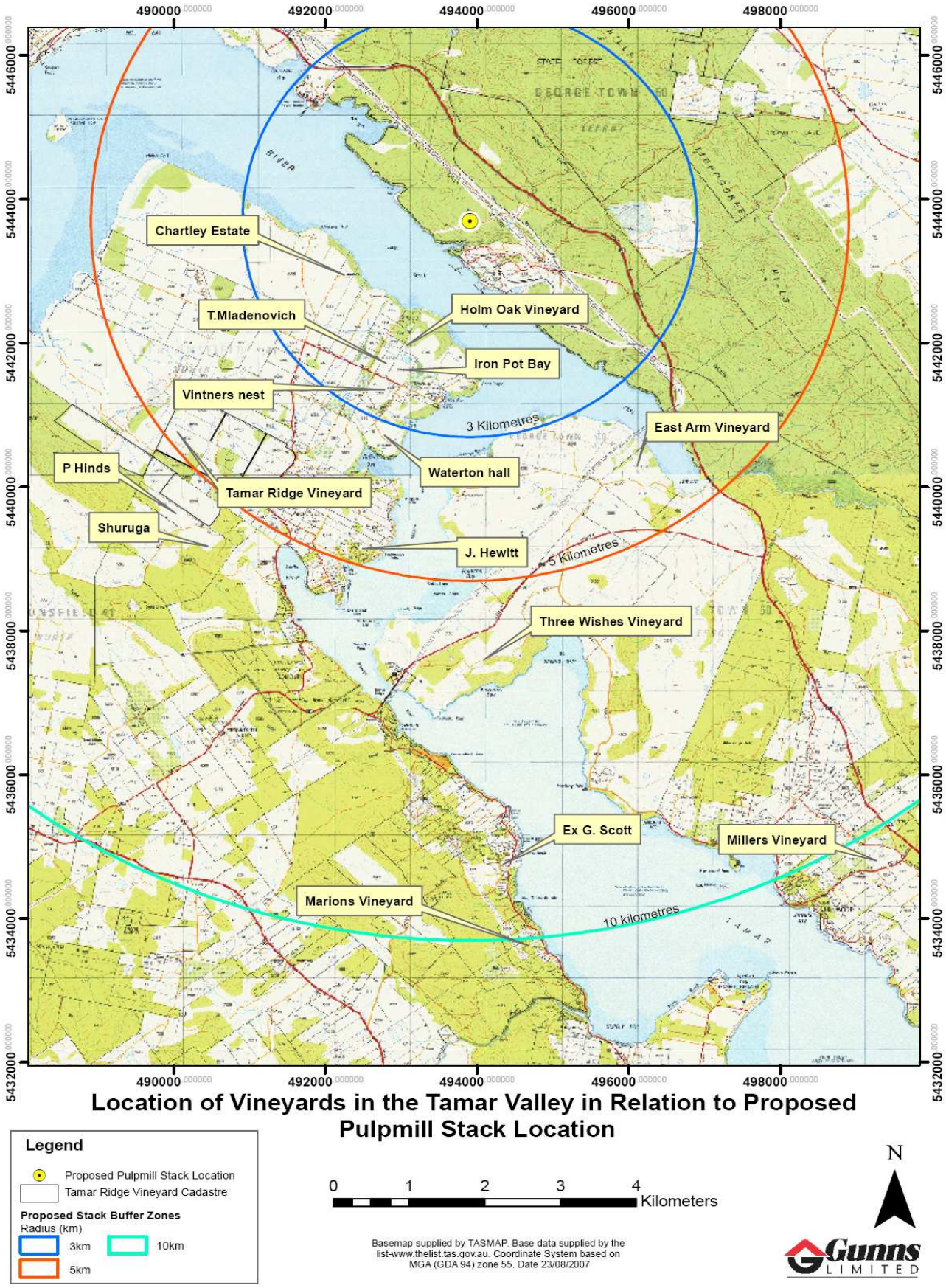
2. That further research be undertaken as soon as possible to measure both odour and emissions, from similar pulp mills located in vineyard areas (e.g. kraft mills located in European countries), to determine if any emissions from these pulp mills has caused wine taint problems. WIT is prepared to work with other institutions such as the AWRI or CSIRO to conduct this research.

