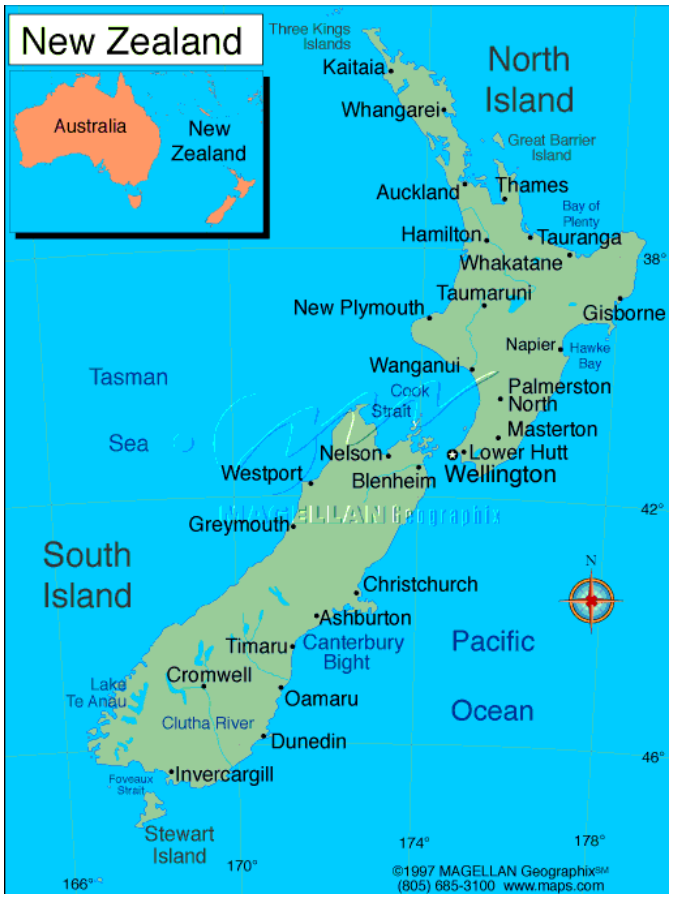
A PC-Based Emission Database System for the Auckland Region

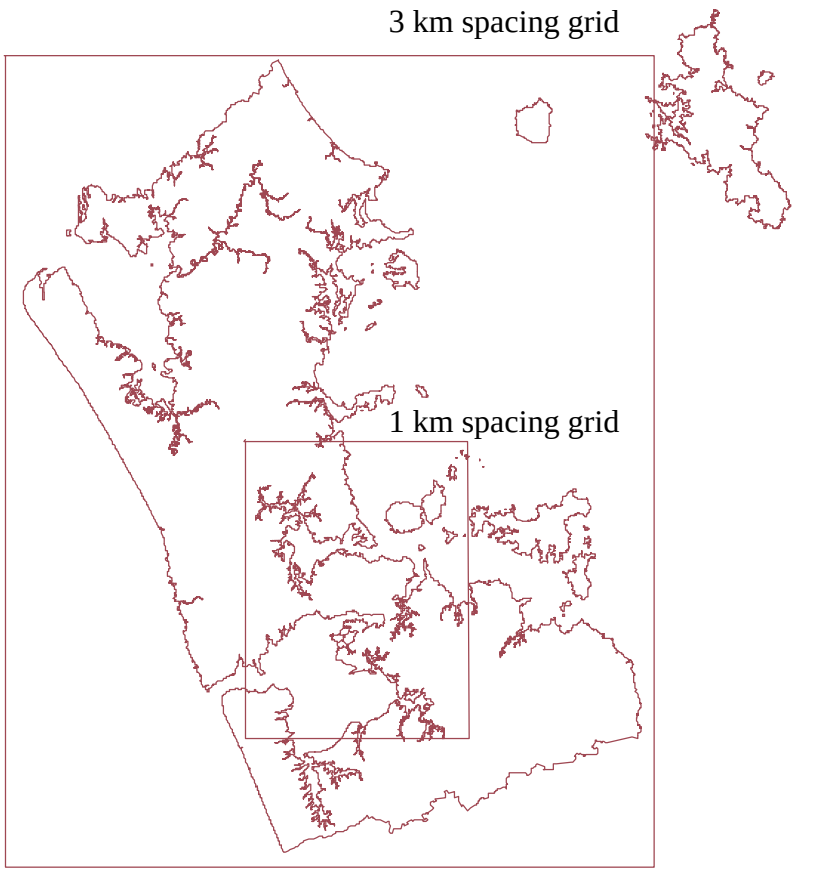
Len Ng and Bob Joynt

Overview of the System

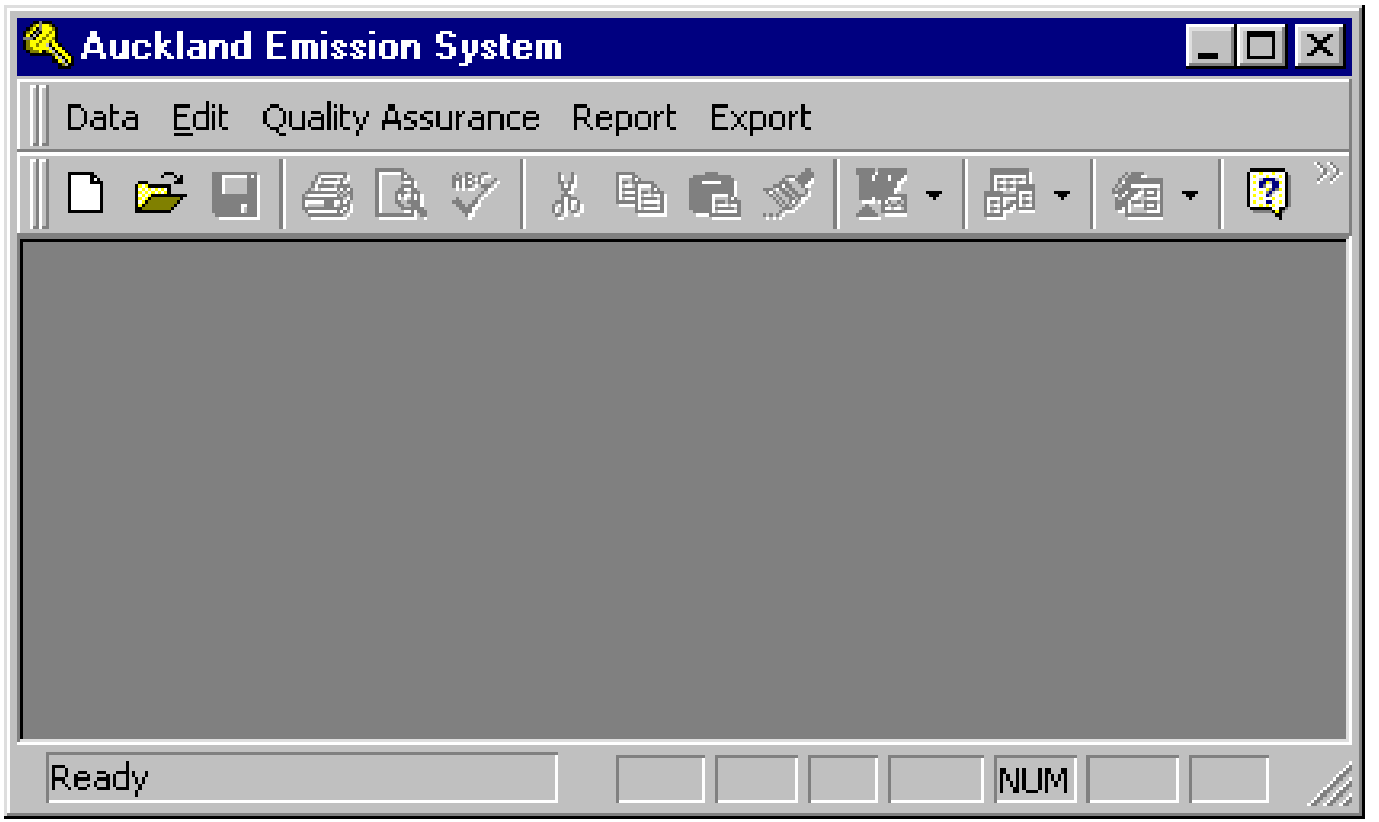
- Spatially distribute, temporally allocate and speciate emissions.
- Project emissions to future years.
- Generate data for use in modelling and GIS.
- Consists of point sources, area sources, motor vehicles and biogenic sources.
- Produce emissions for multiple grids.

