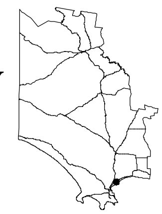
ALLESTREE / DUTTON WAY TOWN REPORT

March 2009



INTRODUCTORY COMMENTS

Allestree / Dutton Way is a small coastal residential strip less than 10 km (10 minutes) east of Portland. Electricity is connected but there is no reticulated water, sewerage or gas. There are some bores. Portland is the nearest centre for shops and other services. It is too small to be documented as a town by the ABS, so no census statistics are available. Due to the recent coastal history of this area these towns are difficult to quantify in terms of the exact number of parcels and properties, however perusal at air photos (map 1) gives some indication that there are similar numbers of developed and undeveloped properties (around 150 of each), and 180 developed (> 350 undeveloped) parcels.[1] The area seems to be primarily a holiday home / retirement destination. Considering the number of undeveloped parcels here, there is much potential for growth pressure.

The landscape at Allestree / Dutton Way consists of a low sand dune-beach ridge along the coast (Qrd / AS/NZS category 1 soil) with a swampy area inland (QrmSa / QrmB / category 9 soils). The latter is constrained due to its very high water table and watercourses within it are mostly constructed drains. Soils are shown on all maps and in the following text will be referred to as category 1 and category 9 soils. Category 9 soils are not found in the AS/NZS and were devised by us to represent soils that are severely constrained, in this case by a high water table.

There are four planning zones in the area (map 2), the most densely subdivided of which are the Rural Living zone and the Special Use Zone (schedule 3). The towns have two distinct subdivision patterns. The majority of parcels are 600m^2 to 800m^2 in the category 1 soils. A large number exceed 1ha, particularly in the category 9 area. There are only few places where residential development appears to have spread over multiple titles.

Many homes will be using all-waste systems with trench technologies for effluent disposal. A serious wastewater impact relates to groundwater. Category 1 soils are so permeable and soil percolation rates so rapid that while they are undoubtedly effectively disposing of septic effluent, unless trench systems are supported by a dosing pump and uniform effluent distribution little effluent treatment would be occurring in the soil. Therefore the bulk of microbial and chemical contaminants may well reach the groundwater table and pollute the groundwater. Hence the most likely wastewater impact relates to groundwater, and only in extreme circumstances would offsite effects such as overland flow of effluent into adjoining public and private spaces be important. For this reason Council needs to pay close attention to the onsite effluent disposal technologies being used in Allestree and Dutton Way. In contrast, category 9 soils have such a high water table that they present a localised health risk (we observed 90cm near the corner of Pumpa Street and Matheson Street (24/10/2007) and Shugg 2007 made similar observations (pp. 28-30)). It is unlikely that effluent from the adjoining category 1 soils is finding its way to category 9 area – swamp water tables are always slightly higher than sea level, so drainage is likely to be towards the sea.

Council needs to pay close attention to the onsite effluent disposal technologies being used in Allestree / Dutton Way. It is our belief that

- on category 1 soils no further trench systems should be permitted.

[1] Discrepancies in these figures arise from the air photo interpretation of dwellings (a combination of outsheds being interpreted as dwellings, informal developments and the presence of holiday cabins).

- on category 9 soils no further onsite systems should be allowed unless an LCA demonstrates the site is sufficiently elevated and an onsite wastewater system is sustainable. Existing dwellings should be upgraded to Aerated Wastewater Treatment Systems (AWTS), and efforts made to reduce household water inputs.

WASTEWATER MAPPING

Maps 3 thru 10 apply the AS/NZS and Code Of Practice in various ways to Allestree and Dutton Way. Only areas on category 1 soils have been mapped because category 9 soils are constrained by a high water table.

Development density series

Map 3 thru map 5 represent the current capacity for local areas to deal with wastewater onsite, and the likelihood that if fully developed they could sustainably deal with wastewaters onsite using trench and irrigation systems.

- Using trench systems a three bedroom home would require at least 1122 m^2 to adequately deal with its wastewater on AS/NZS category 1 soils (ie. 450m^2 of impervious surfaces plus 336m^2 disposal area plus 336m^2 reserve area - see table 6 in the report introduction). No new trench systems should be allowed in Allestree or Dutton Way. We have modelled this theme only for the purpose of understanding the sustainability of existing onsite systems.
- Using irrigation systems a three bedroom home would require at least 635 m^2 to adequately deal with its wastewater on AS/NZS category 1 soils (ie. 450m^2 of impervious surfaces plus 185m^2 disposal area - see table 3.1).