Once again on behalf of the Board of Wine Industry Tasmania, we thank you for reviewing this submission and if you require further information, and/or a briefing on the issues outlined in this document, please do not hesitate to contact me on (03) 6223 3770 or via email – mail@winetasmania.net.au

Yours sincerely

Graeme B Lynch
Chairman

Figure 1 Location of vineyards around proposed pulp mill



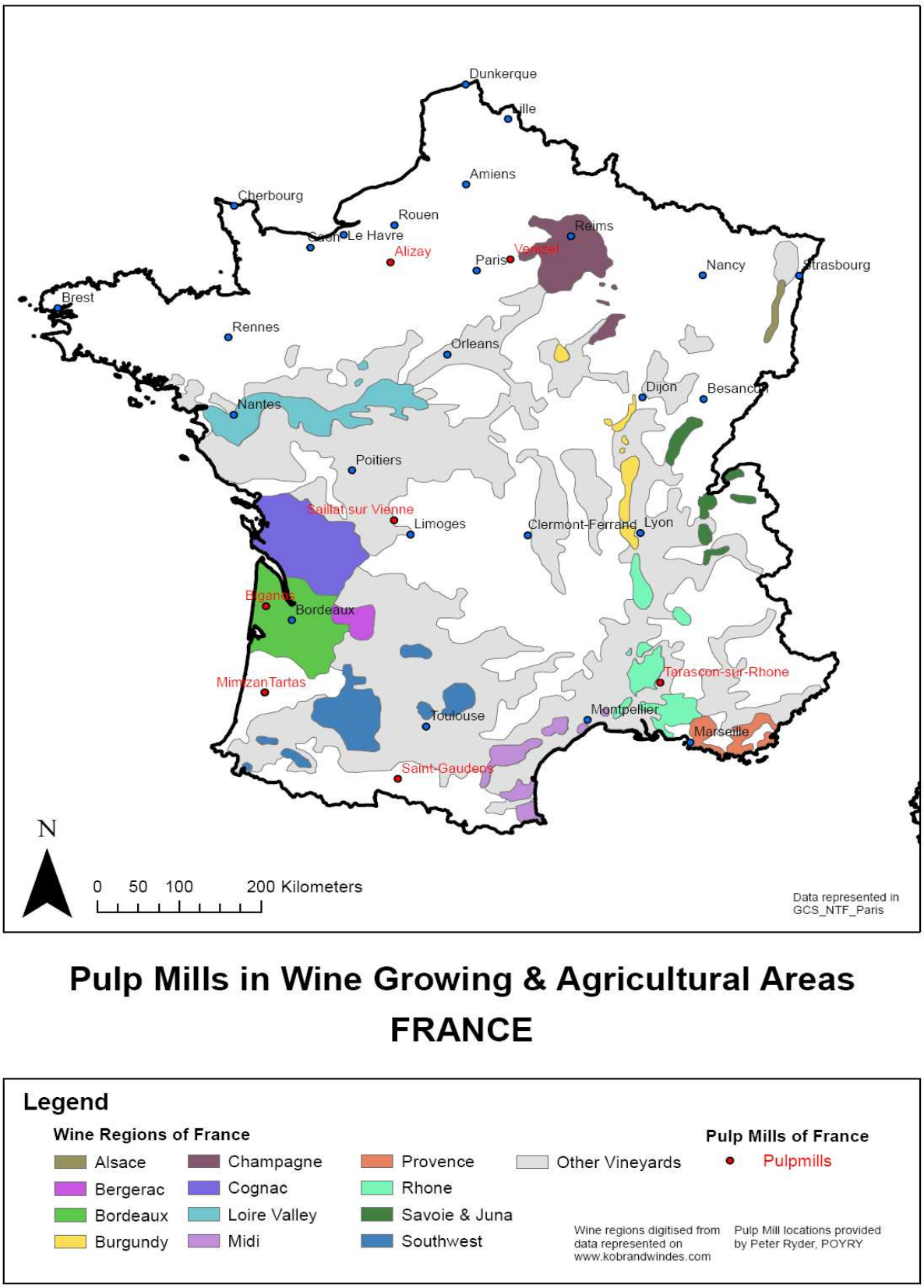


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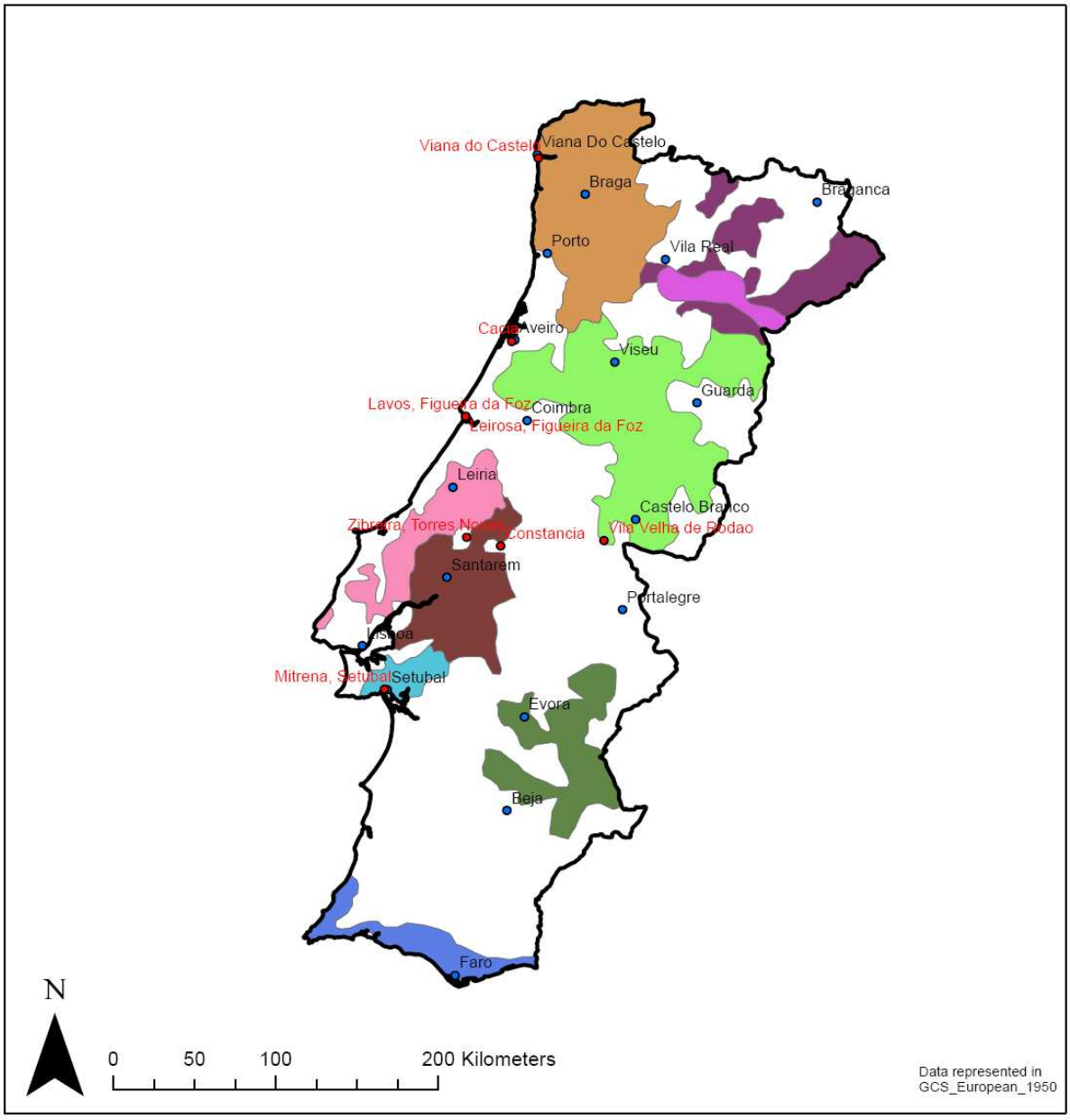
Figure 2 Kraft pulp mills in France, see text regarding area west of Bordeaux



Pulp Mills in Wine Growing & Agricultural Areas
PORTUGAL

Legend

Wine regions digitised from data represented on www.kobrandwines.com
Pulp Mill locations provided by Peter Ryder, POYRY