Auckland Region

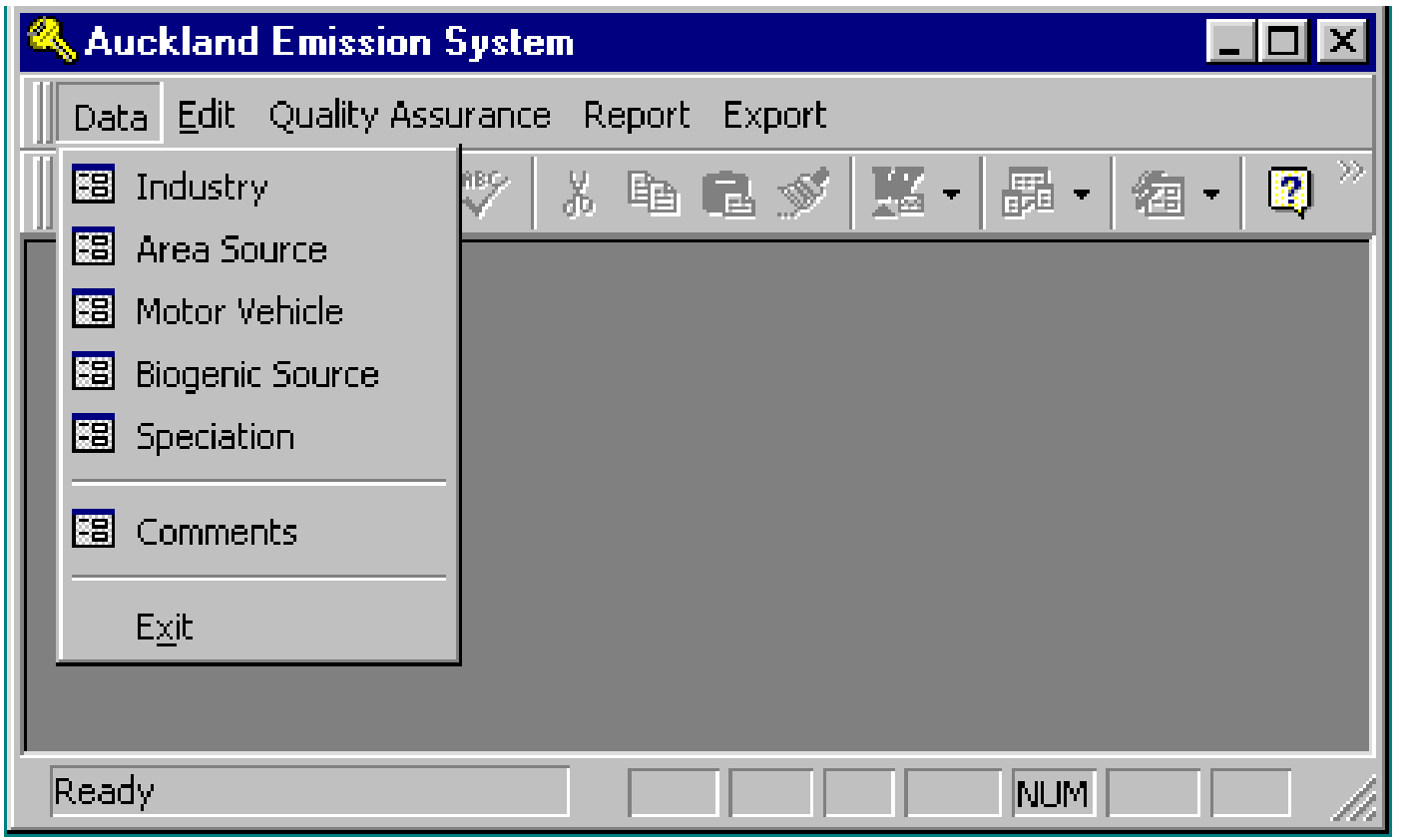


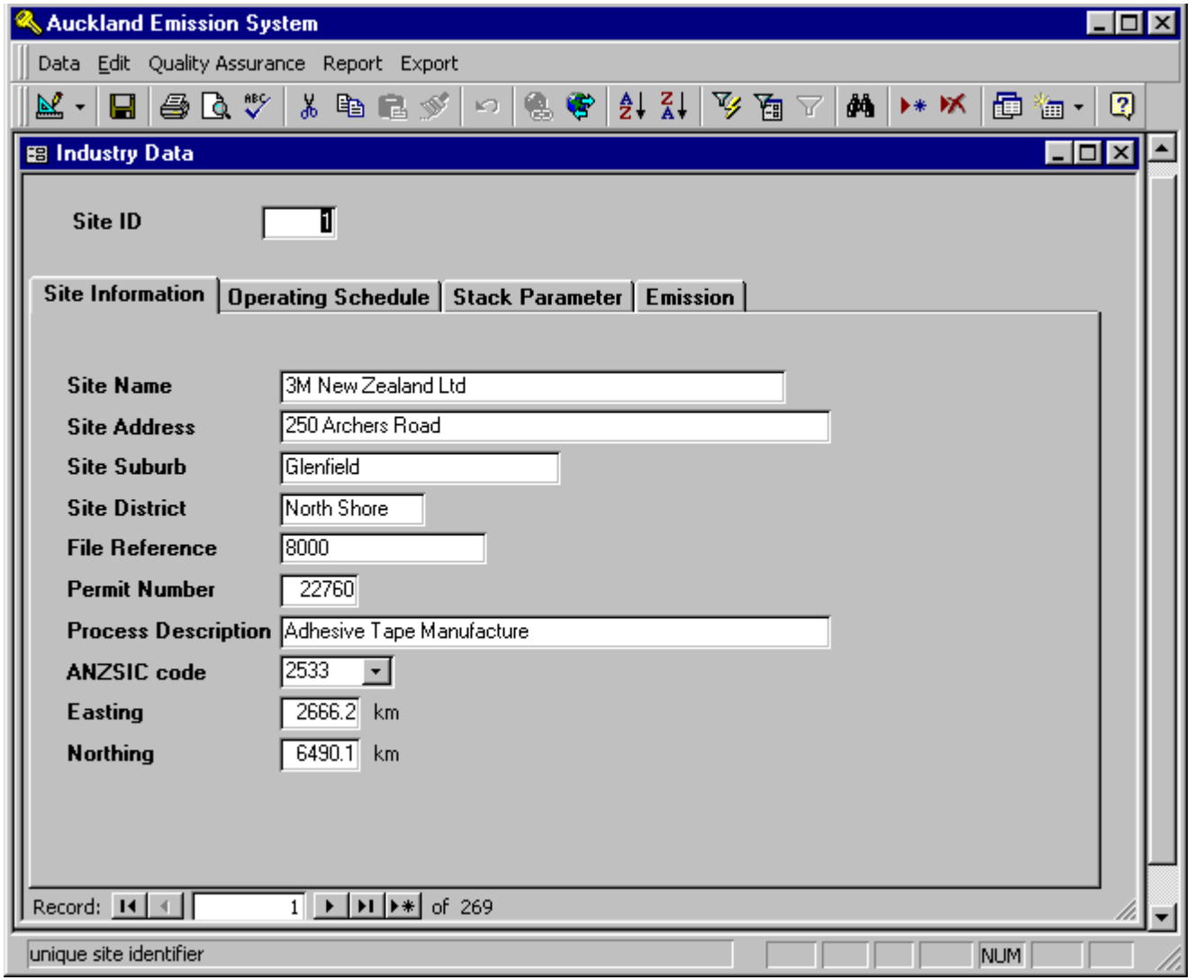


User Interface

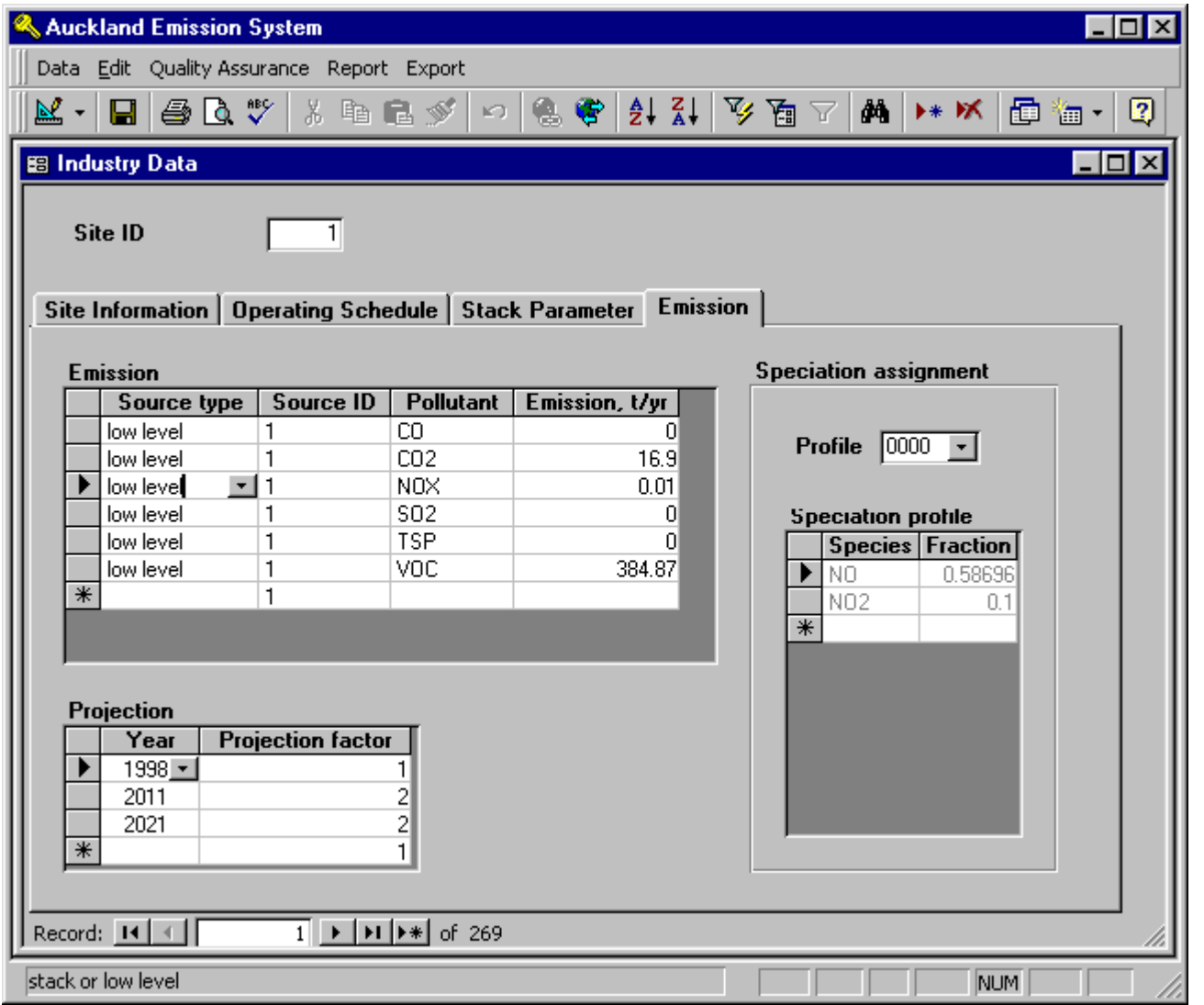


Data Menu

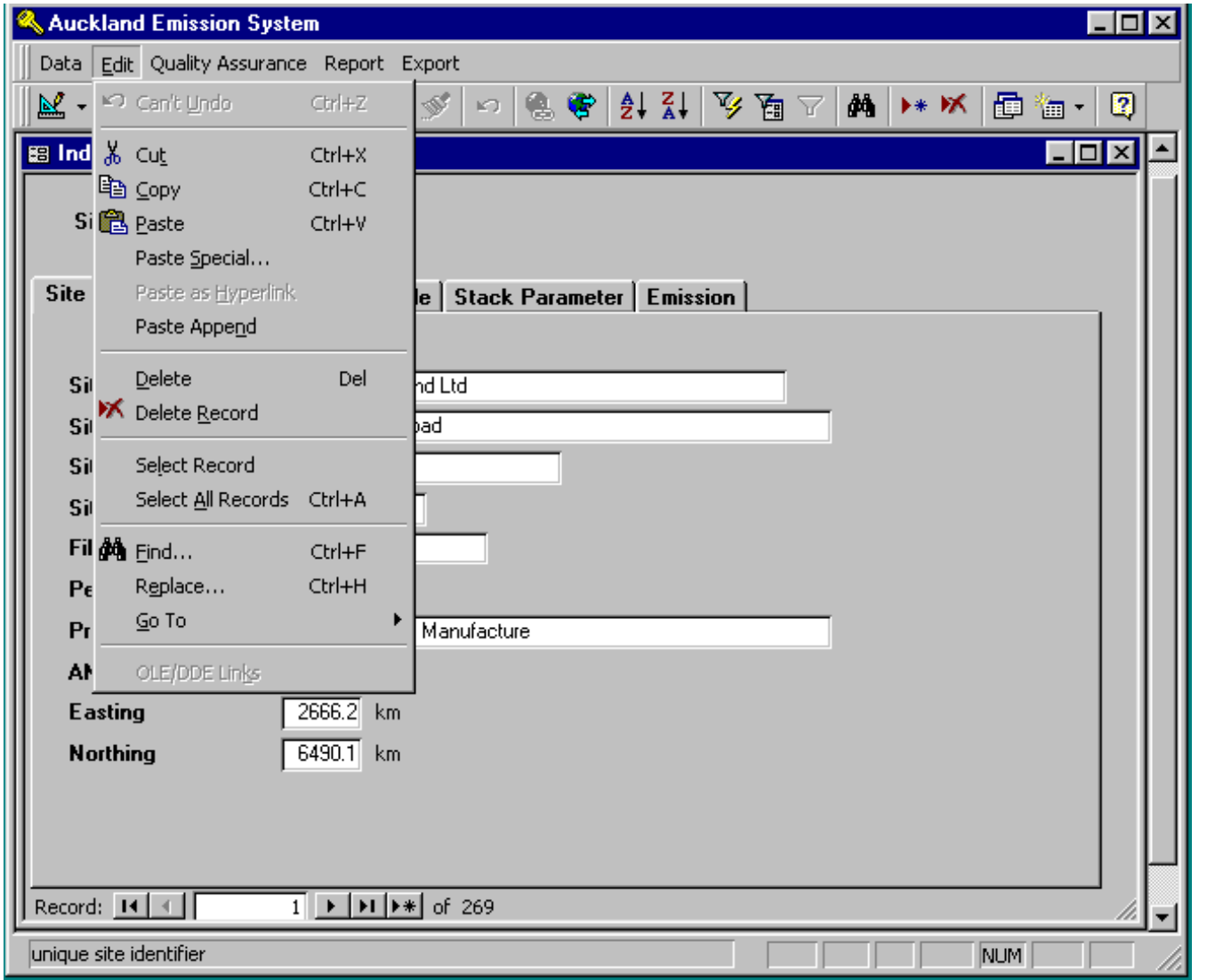

Auckland Emission System
Data
Edit
Quality Assurance
Report
Export
Industry
Area Source
Motor Vehicle
Biogenic Source
Speciation
Comments
Exit
Ready
NUM



Form for entering industrial site information

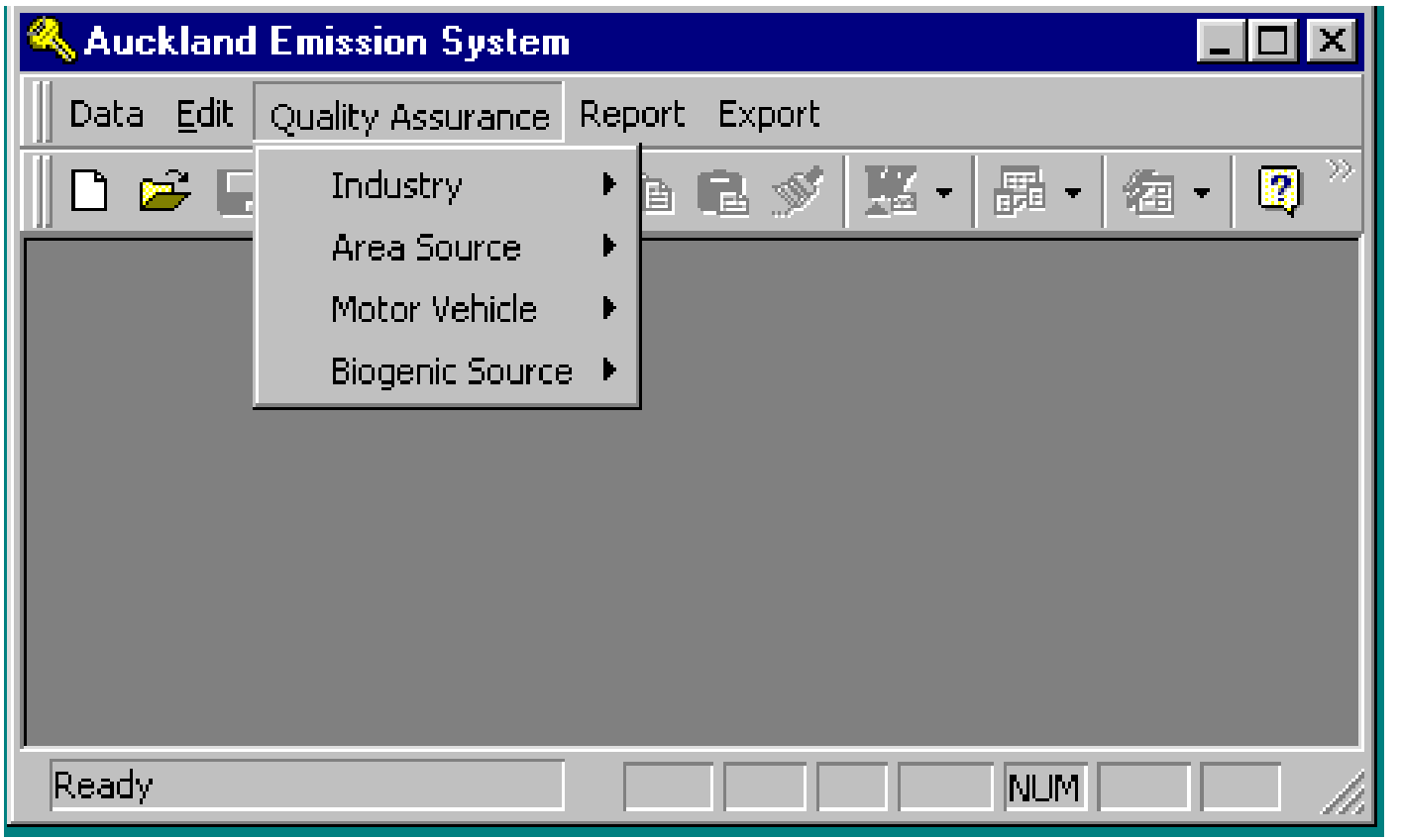


Form for entering industrial emissions

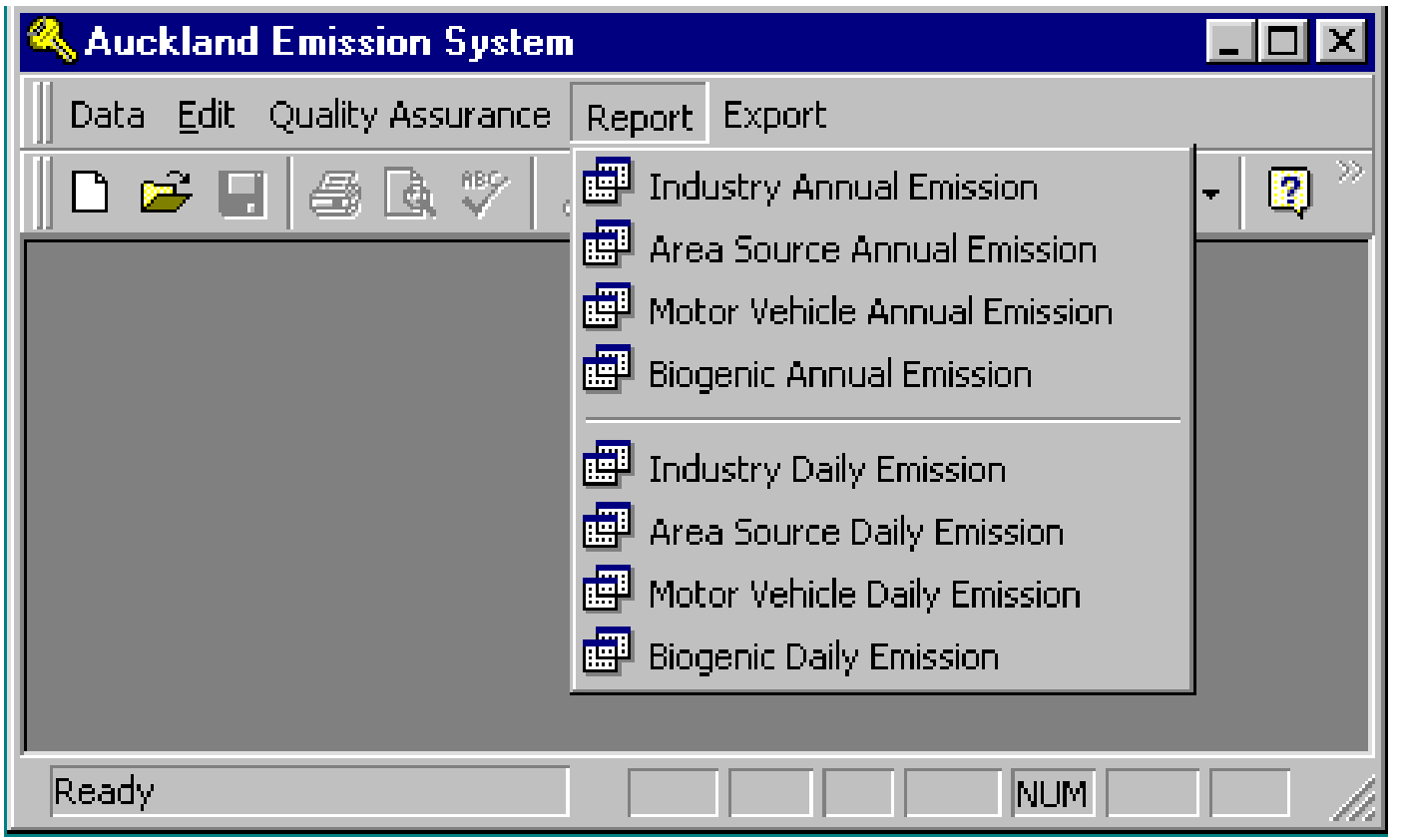

Auckland Emission System
Data
Edit
Quality Assurance
Report
Export
Can't Undo Ctrl+Z
Cut Ctrl+X
Copy Ctrl+C
Paste Ctrl+V
Paste Special...
Paste as Hyperlink
Paste Append
Delete Del
Delete Record
Select Record
Select All Records Ctrl+A
Find... Ctrl+F
Replace... Ctrl+H
Go To
OLE/DDE Links
Site
Stack Parameter
Emission
Manufacture
Easting
2666.2
km
Northing
6490.1
km
Record:
1
of 269
unique site identifier
NUM

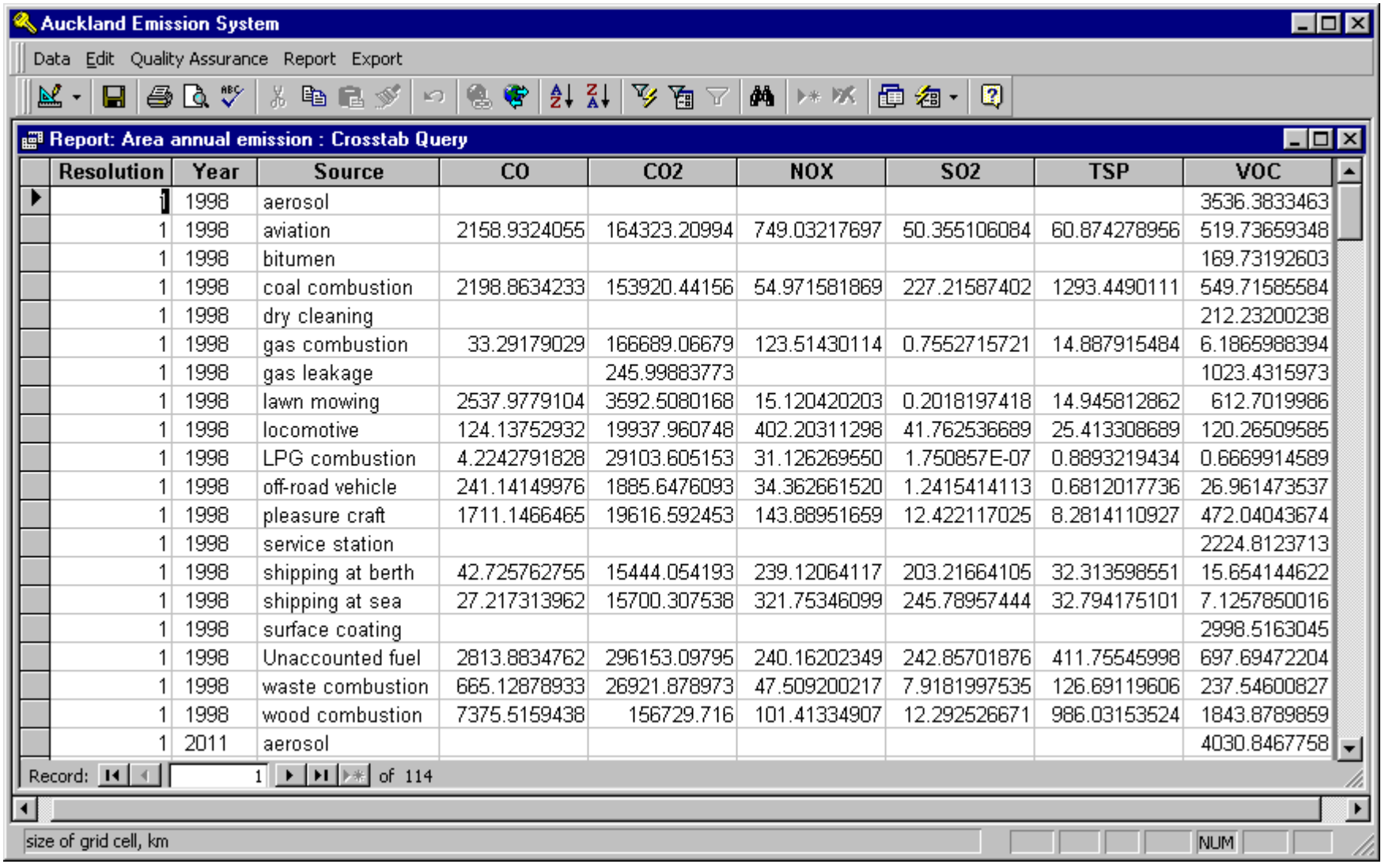
Edit menu

Quality Assurance Menu



Report Menu


Auckland Emission System
Data
Edit
Quality Assurance
Report
Export
Industry Annual Emission
Area Source Annual Emission
Motor Vehicle Annual Emission
Biogenic Annual Emission
Industry Daily Emission
Area Source Daily Emission
Motor Vehicle Daily Emission
Biogenic Daily Emission
Ready
NUM