Map 3 assumes that trench systems are used throughout Allestree and Dutton Way and so represents the present sustainability of areas. Assuming dosing pumps are in use, some areas on category 1 soils do not meet the performance requirements set out in the Code of Practice.

Map 4 represents the sustainability of areas if all parcels were to be developed using trench systems. Compared to Map 3, many areas change their status from green, to red or amber, meaning that on average few areas would be able to deal with wastewater if fully developed with three bedroom homes.

Map 5 represents the sustainability of onsite systems in Allestree and Dutton Way if all parcels were to be developed and all developments were to make use of irrigation technology. Only one area would be unable to dispose of domestic wastewater onsite in a sustainable manner if fully developed with three bedroom homes.

Constraints

Map 6 shows that category 9 soils are constrained due to a high water table. It also shows the 60 m buffer from Portland Bay as prescribed by the Code of Practice. The Code also prohibits development within 6 metres upslope or 3 metres downslope of an adjacent allotment. Buffer distances from adjoining allotments are reduced by up to 50% if irrigation systems are used. In map 6, allotments are buffered by 3m (red) and 1.5m (pink) on the basis of our recommendation that all wastewater systems should be pressurised.

Trench performance series

The trench system series (Map 7 and Map 8) gives some indication how existing systems might be performing in terms of surface runoff potential, but does not account for impacts on groundwater, which will be greater where dosing pumps are not in use.

Map 7 shows that there are a significant number of properties with limited development potential. These have a generalized and dense spread across the towns suggesting that there are probably already wastewater problems in the area.

Map 8 shows that many parcels in Allestree and Dutton Way have limited development potential if trench technology is used. Severe problems could emerge if all parcels were to be developed and trench systems were to be used.

Irrigation performance series

The irrigation map series (map 9 and map 10) shows that many blocks constrained when trench systems are used, are not constrained when irrigation technologies are used. However, many blocks do not change status because they are affected by the 60 m buffer from Portland Bay.

Map 9 represent the present ability of the local soils to deal with wastewater onsite should all existing development be upgraded to irrigation systems.

Map 10 represents the overall effect of using irrigation technology should all parcels be developed in the future.

RECOMMENDATIONS AND CONCLUSIONS FOR IMPROVING SUSTAINABILITY

Failing or inappropriate onsite wastewater systems create concerns for human health and the health of the environment. In this sense, Allestree and Dutton Way certainly represents a problem. Although Map 3 indicates that three areas are probably not performing in a manner that meets EPA guidelines, this map does not incorporate the constraints shown in Map 6 and is based on the assumption that all developments have properly maintained septic systems, trench disposal, and dosing pumps. The reality is that these technologies and maintenance regimes are unlikely to be in place for all developments. Category 1 soils are so permeable that the most likely wastewater impact relates to groundwater, and the public health and environmental risks that stem from that. Only in extreme circumstances would offsite effects such as overland flow of effluent into adjoining public and private spaces be important. Shugg (2007, p.19) states that "in the coastal dunes.the water table is seldom deeper that 2 (metres)". Given that the Standard notes that the depth to seasonal water table should preferably be > 1.2 metres (AS/NZS 1547, 2000, p. 129), for some blocks this will be an additional constraint, and one that is not reflected in the mapping.