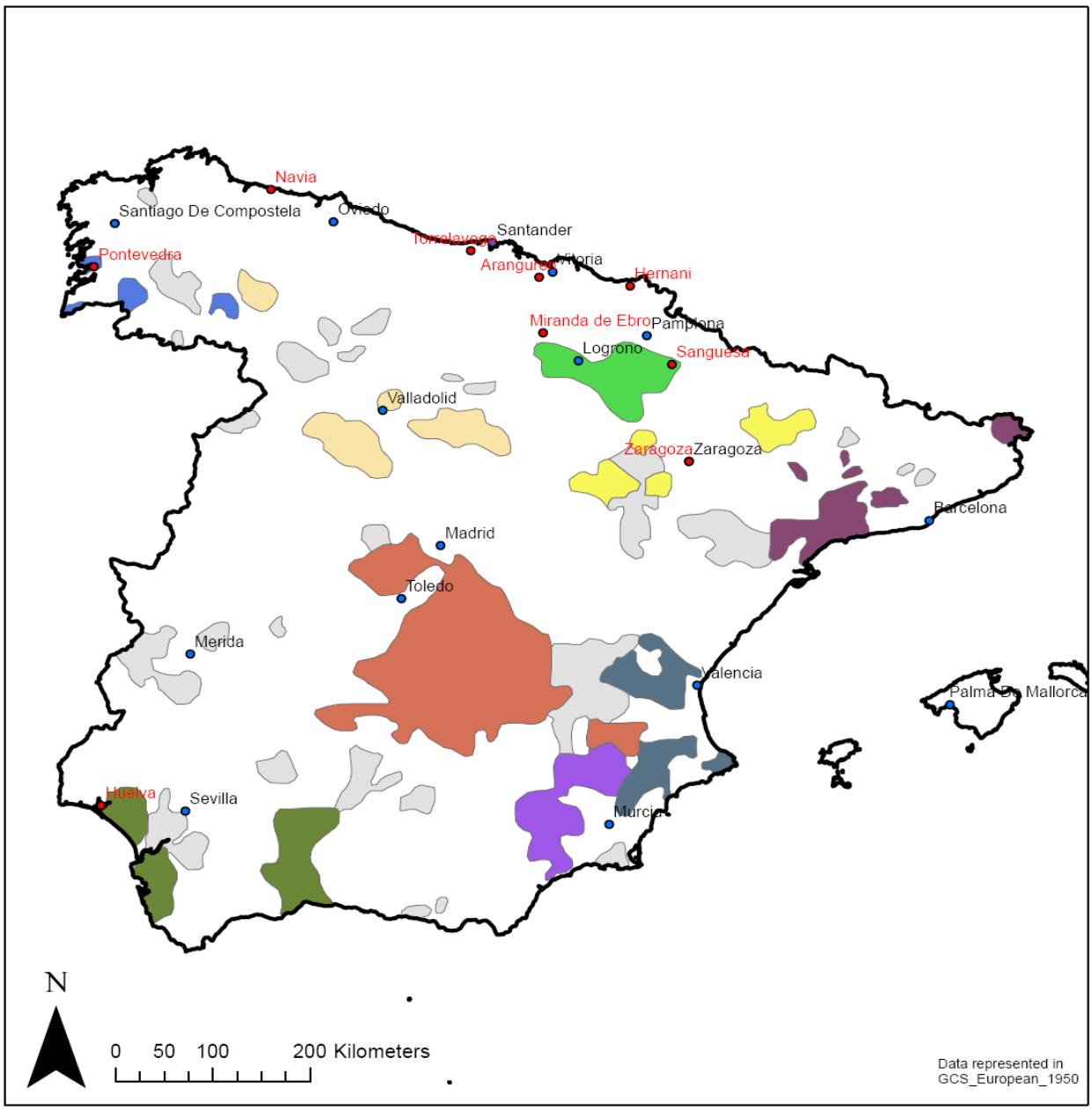
Wine Regions of Portugal

- Alentejano
- Algarve
- Bieras
- Estramadura
- Minho
- Ribatejo
- Terras do Sado
- Tras-on-Montes
- Upper Douro

Pulp Mills of Portugal

- Pulpmills

Figure 3 Kraft pulp mills in Portugal



Pulp Mills in Wine Growing & Agricultural Areas

SPAIN

Legend

Wine regions digitised from data represented on www.kobrandwines.com
Pulp Mill locations provided by Peter Ryder, POYRY