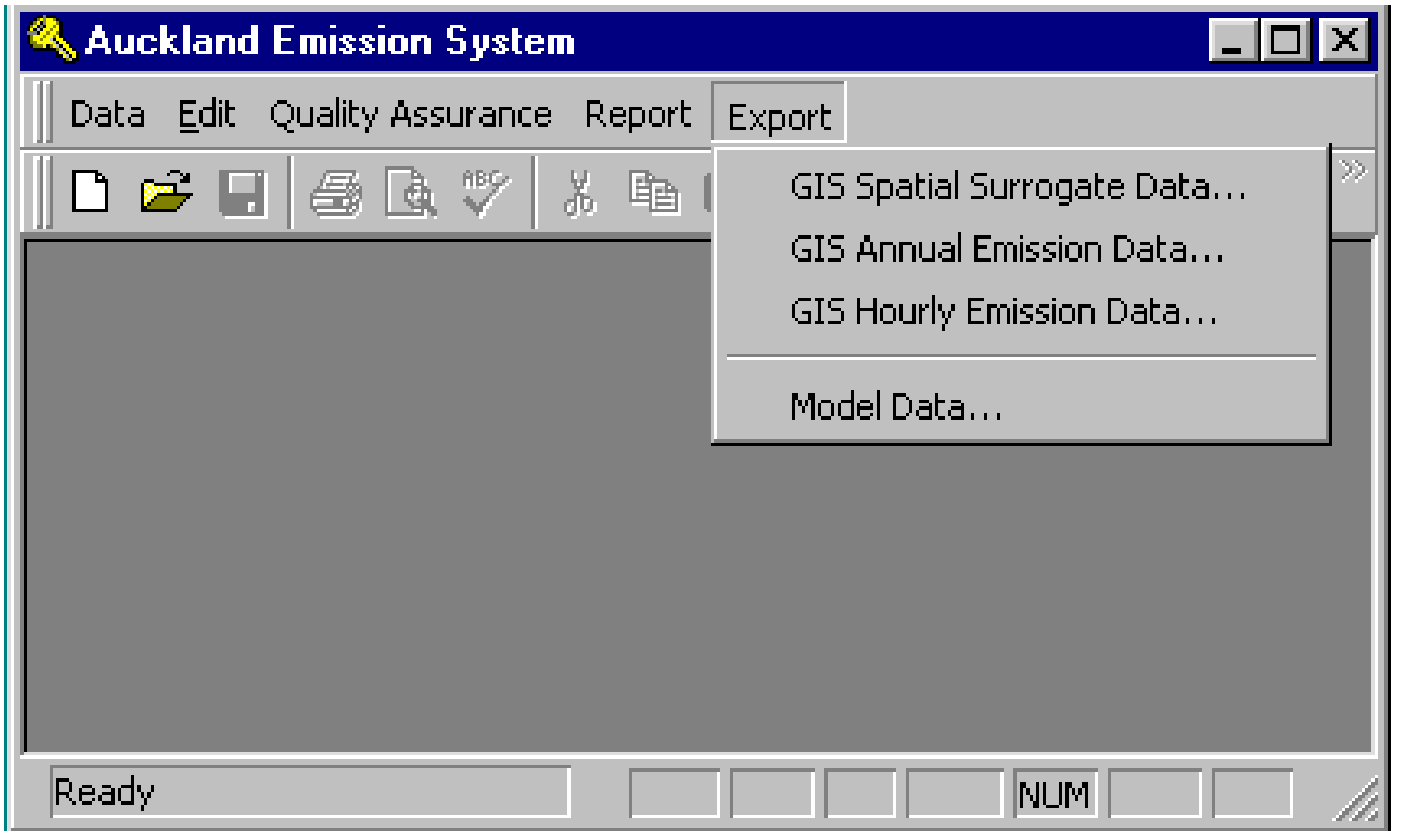


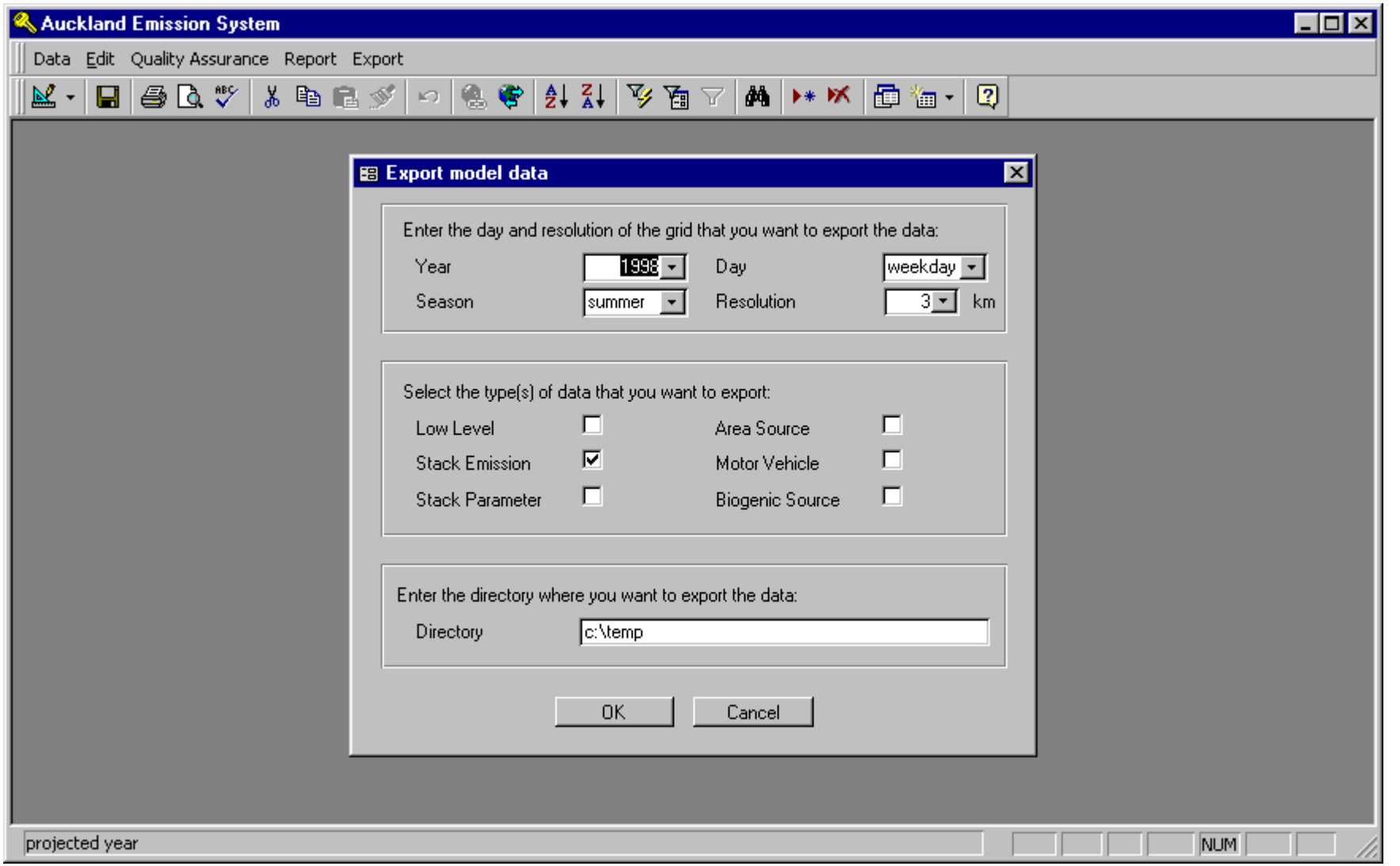
Resolution	Year	Source	CO	CO2	NOX	SO2	TSP	VOC
1	1998	aerosol						3536.3833463
1	1998	aviation	2158.9324055	164323.20994	749.03217697	50.355106084	60.874278956	519.73659348
1	1998	bitumen						169.73192603
1	1998	coal combustion	2198.8634233	153920.44156	54.971581869	227.21587402	1293.4490111	549.71585584
1	1998	dry cleaning						212.23200238
1	1998	gas combustion	33.29179029	166689.06679	123.51430114	0.7552715721	14.887915484	6.1865988394
1	1998	gas leakage		245.99883773				1023.4315973
1	1998	lawn mowing	2537.9779104	3592.5080168	15.120420203	0.2018197418	14.945812862	612.7019986
1	1998	locomotive	124.13752932	19937.960748	402.20311298	41.762536689	25.413308689	120.26509585
1	1998	LPG combustion	4.2242791828	29103.605153	31.126269550	1.750857E-07	0.8893219434	0.6669914589
1	1998	off-road vehicle	241.14149976	1885.6476093	34.362661520	1.2415414113	0.6812017736	26.961473537
1	1998	pleasure craft	1711.1466465	19616.592453	143.88951659	12.422117025	8.2814110927	472.04043674
1	1998	service station						2224.8123713
1	1998	shipping at berth	42.725762755	15444.054193	239.12064117	203.21664105	32.313598551	15.654144622
1	1998	shipping at sea	27.217313962	15700.307538	321.75346099	245.78957444	32.794175101	7.1257850016
1	1998	surface coating						2998.5163045
1	1998	Unaccounted fuel	2813.8834762	296153.09795	240.16202349	242.85701876	411.75545998	697.69472204
1	1998	waste combustion	665.12878933	26921.878973	47.509200217	7.9181997535	126.69119606	237.54600827
1	1998	wood combustion	7375.5159438	156729.716	101.41334907	12.292526671	986.03153524	1843.8789859
1	2011	aerosol						4030.8467758

Record: 1 of 114

Report: Area source annual emission

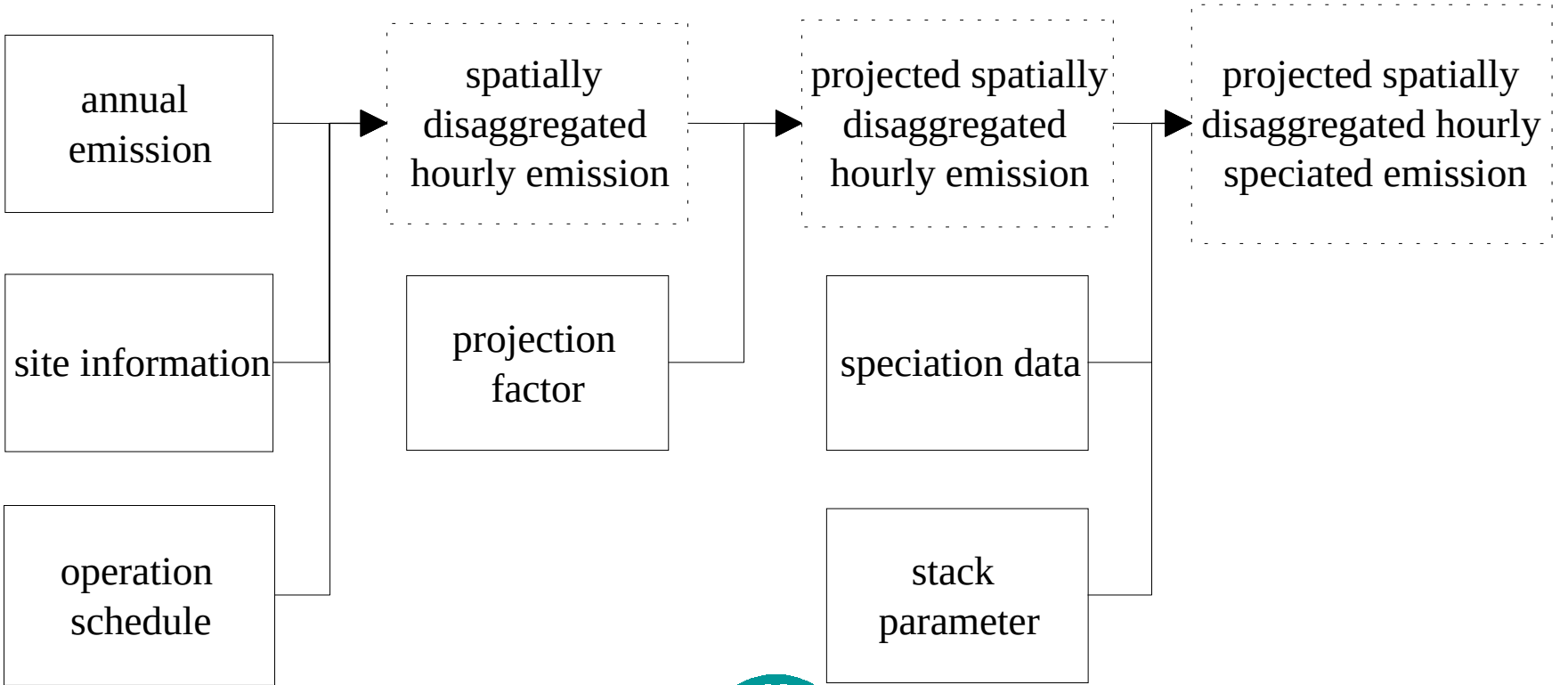
Export Menu


Auckland Emission System
Data
Edit
Quality Assurance
Report
Export
GIS Spatial Surrogate Data...
GIS Annual Emission Data...
GIS Hourly Emission Data...
Model Data...
Ready
NUM



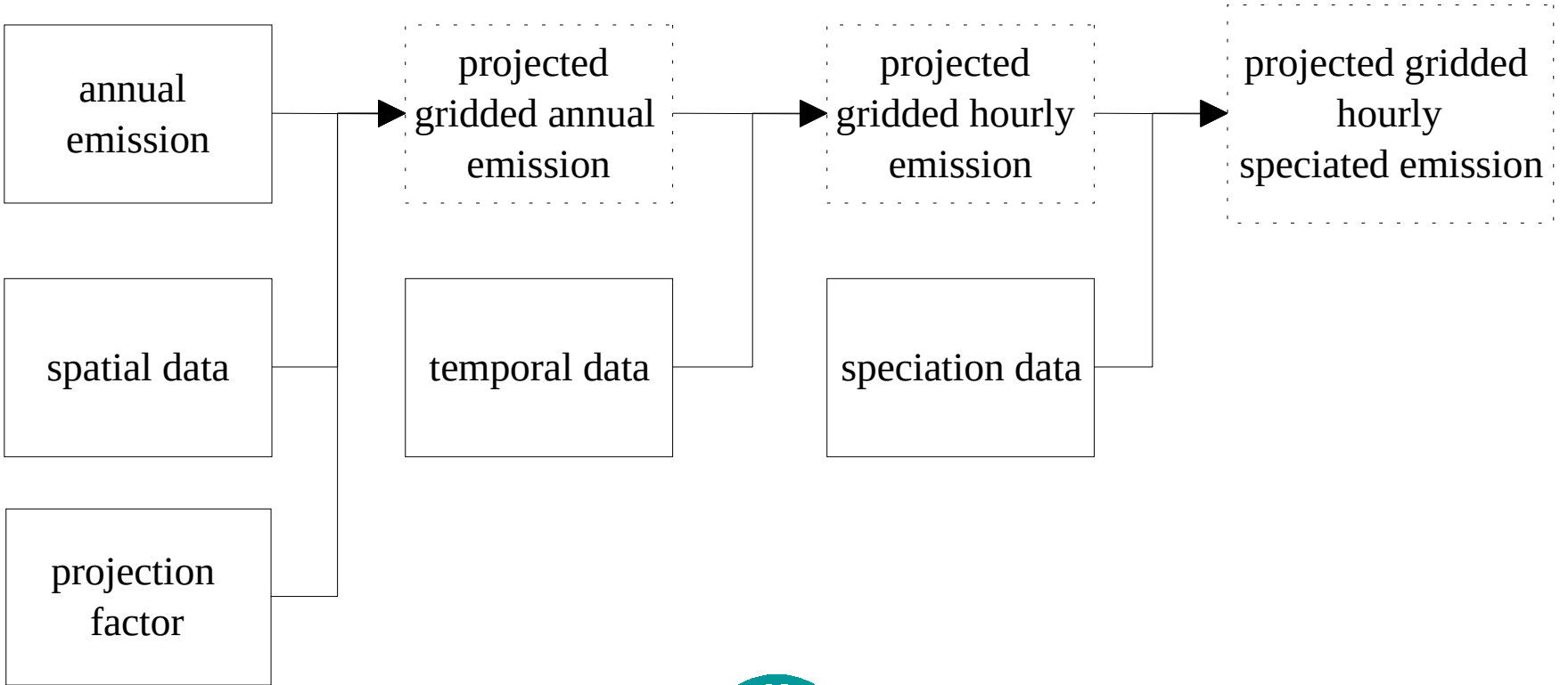
Export model data dialog box

Industry



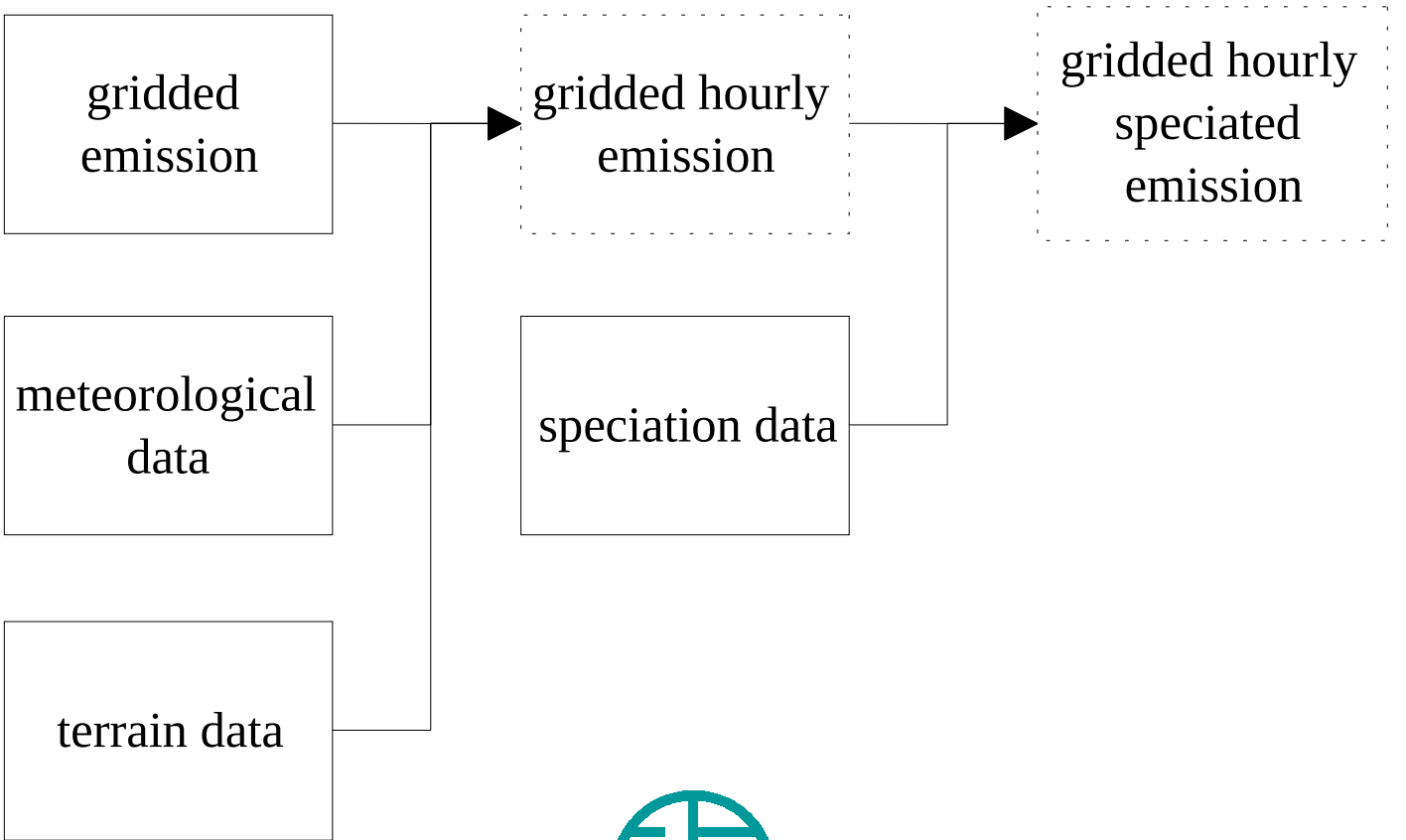
Data flow diagram for industrial emissions