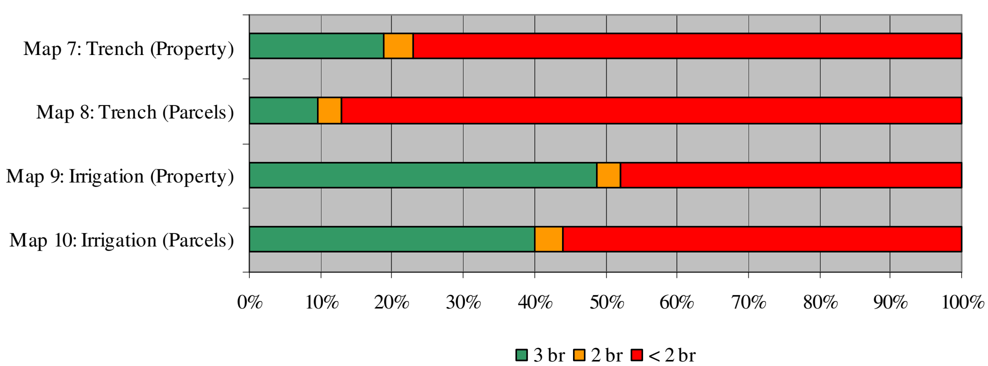


Chart 1: This chart illustrates the information shown in Maps 7 thru 10. It gives an impression of the impact that changes in technology and planning approaches make on the sustainability outcomes for development in the towns. Even with irrigation technology, less than 50% of blocks will ever be sustainable. The maps show these blocks to be evenly spread throughout the towns, meaning that there is little scope for taking different wastewater management approaches in different areas of the towns. Many blocks are unlikely to ever overcome constraints that relate to a shallow water table and buffers from water bodies.

Map 4 shows that even in the absence of the constraints shown in map 6, a policy that allowed additional trench systems would be unsustainable in the long term. Map 7 thru map 10, summarized in Chart 1, are the most concerning series of maps. These maps apply constraints prescribed by the EPA Code Of Practice (Map 6) and disposal area recommendations from within the AS/NZS (table 6 in the report series introduction and table 3 in this document) to both properties and parcels. The trench series of maps is based on the assumption that all developments have properly maintained septic systems, trench disposal, and dosing pumps. Even with this best practice case, on the basis of not being able to support wastewater from a three bedroom home, less than 20% of properties on AS/NZS code 1 soils if developed, could meet the siting criteria set out in the Code of Practice (Map 7 and Chart 1). In a scenario where council continued to approve trench systems and allowed the area to be fully developed, this figure would fall to less than 10% (Map 8 and Chart 1). In a scenario where all existing developments on code 1 soils were retrofitted with irrigation systems, around 50% would meet

the siting criteria set out in the Code of Practice (Map 9 and Chart 1), and this figure falls to 40% if all parcels on code 1 soils were to be developed using irrigation systems (Map 10 and Chart 1).

In the absence of reticulated sewerage, the maps and Chart 1 suggest that for many blocks the situation would improve if irrigation systems were to be adopted (Map 5, Map 9 and Map 10). In fact, due to the high quality wastewater produced by Aerated Wastewater Treatment Systems, in the absence of reticulated sewerage the sustainability of all sites would be improved if upgraded to irrigation systems. For some sites where trench systems are being replaced, it may be necessary to re-use existing trenches for AWTS treated water, or to install irrigation lines within existing trench areas.

Recommendation: We believe that the use of onsite wastewater systems in Allestree and Dutton Way is unsustainable and suggest three approaches to dealing with this. Our most preferred is Approach 1 and our least preferred is Approach 3.

- **Approach 1:** The area should be sewered. A Common Effluent Drainage system may have merit. Such a system may not be susceptible to the ingress of potentially saline groundwater as would be the case in conventional deep sewers.
- **Approach 2:** Upgrade all trench systems to be irrigation systems. Initial focus should be on those developed properties shaded red in map 7. It is possible that some blocks shaded green should be red on the basis of a high water table.
- **Approach 3:** Adopt a policy that would.
  - Lead to the long term upgrading of trench systems to irrigation systems. Permit approval might be the trigger for this. Priorities should be blocks.
    - Using onsite systems that would not currently be approved (eg. soakage pits, blackwater only systems).
    - Mapped as being unable to sustain a three bedroom house.
  - Limit the subdivision of properties.
  - Deal with high priority problems
  - Manage remaining problems.

Notes on Approaches

High priority problem

- The cluster of developed properties near the corner of Ocean Road and Dutton Way within category 9 soils should be given the highest priority for council action (map 7). Due to the high water table, these properties represent a localised health risk. Efforts need be made to upgrade systems there to AWTS .

Problems to manage

- Audit of existing systems in areas shaded red in map 7.
  - Document onsite technology being used.
  - Initial desludging of all tanks.
  - Establish system to monitor future desludging.
- Begin a community awareness campaign to encourage the use of water saving devices and practices. The motivation for this is wastewater reduction rather than reduced water consumption.
- Full Land Capability Assessment to be undertaken for development proposals that deviate from the wastewater technologies discussed in this document, or are shown to be unsustainable in Map 9 or Map 10.
- Ensure the regular maintenance of AWTS in accordance with certificate of approval.