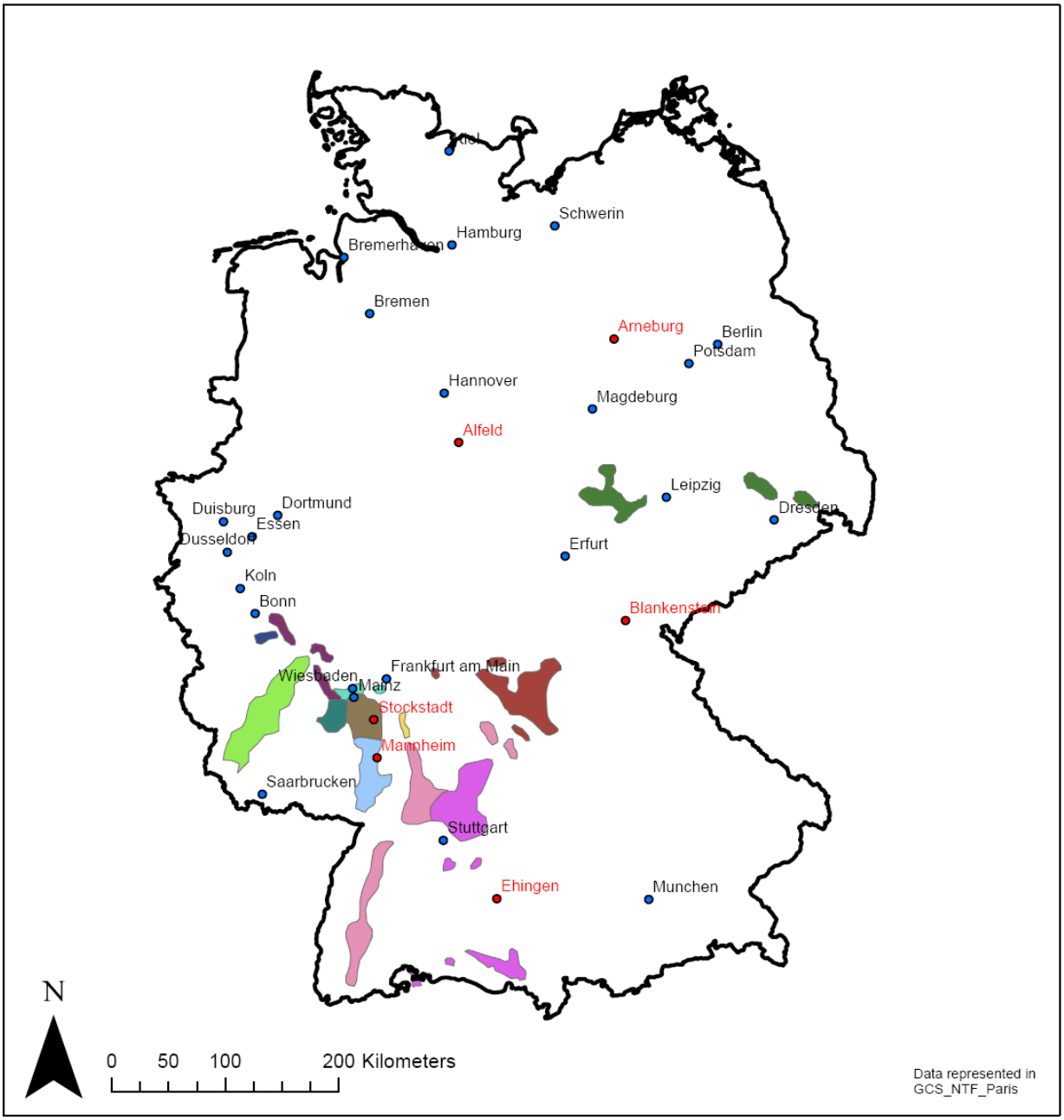
Wine Regions of Spain

- Andalucia
- Aragon
- Castilla Leon
- Castilla la Mancha & Madrid
- Cataluna
- Galicia
- Murcia
- Rioja, Navarra & Pais Vasco
- Valencia
- Other Growing Regions

Pulp Mills of Spain

- Pulpmills

Figure 4 Kraft pulp mills in Spain



Pulp Mills in Wine Growing & Agricultural Areas GERMANY

Legend

Wine regions digitised from data represented on www.kobrandwines.com
Pulp Mill locations provided by Peter Ryder, POYRY