Area Sources & Motor Vehicles



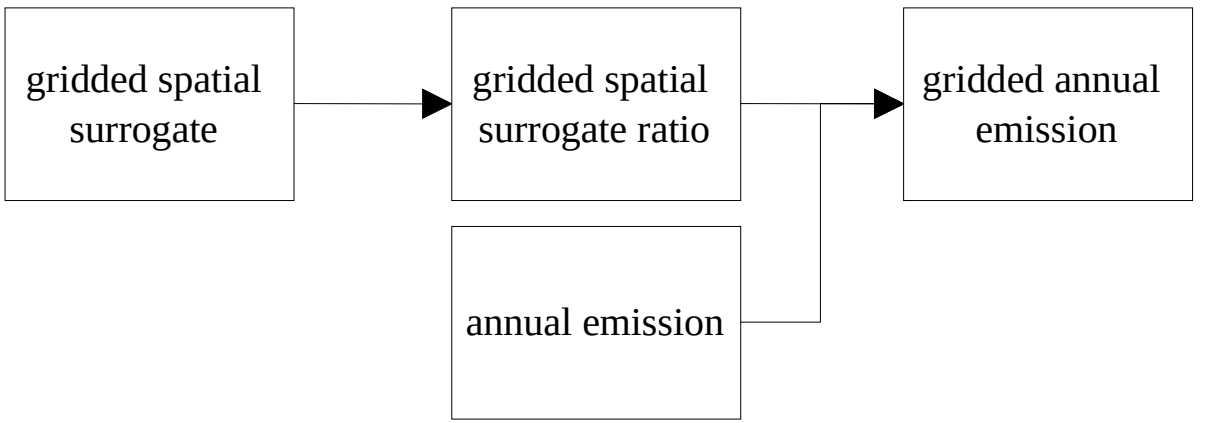
Data flow diagram

Biogenic Sources



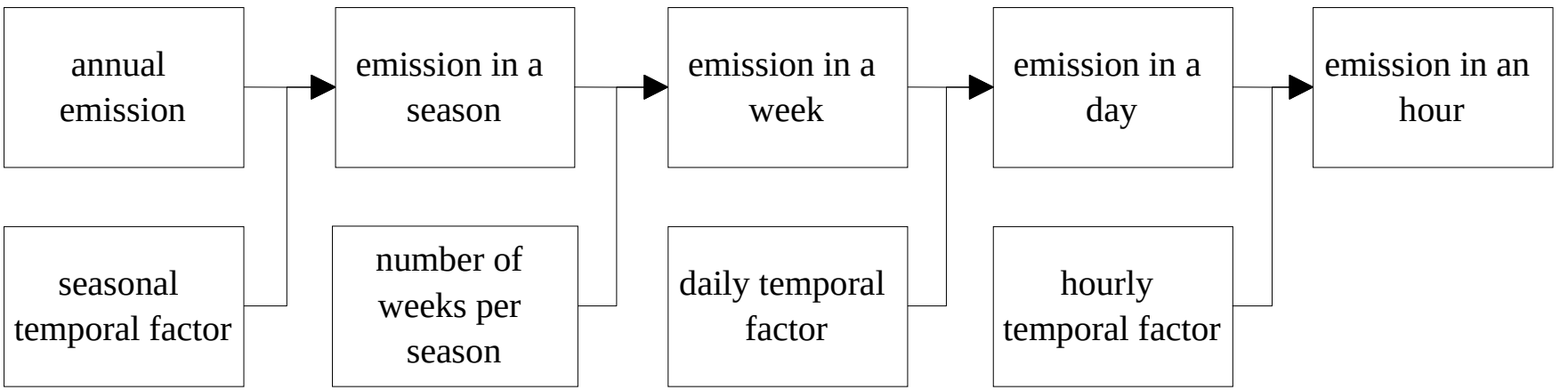
Data flow diagram for biogenic emissions

Spatial Allocation

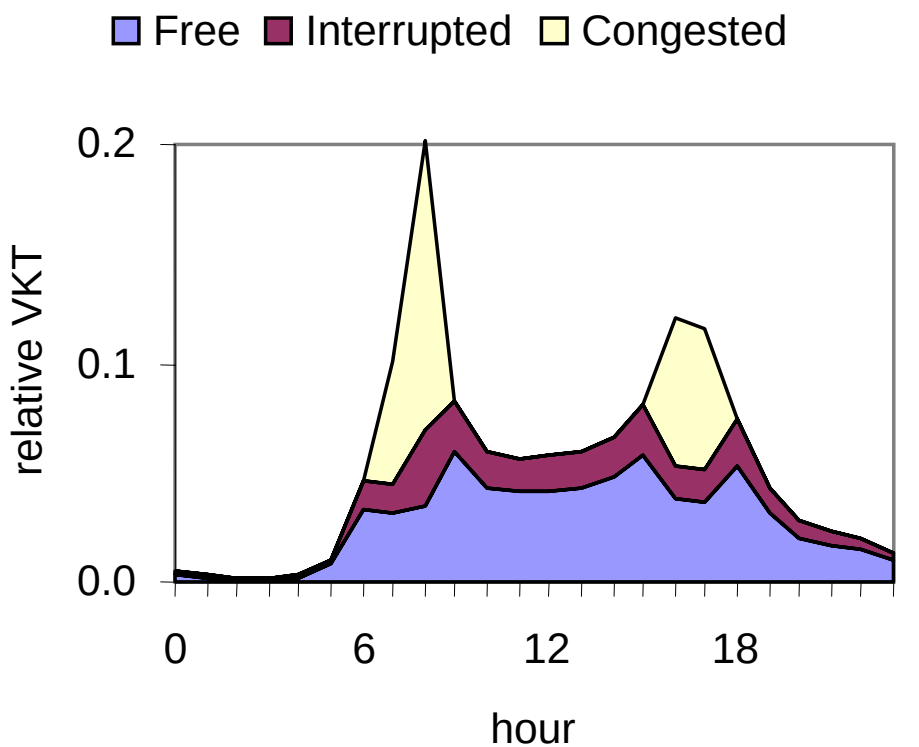


- Sum of spatial surrogate ratios for a spatial surrogate is 1 in the 3 km spacing grid.
- Spatial surrogate ratios can be different for different years.

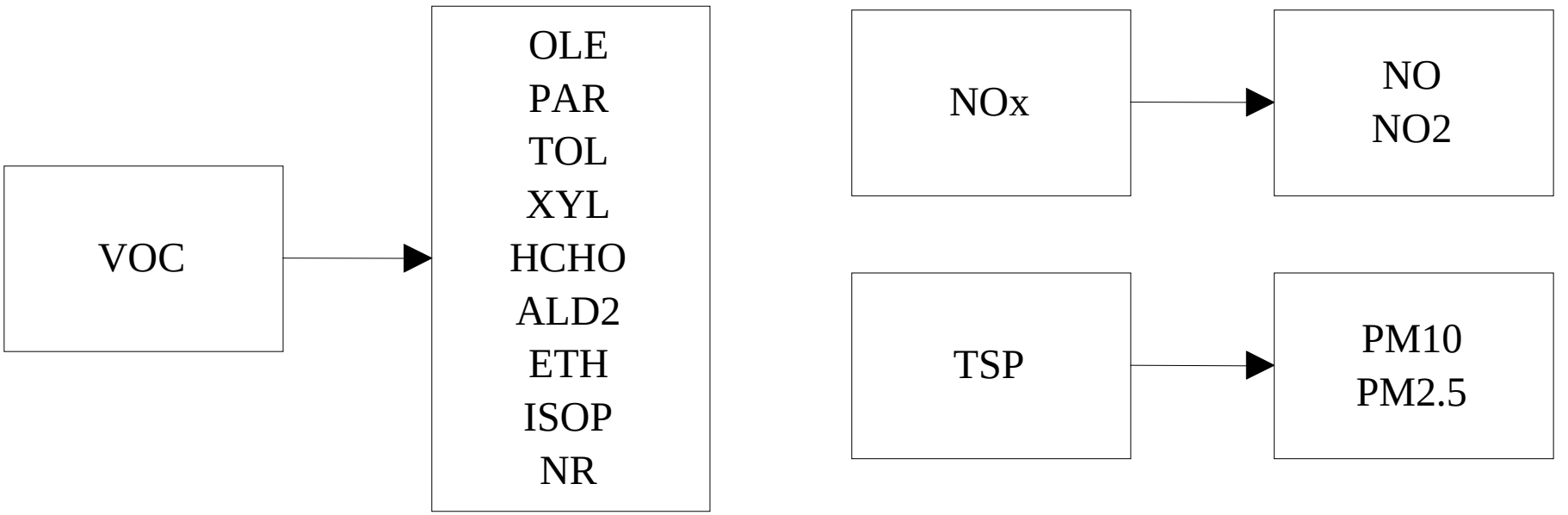
Temporal Allocation



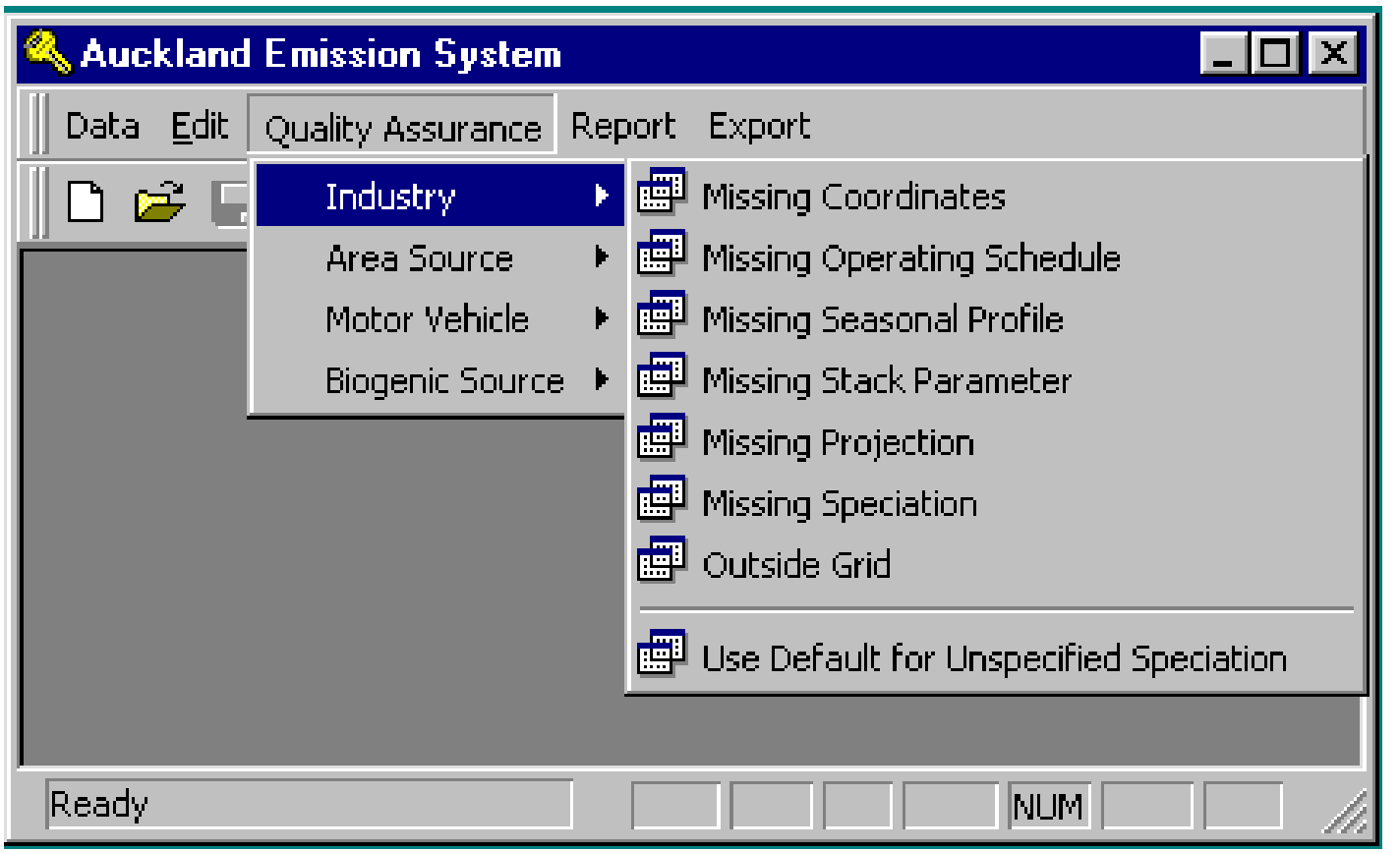
Hourly Profile for Vehicle Kilometres Travelled



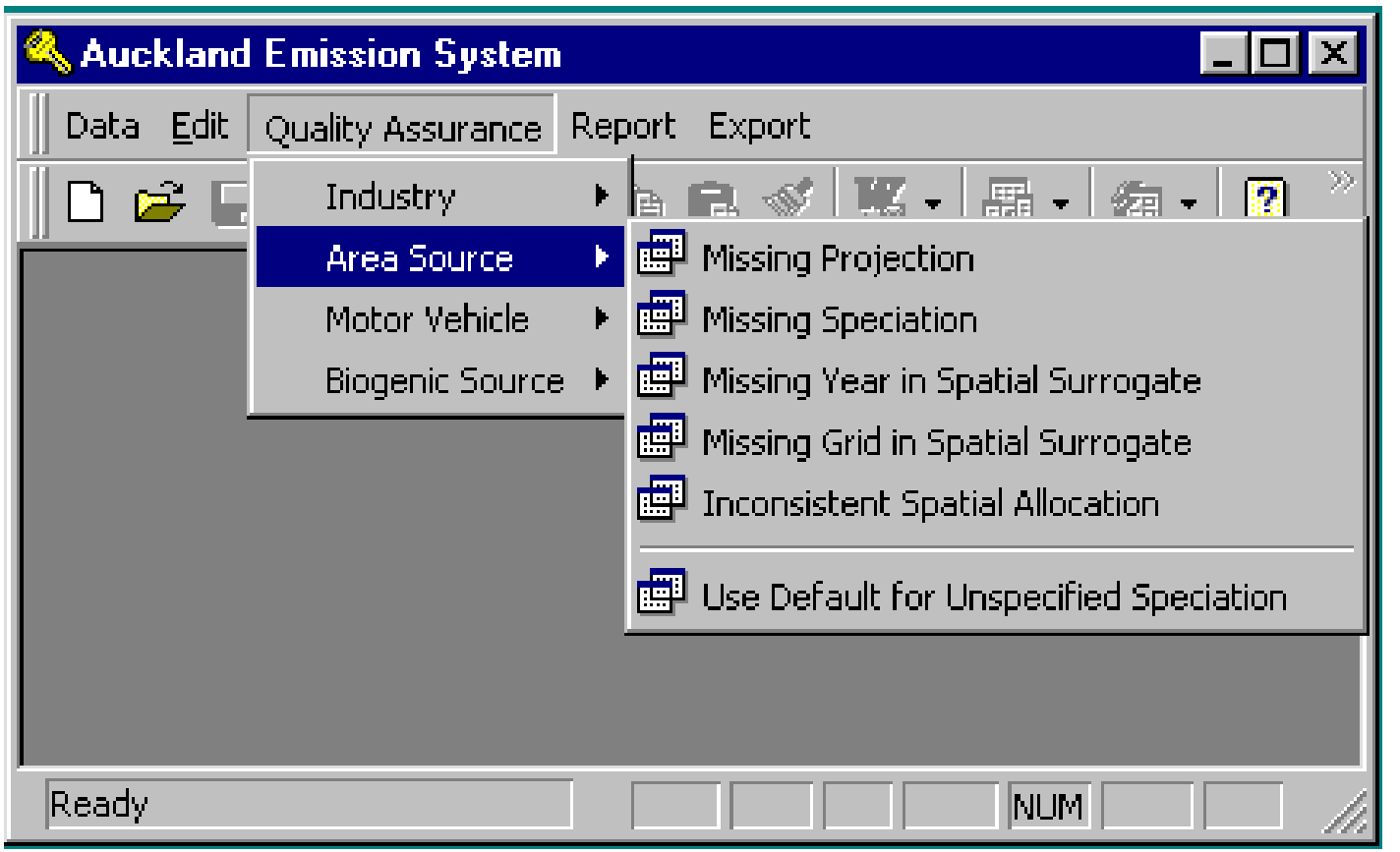
Speciation


VOC
OLE
PAR
TOL
XYL
HCHO
ALD2
ETH
ISOP
NR
NOx
NO
NO2
TSP
PM10
PM2.5

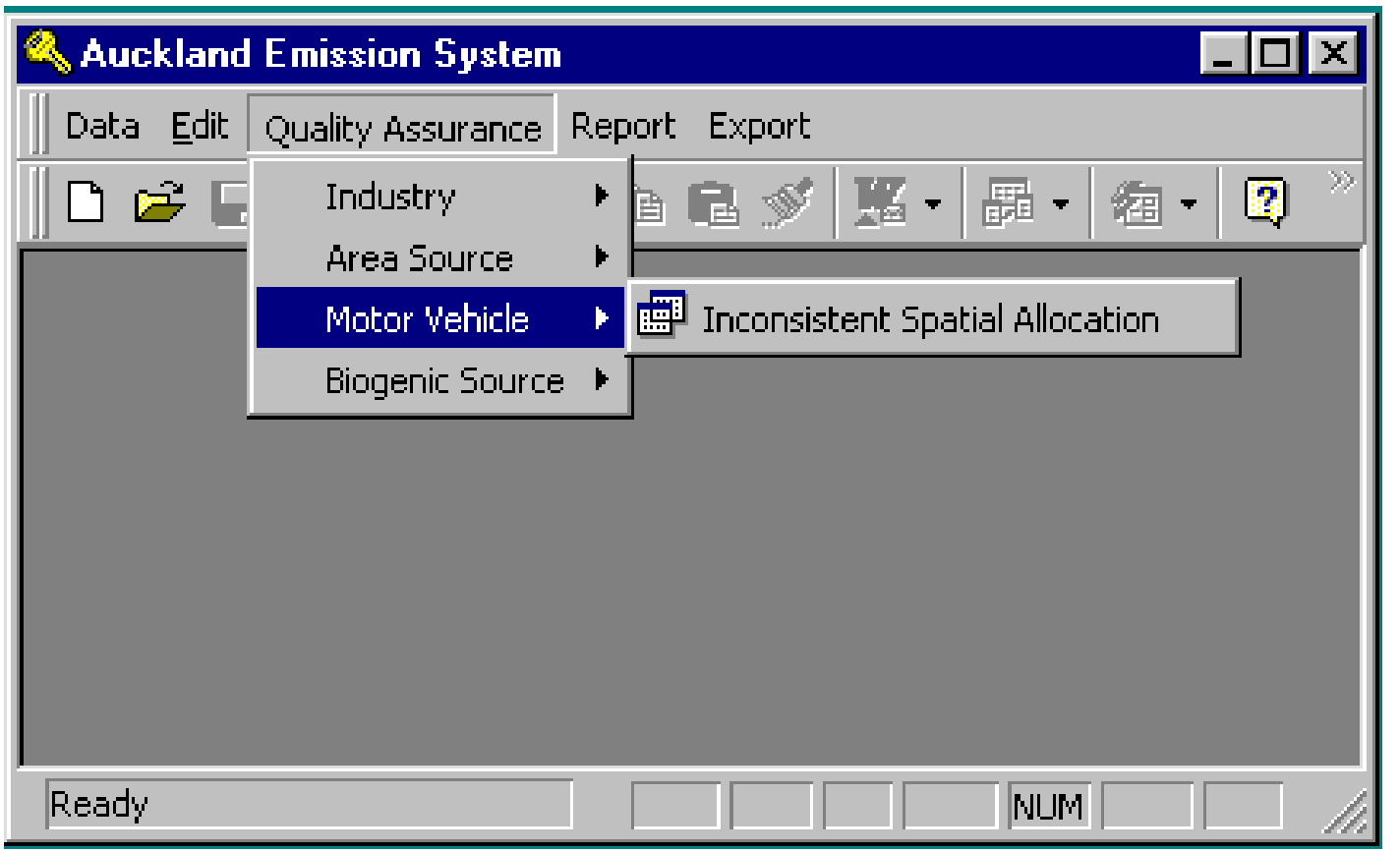
Quality Assurance: Industry



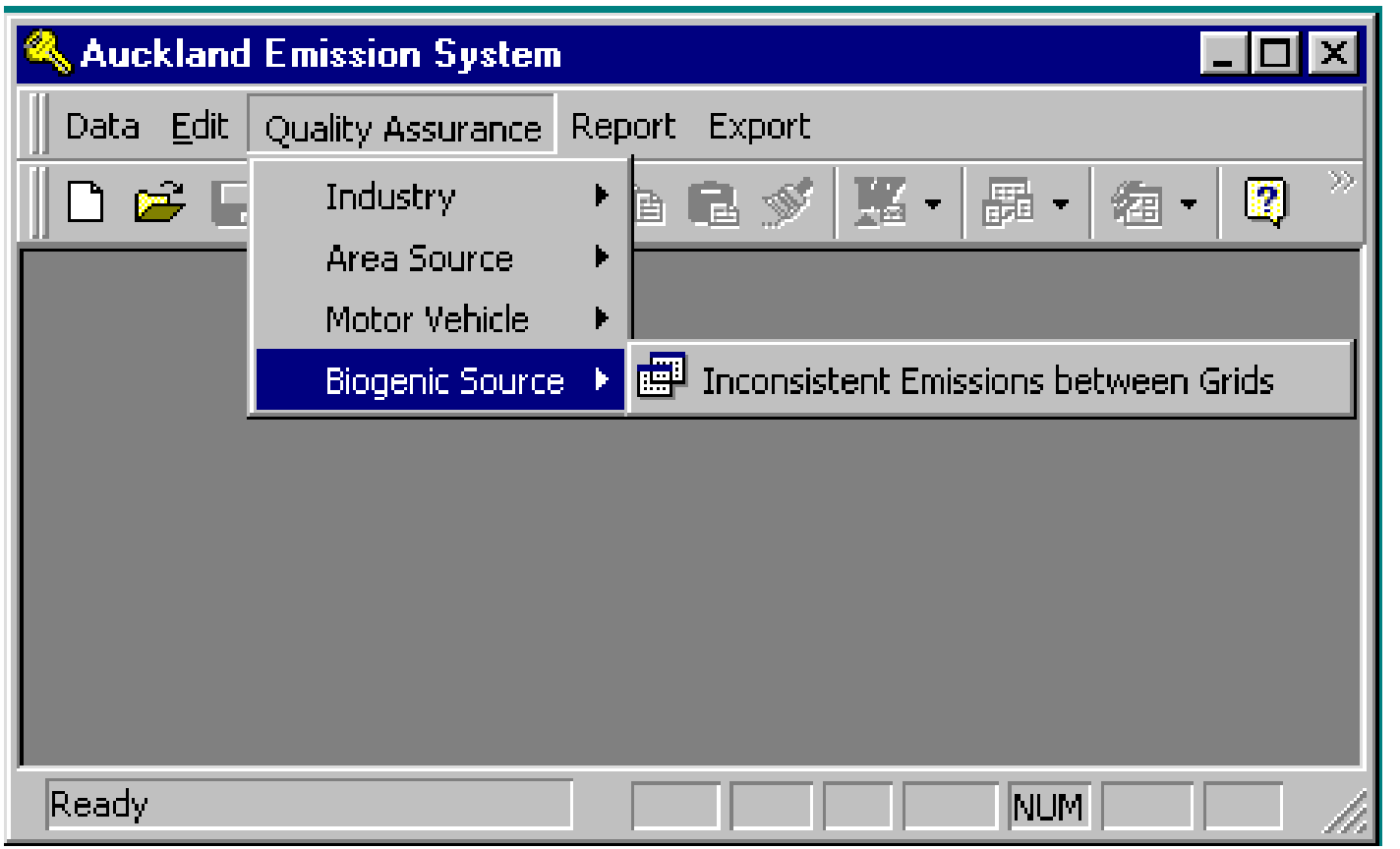
Quality Assurance: Area Source



Quality Assurance: Motor Vehicle



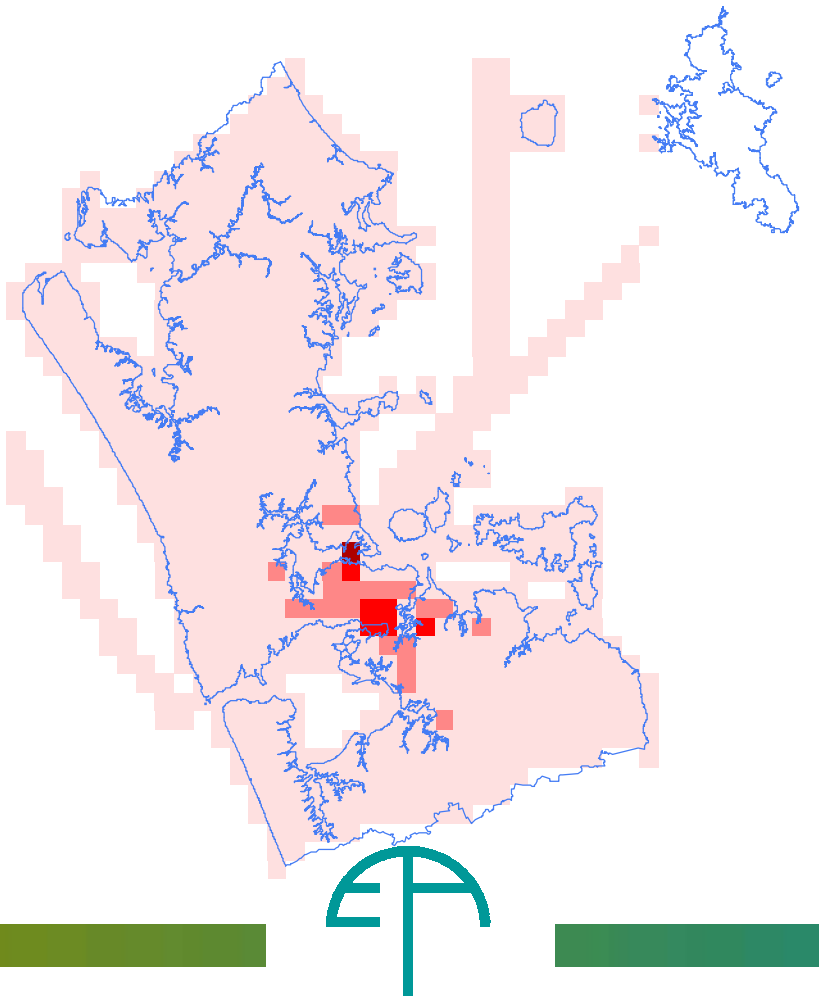
Quality Assurance: Biogenic Source



Some Results...

VOC emission

1 am



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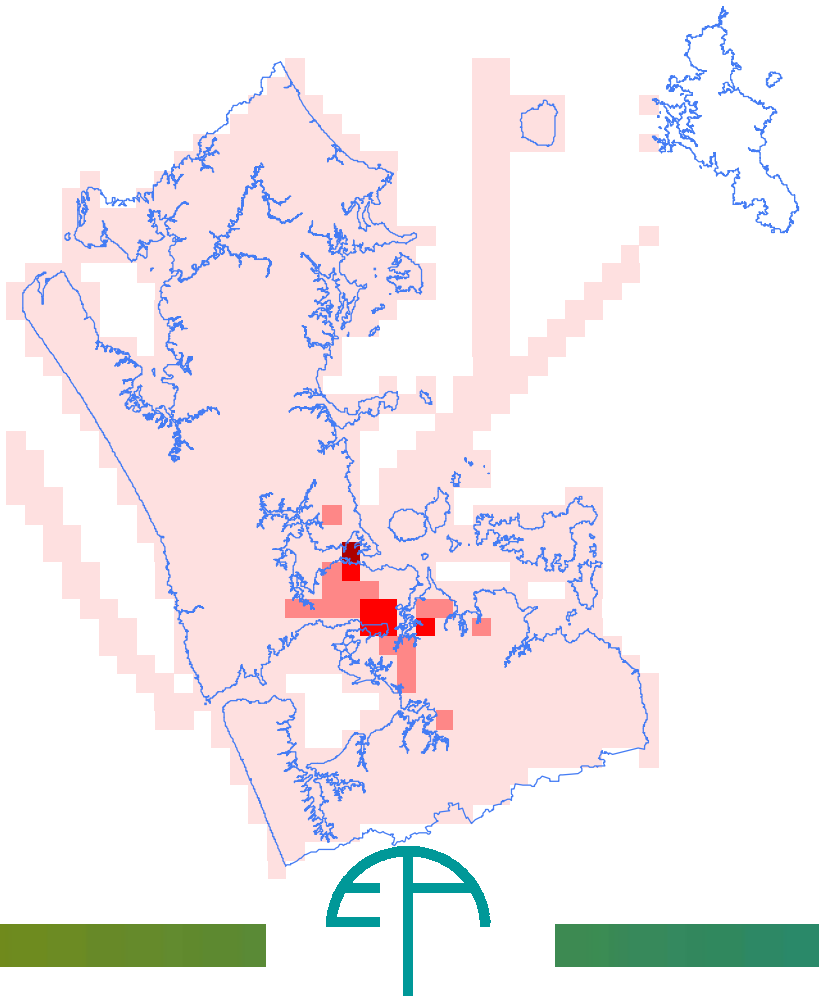

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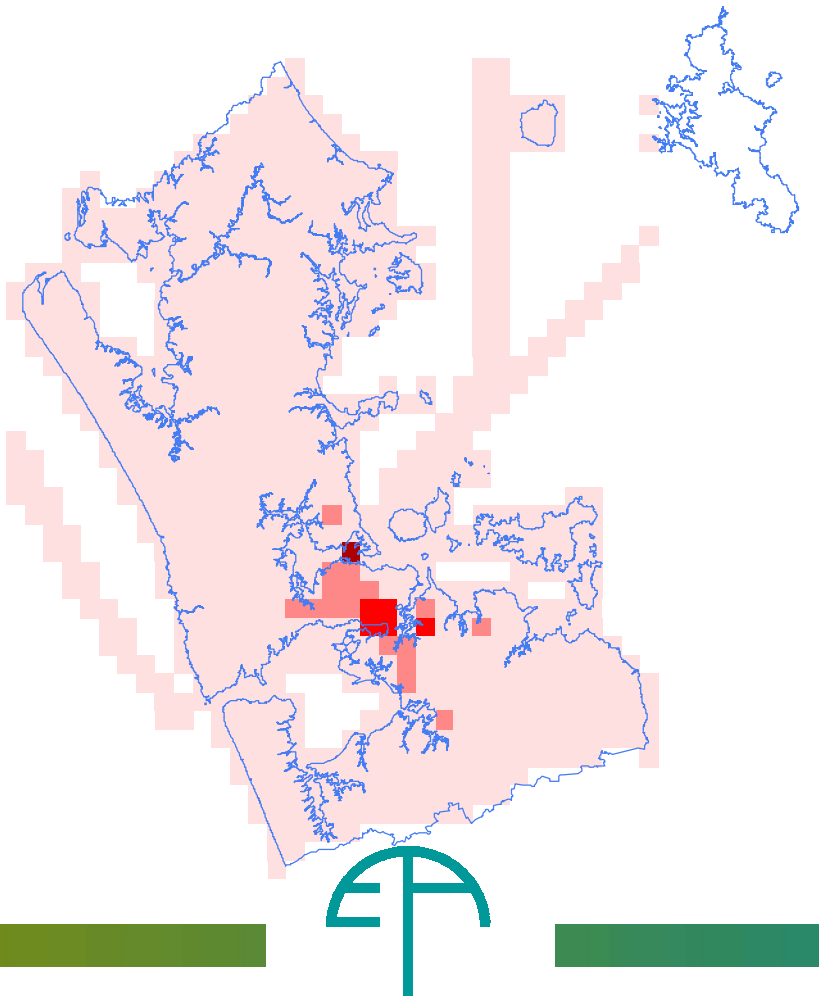

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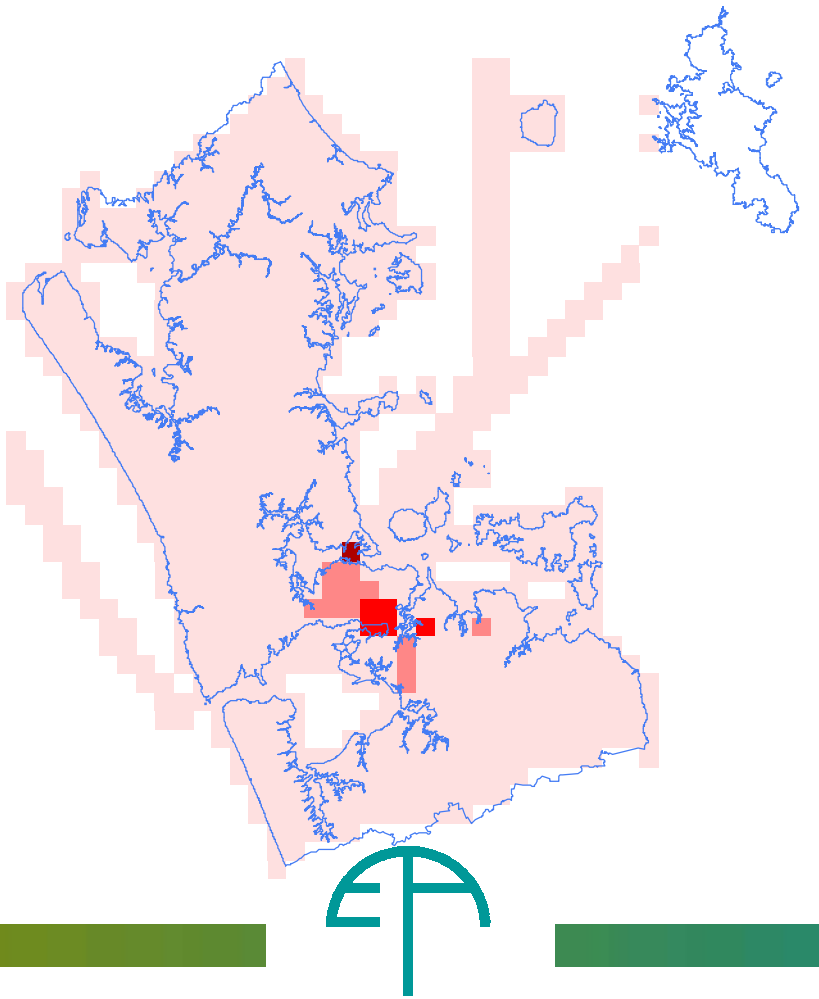