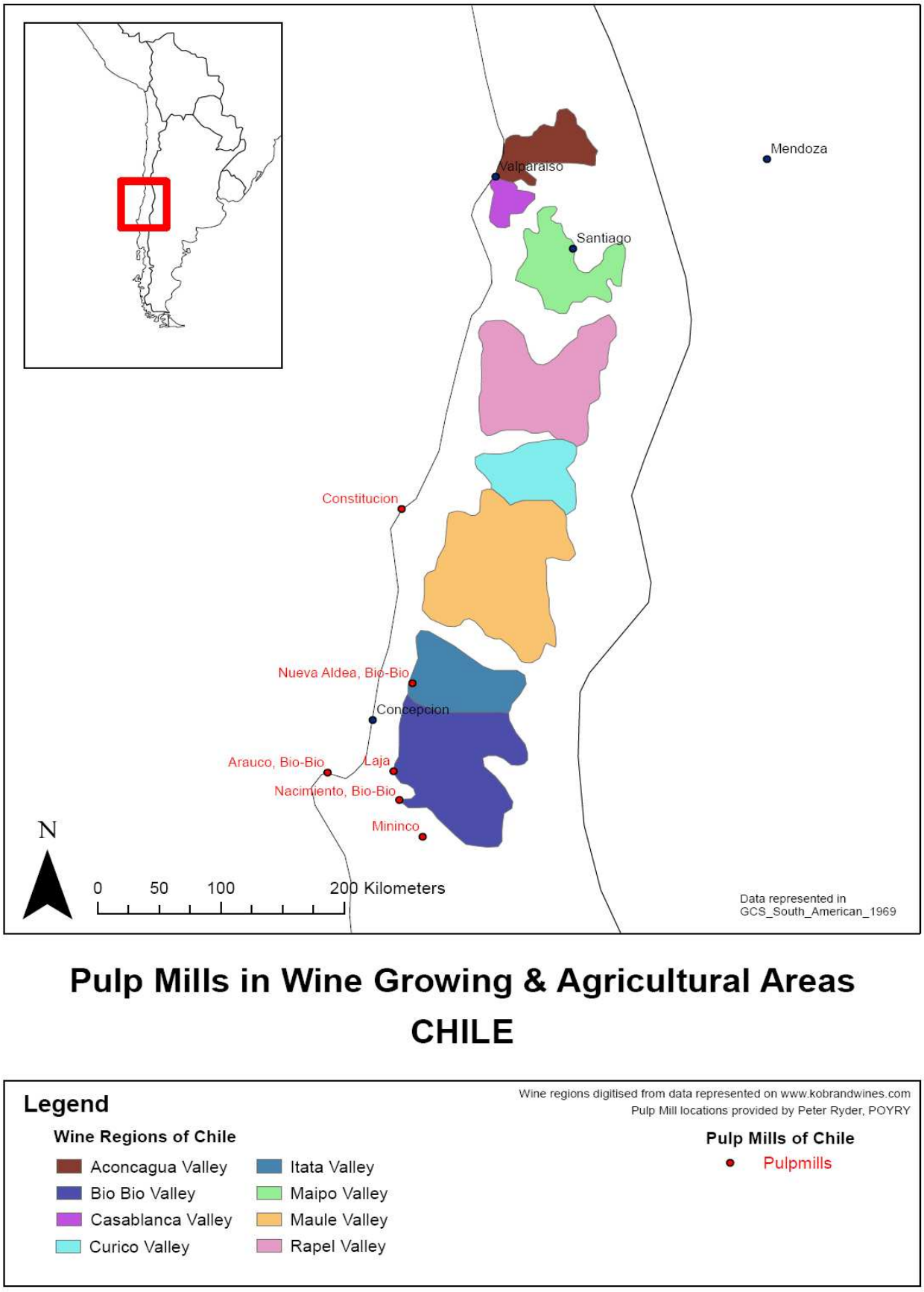
Wine Regions of Germany

- Ahr
- Baden
- Franken
- Hessicshe-Bergstrasse
- Mittlerhein
- Mosel-Saar-Ruwer
- Nahe
- Pfalz
- Rheingau
- Rheinhessen
- Saale-Unstrut & Sachen
- Wurttemberg

Pulp Mills of Germany

- Pulpmills

Figure 5 Kraft pulp mills in Germany



Pulp Mills in Wine Growing & Agricultural Areas
CHILE

Legend

Wine regions digitised from data represented on www.kobrandwines.com
Pulp Mill locations provided by Peter Ryder, POYRY