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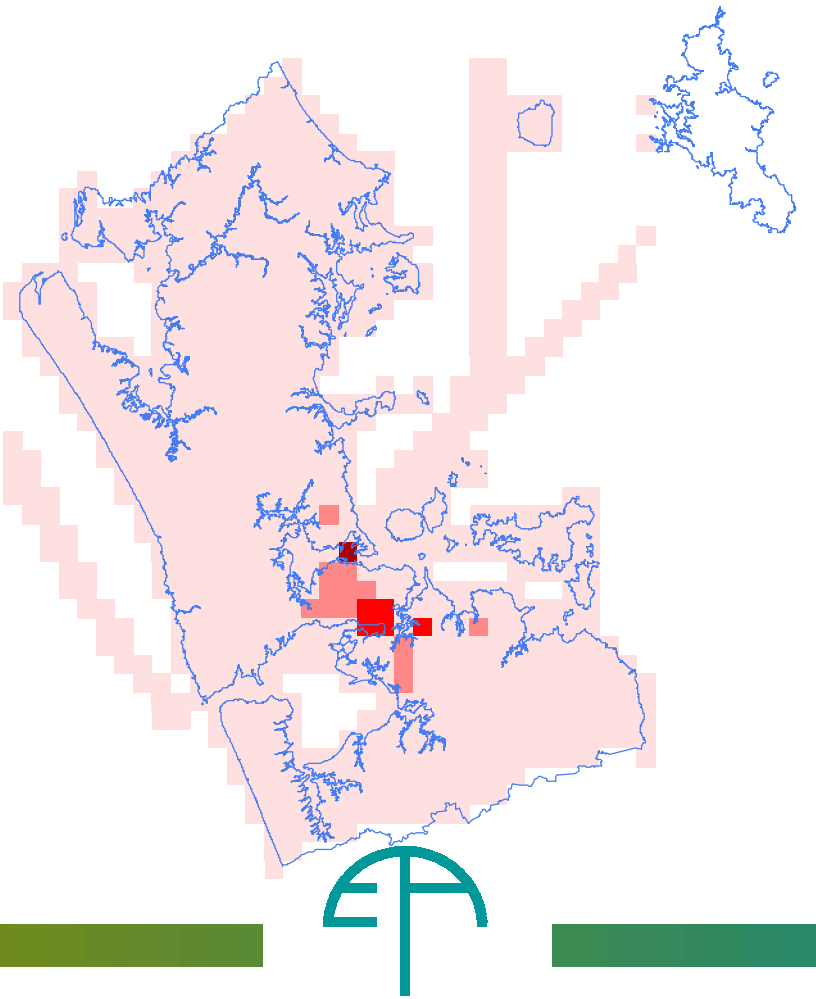

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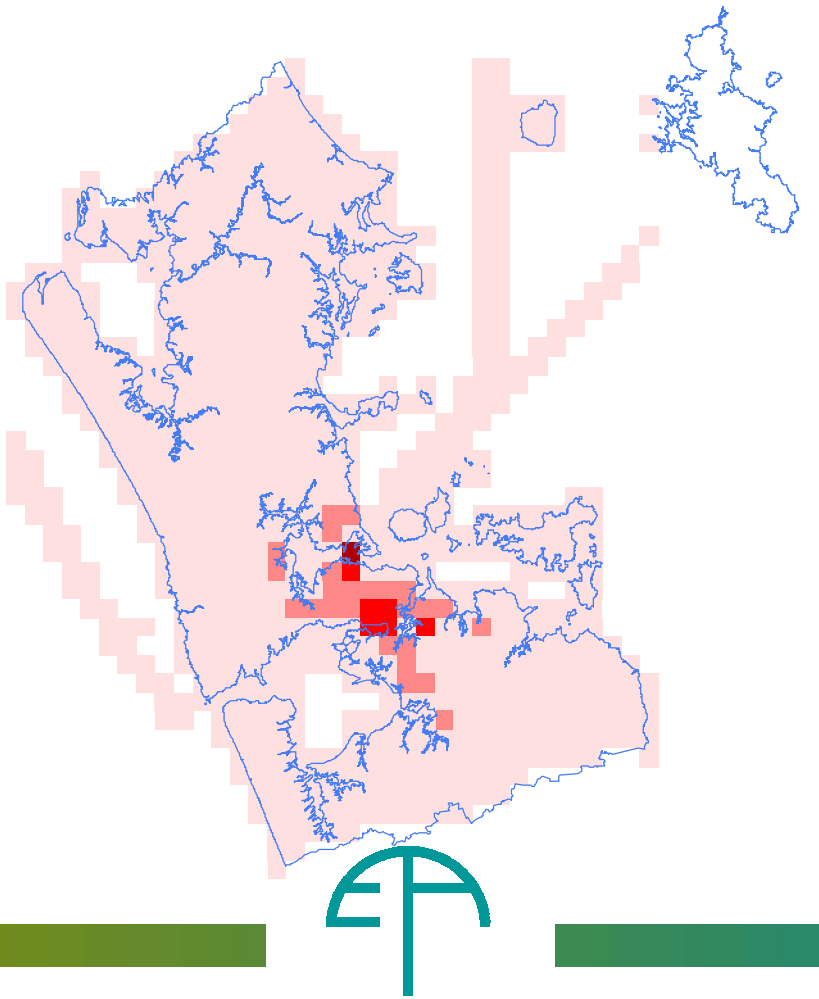

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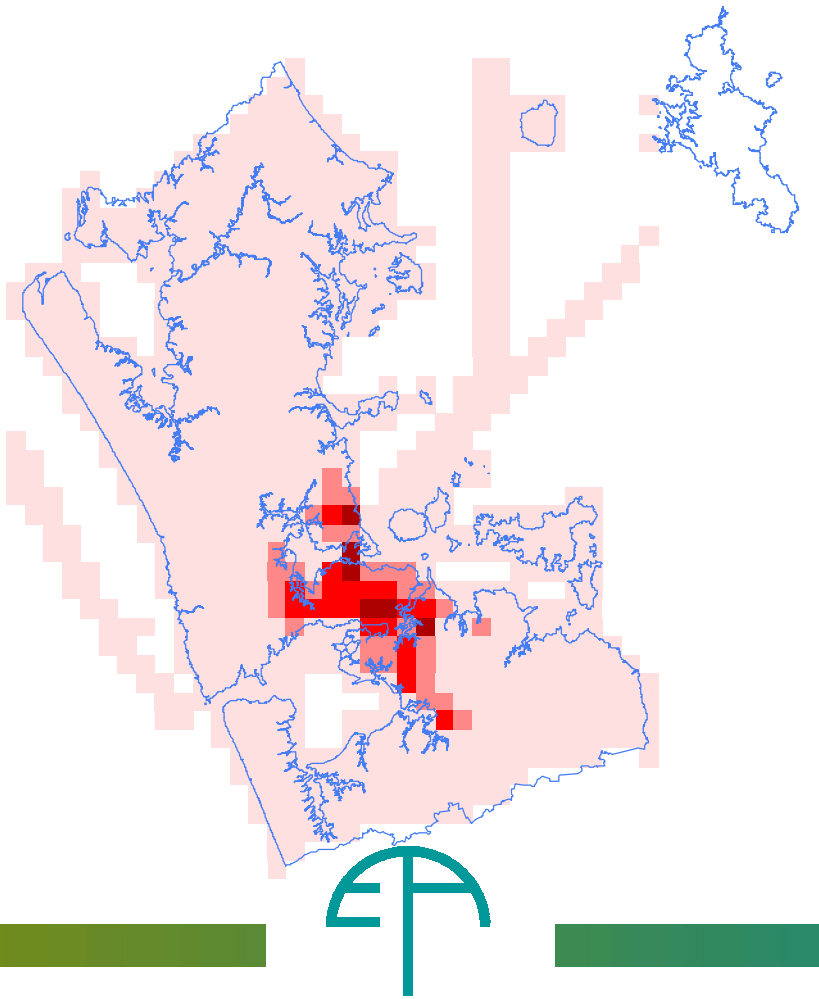

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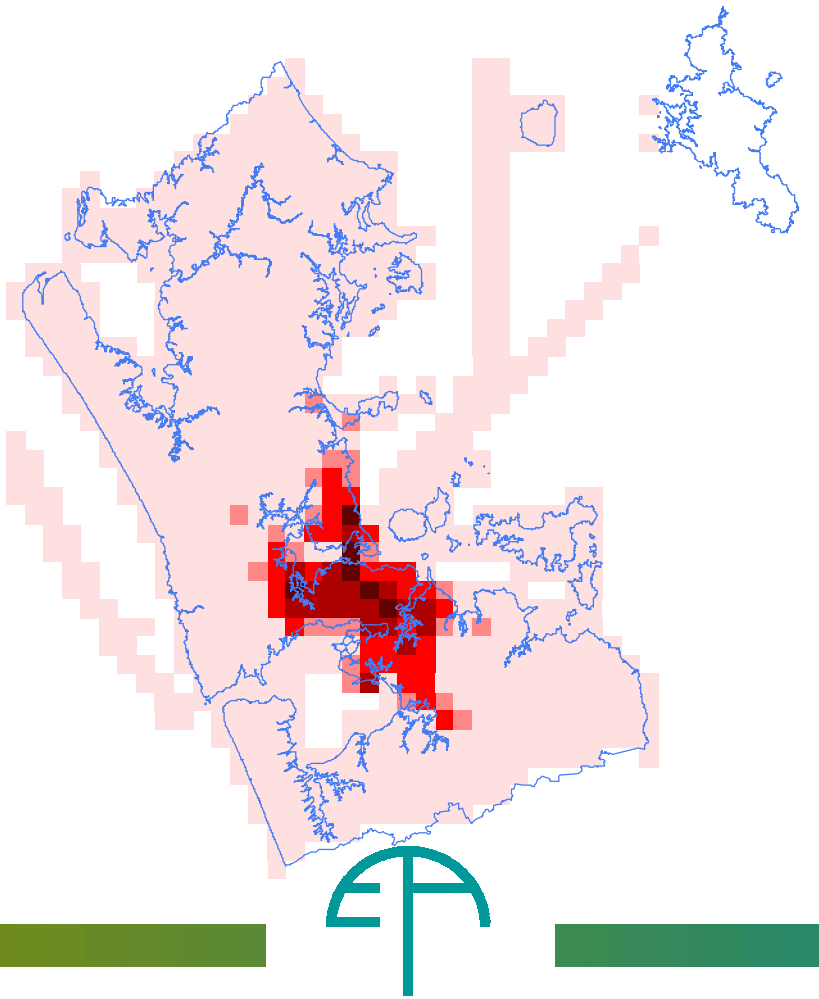

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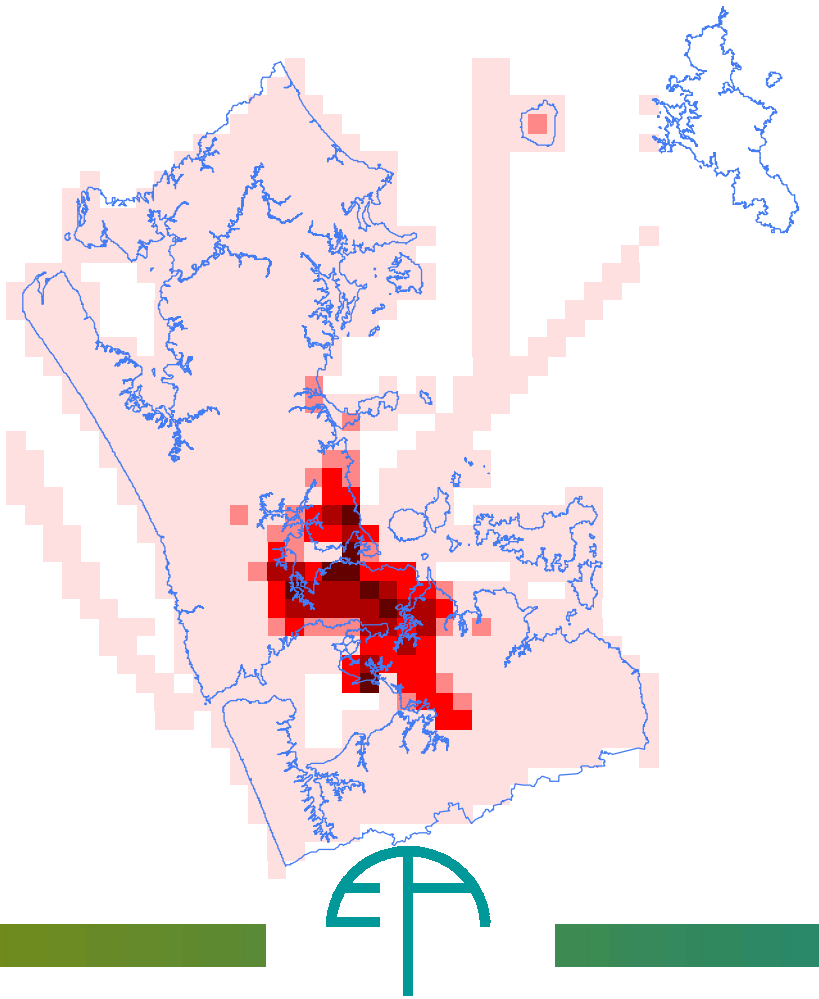

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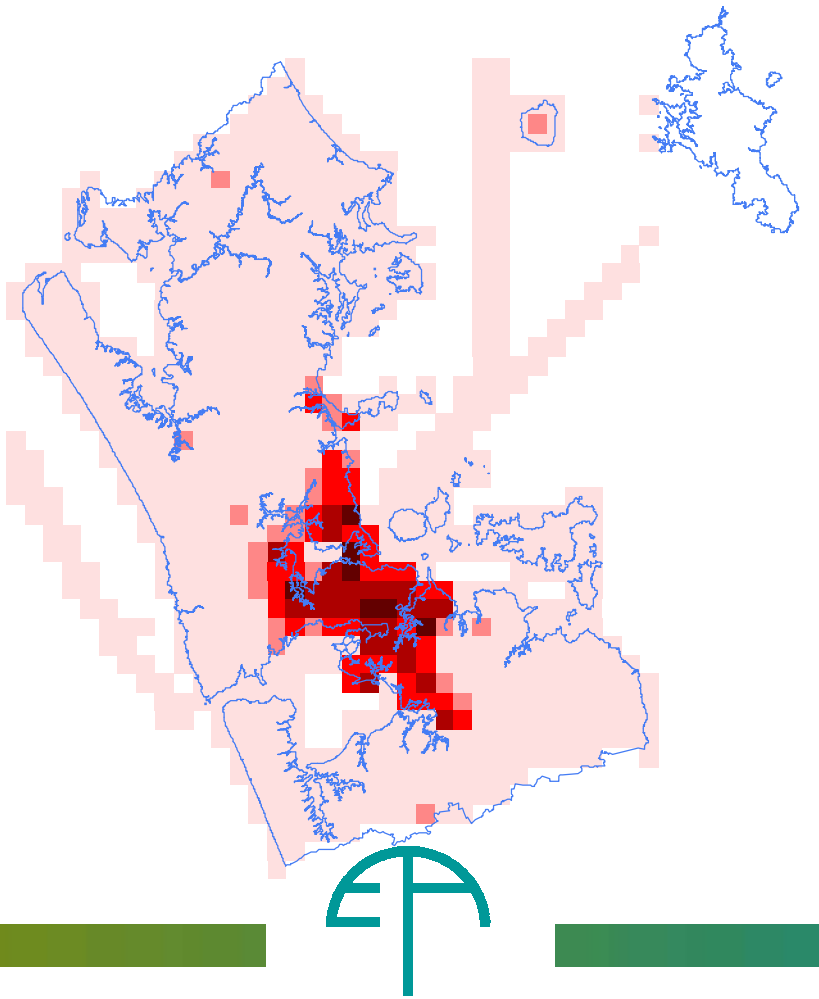

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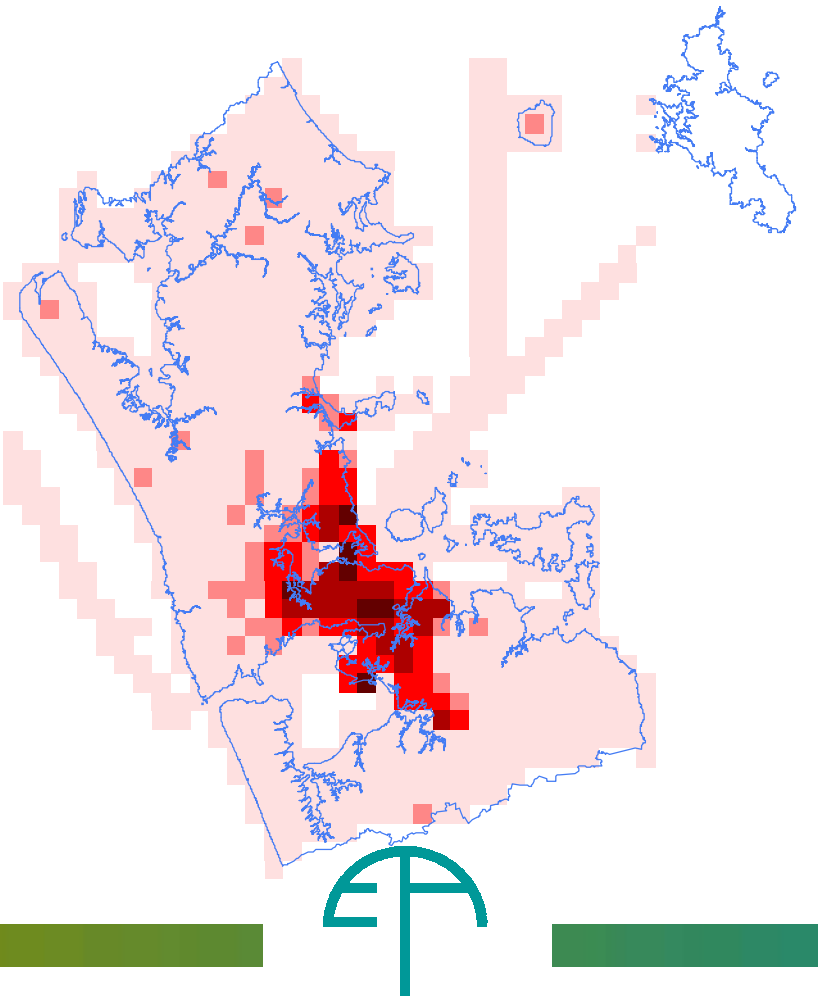

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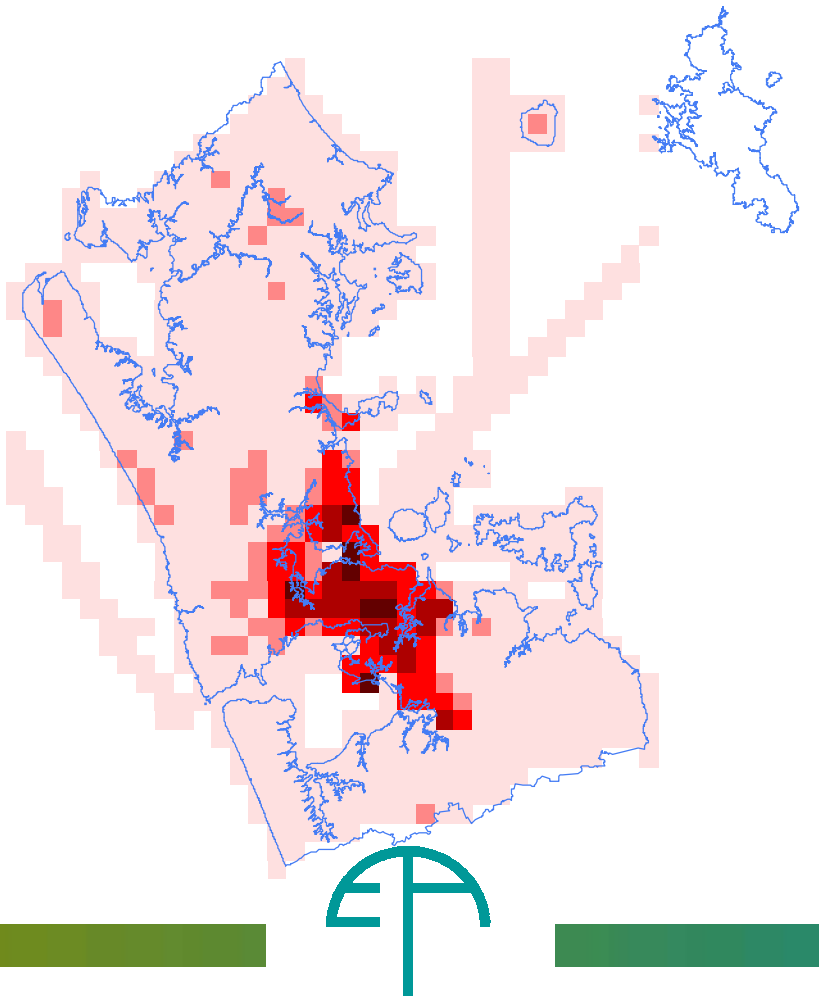

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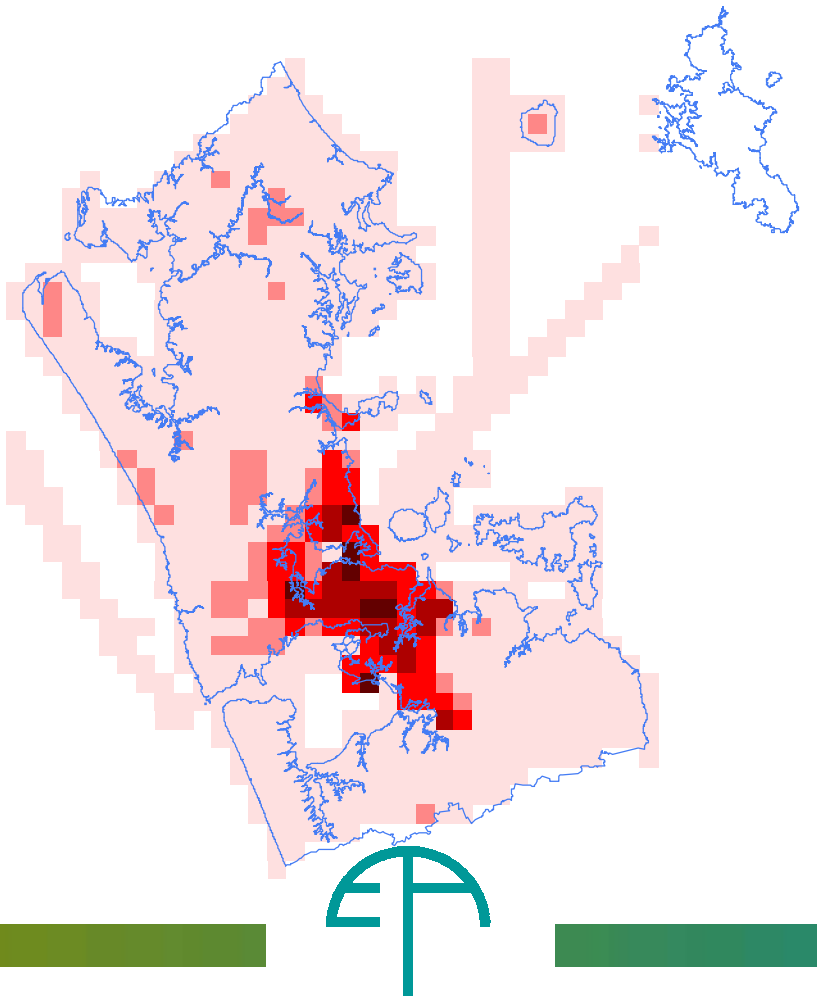

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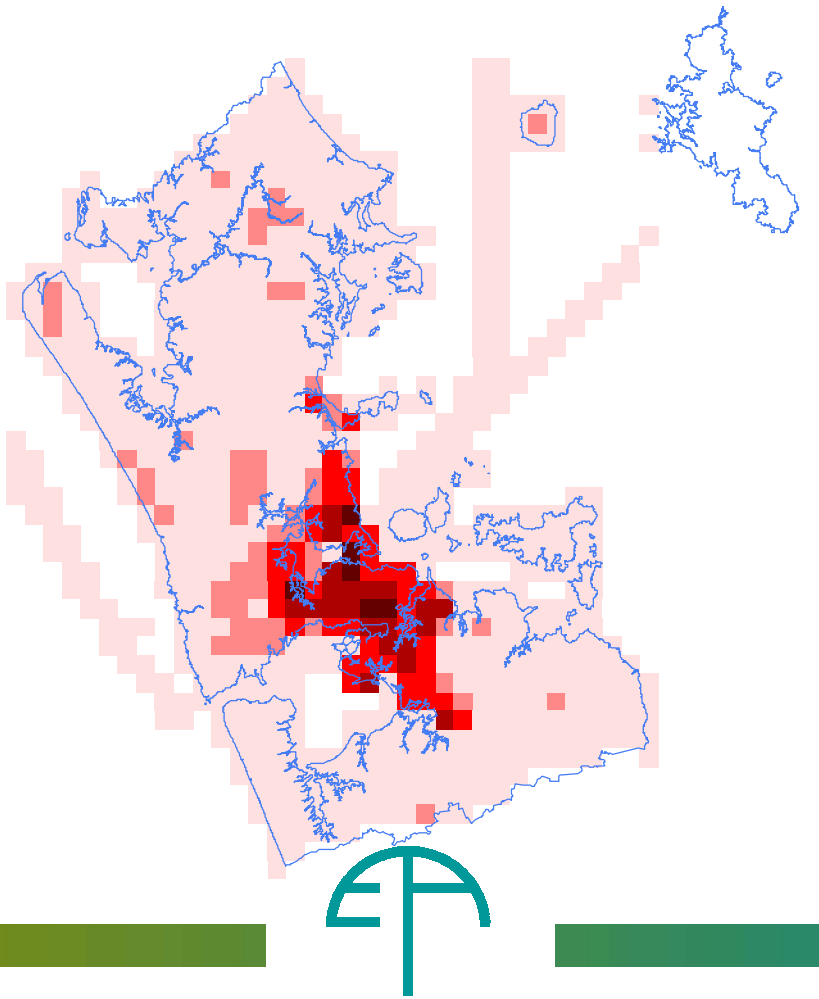

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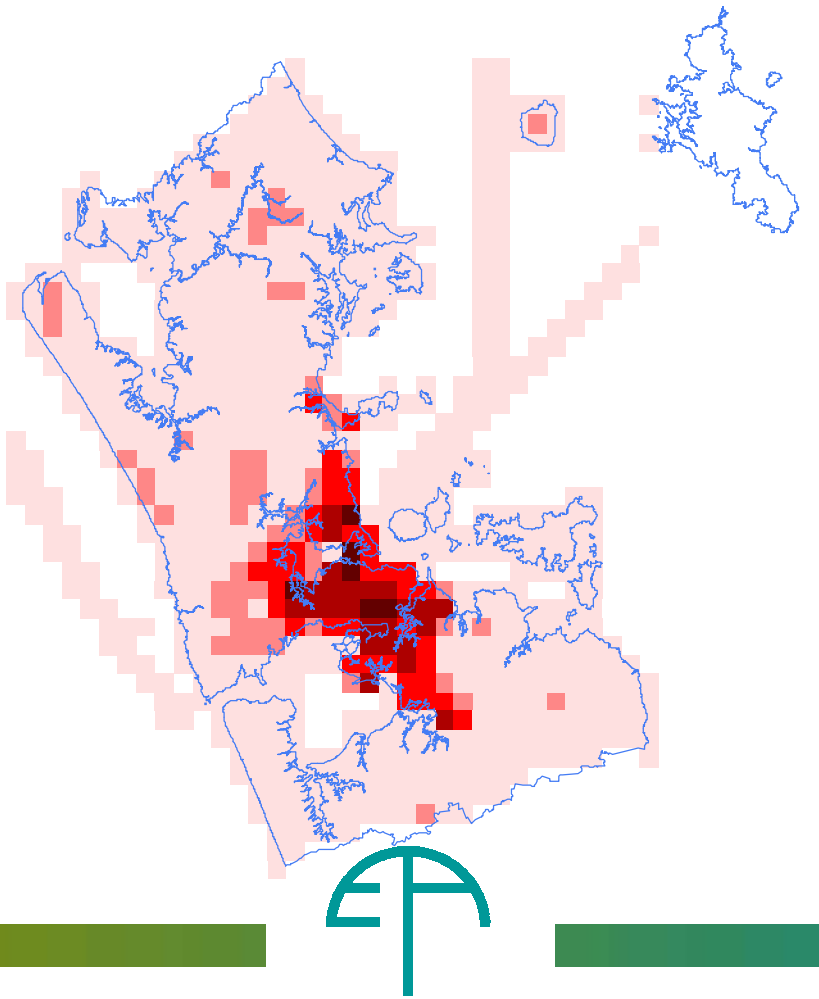

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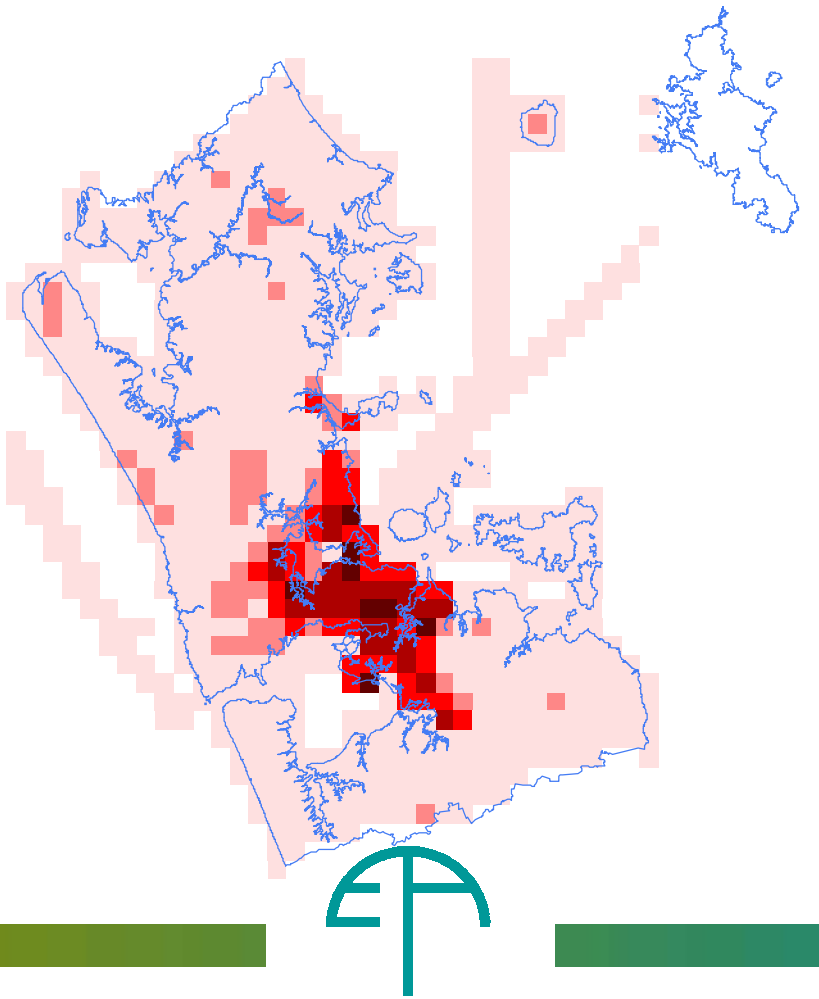

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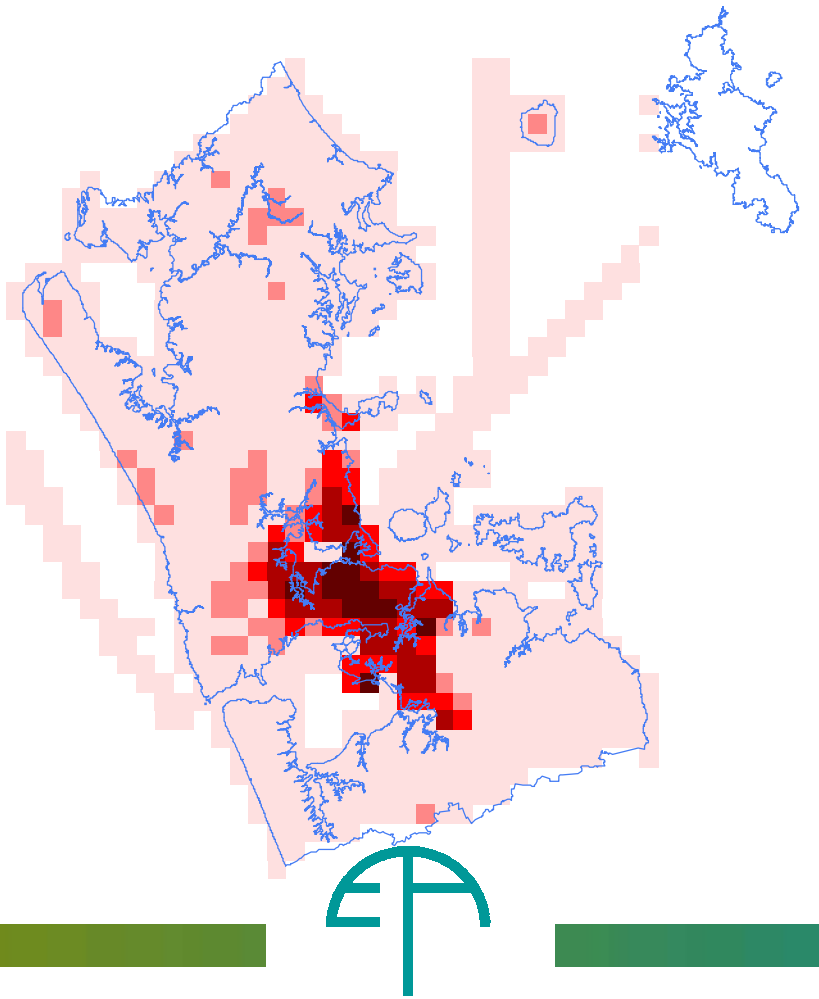