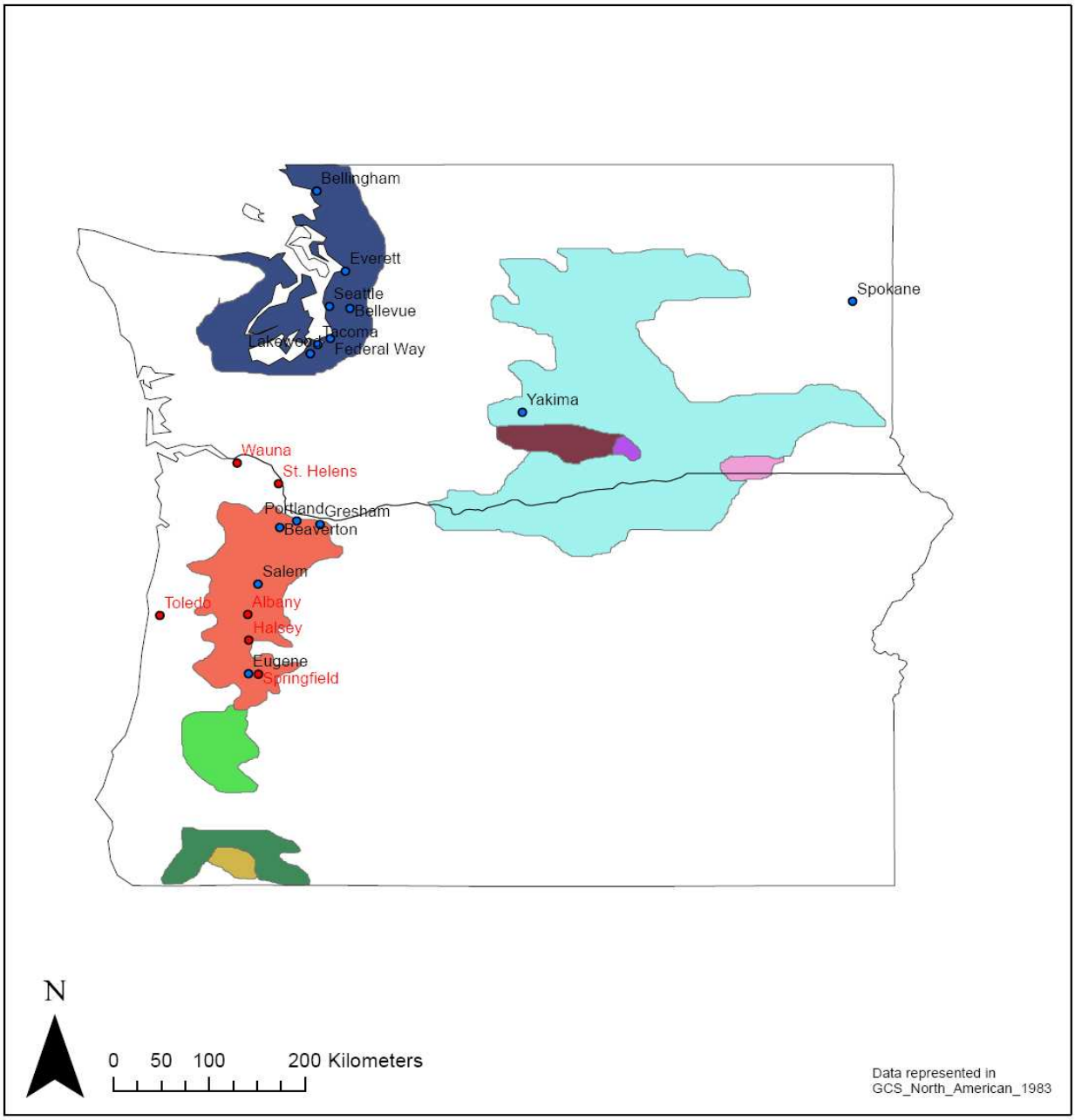
Wine Regions of Chile

- Aconcagua Valley
- Bio Bio Valley
- Casablanca Valley
- Curico Valley
- Itata Valley
- Maipo Valley
- Maule Valley
- Rapel Valley

Pulp Mills of Chile

- Pulpmills

Figure 6 Kraft pulp mills in Chile



Pulp Mills in Wine Growing & Agricultural Areas
OREGON, USA

Legend

Wine regions digitised from data represented on www.kobrandwines.com
Pulp Mill locations provided by Peter Ryder, POYRY

Wine Regions of Oregon

- Puget Sound
- Applegate Valley
- Columbia Valley
- Red Mountain
- Rogue Valley
- Umpqua Valley
- Walla Walla Valley
- Willamette Valley
- Yakima Valley

Pulp Mills of Oregon

- Pulpmills

Figure 7 Pulp kraft mills in Oregon