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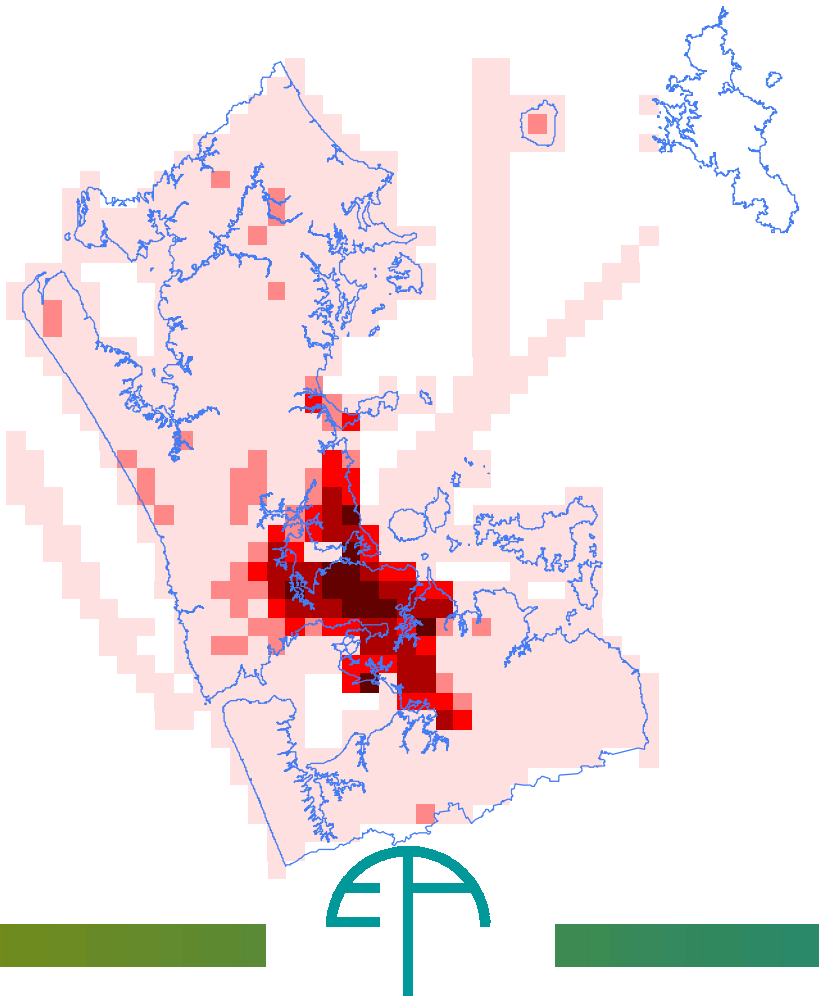

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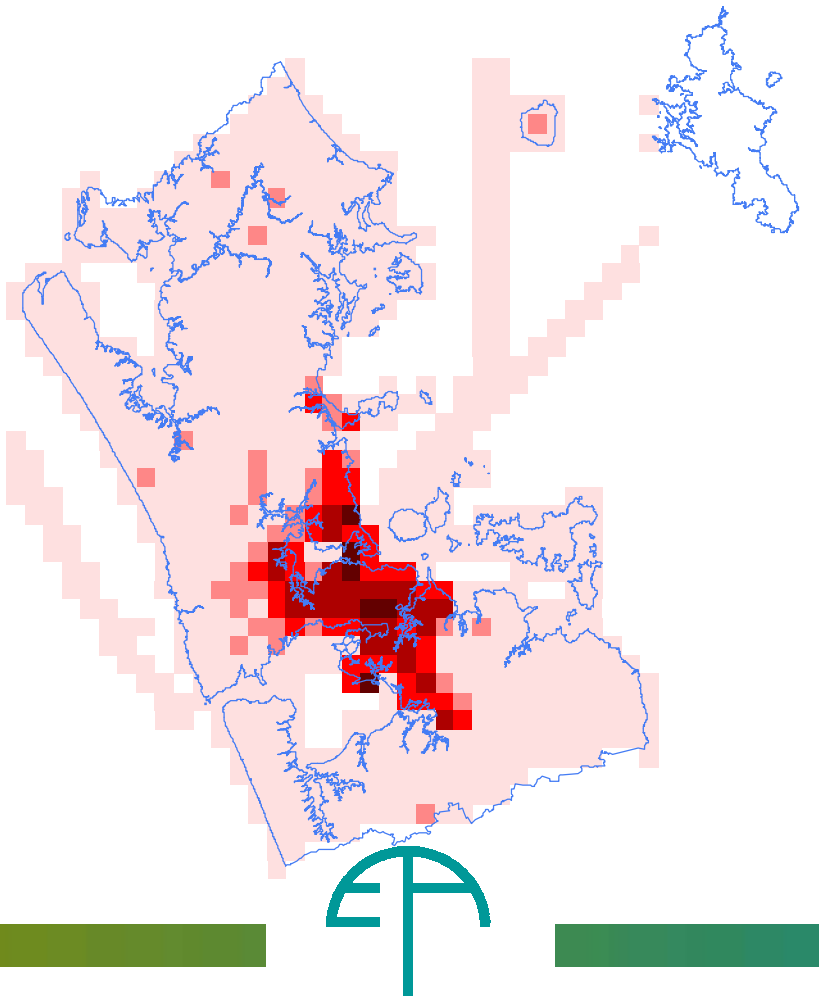

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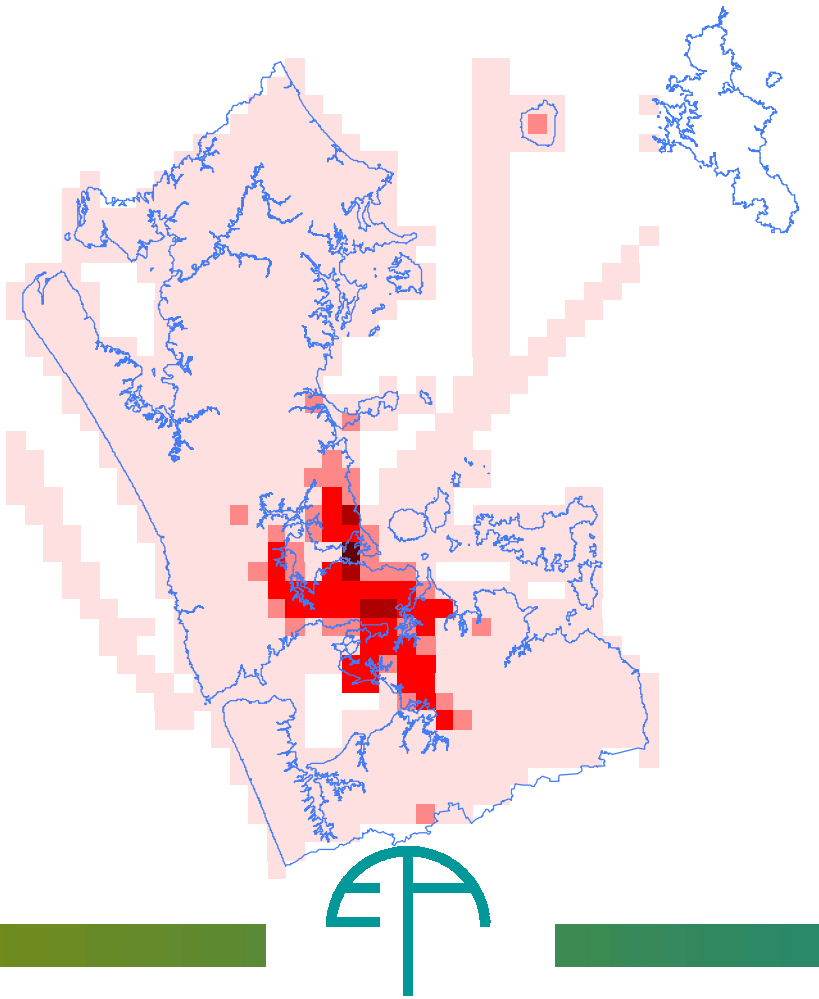

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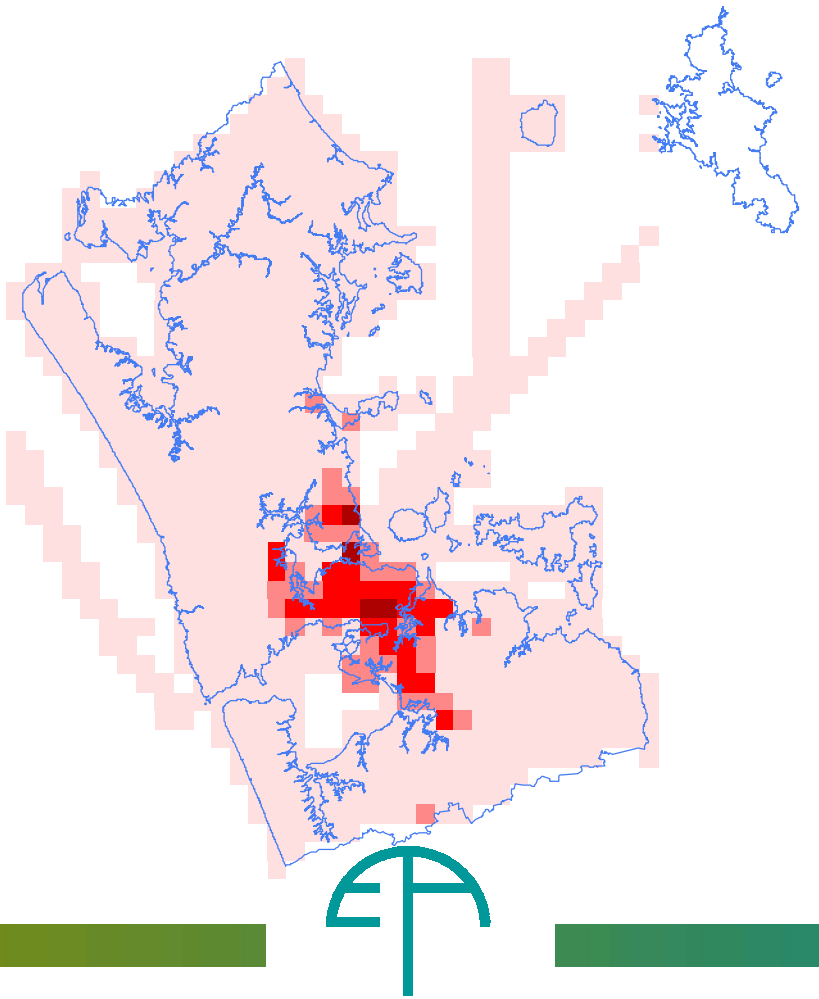

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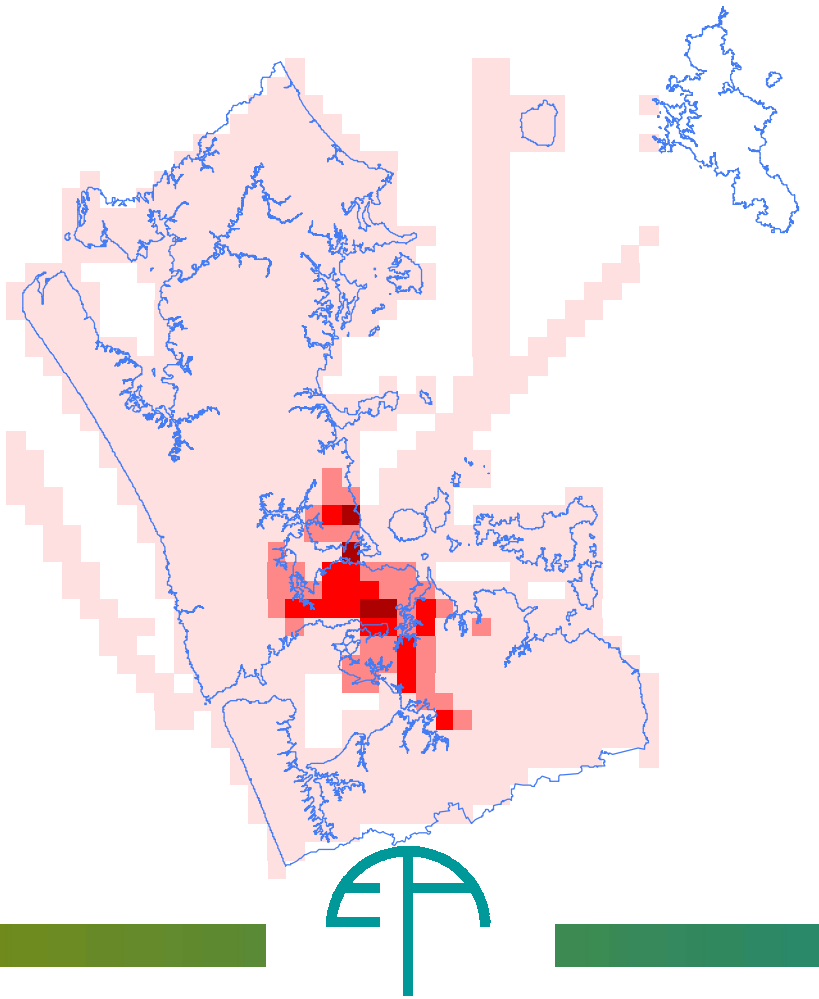

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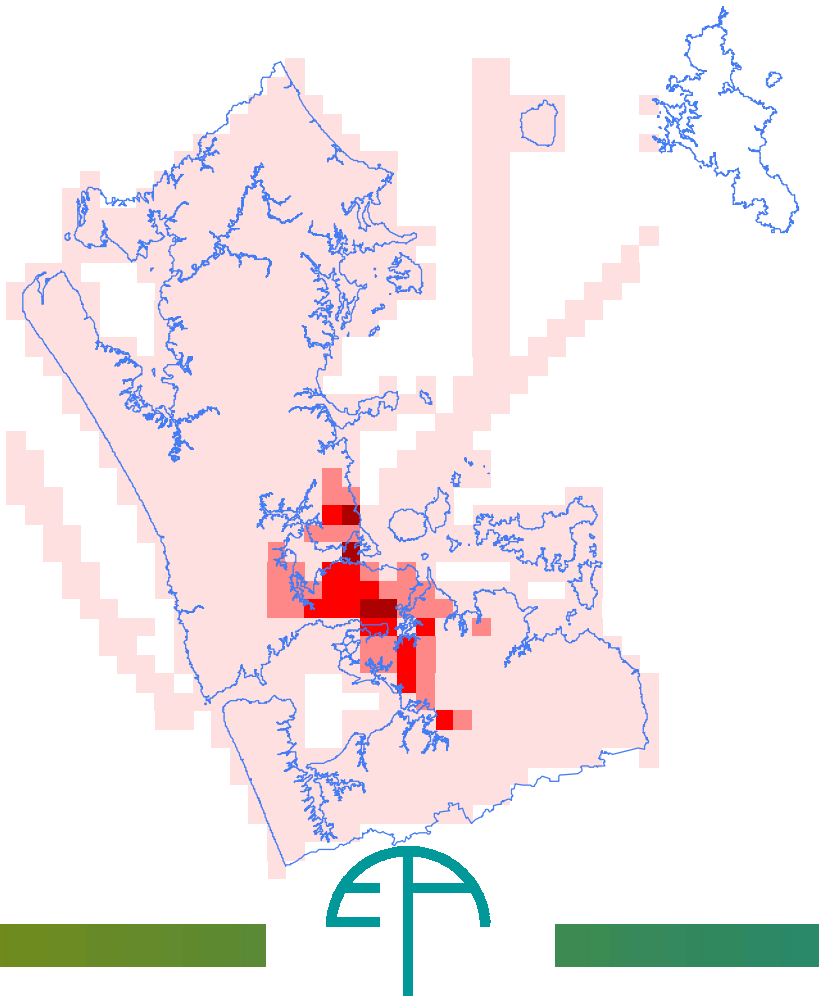

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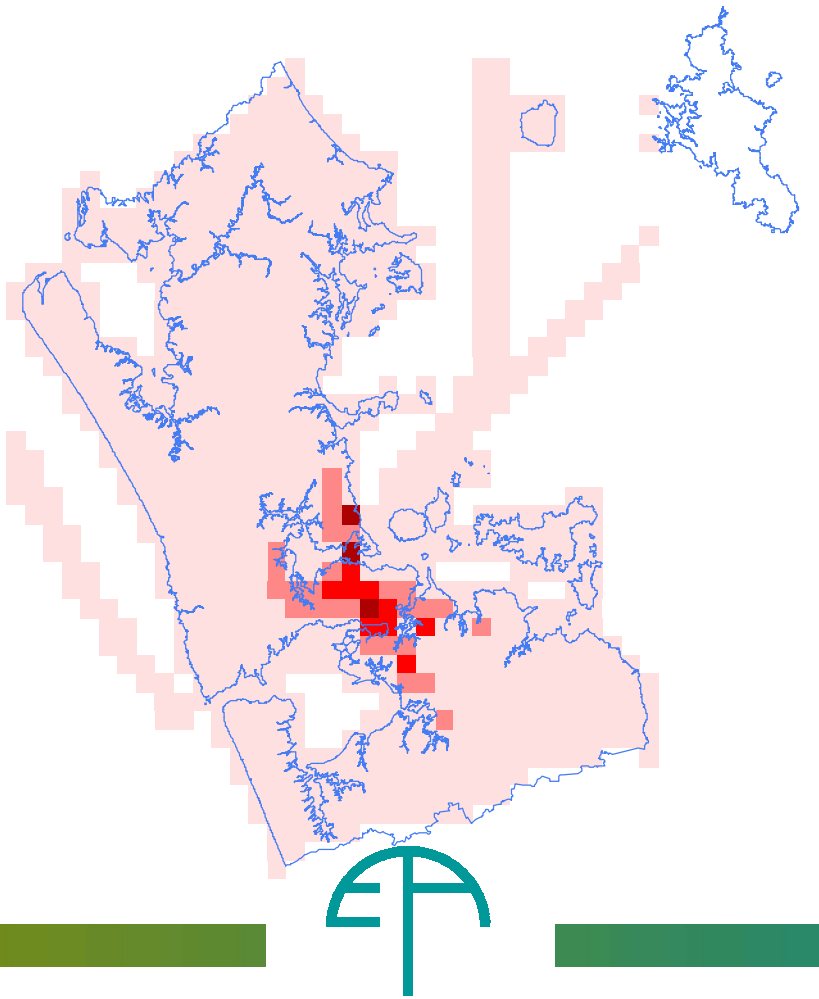

Conclusions

- Capable in both urban-scale and regional scale domains.
- Includes industry, area source, motor vehicles and biogenic source for air quality model.
- Project emissions to future years and generate different scenarios for different policy settings.
- Demonstrates the feasibility to develop a comprehensive and powerful emission system on a personal computer.

Acknowledgment

- The Auckland Regional Council for providing the permission to publish the results presented in this conference.