- Where bores exist, the water could become contaminated from wastewater and health problems result.
    - Observe setback distances between disposal fields and bores that are set out in the Code Of Practice.
    - Discourage use of bore water for potable supply.
    - Promote secondary treatment and disinfection

Notes on upgrading existing septic tank systems

- Irrigation technology is the preferred option and implies the installation of AWTS. Wastewater should be treated to a 20/30 standard.
- A professionally designed and constructed sand filter would be an acceptable alternative technology.
- Aerated Wastewater Treatment System (AWTS) in combination with extended trenches and a dosing pump would be another option.

REFERENCES

Australian / New Zealand Standard, On-site domestic-wastewater management – AS/NZS 1547:2000, 2000

DPI Victoria, 2007, Geoscientific data DVD (geological boundaries were reinterpreted using 1 metre contours provided by the shire)

EPA, December 2008, Code of Practice – Onsite Wastewater Management document, Publication 891.2

Shugg A, December 2007, Evaluation of groundwater conditions at several Portland sites: Dutton's Way to Narrawong (Draft), Sinclair Knight Mertz

ACKNOWLEDGEMENT

Extensive use has been made of an earlier wastewater report produced by Mr Larry White.

Table 2: Climatic Regime (mm) – Meteorological Stations: Portland for rainfall, Mount Gambier for evaporation.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Mean Rainfall	35.4	33.3	42.8	65.1	88.3	100.1	108.3	107.6	85.4	69.9	52.7	44.7	835.2
Mean Pan Evap'n	213.0	189.3	148.1	88.2	53.1	36.1	41.7	68.2	90.0	134.5	168.0	225.1	1347.3
Crop Factor	0.70	0.70	0.70	0.60	0.50	0.45	0.40	0.45	0.55	0.65	0.70	0.70	
Mean Pot'l Evapotrans'n	149.1	132.51	103.67	52.92	26.55	16.245	16.68	30.69	49.5	87.425	117.6	157.57	940.46
Water Deficit	113.7	99.2	60.9	-	-	-	-	-	-	17.5	64.9	112.9	469.1
Water Excess	-	-	-	12.2	61.8	83.9	91.6	76.9	35.9	-	-	-	362.2
90-Percentile Rainfall	69.8	69.7	82.8	109.1	141.8	153	167	164.6	124.8	111.3	92.2	80.4	997.7

The 90-Percentile annual rainfall[2] is the higher than normal yearly rainfall that on average occurs only once in ten years, and it is made up by some parts of the year having sufficiently higher than average rainfall. It is based on a long historical period of rainfall measurements. This index is used in EPA publications on irrigation of large scale industrial and municipal wastewater and also for grey water re-use schemes. In Allestree-Dutton Way-Narrawong the 90-percentile high rainfall is about 19% higher than the mean annual rainfall.

During an average rainfall and evaporation year, there will be six months that have more rainfall than will be transpired by a grassed surface. The excess rainfall in these months is about 360 mm. The excess rainfall water will infiltrate into the soil and some of it will be stored in the soil profile, becoming available for use during the six drier summer months when the total deficit amounts to approximately 470 mm. However, sandy soils have a low water holding capacity and therefore much of the excess will be lost to deep drainage.

All these areas consist of an ocean-facing low beach ridge and low flat dunes, separated from the higher ground behind them by low swampy depressions. They have a very shallow ground water table and the ground water will generally be of good quality, but may just be lens of fresh water over saline water. Because the water table is relatively close to the surface, and some water has risen into the soil above by capillary forces, it takes less input of rainwater or other water for the water table to rise quickly.

The lowest parts of these beach ridges adjacent to the swampy depressions may have a water table within 0.5-1 m depth.

It is important that the potential impact of minor rises of sea levels on the level of the groundwater table be considered. Rises of the groundwater table would render the current and future on-site wastewater management less sustainable.

[2] The 90-Percentile annual rainfall is very much less than the sum of the 90-Percentile monthly rainfalls because the chance of having twelve months in succession each with the 90-Percentile high rainfall is vanishingly small. The chance of any one month having a 1 in 10 month high rainfall is 1:10 or 0.1 per definition. This is true for each month in the year. The chance that in one year two months will each have a 1 in 10 high rainfall therefore is 1:100, or 0.01 or 1 in 10^2. Thus for all twelve months in the year to have a 1 in 10 high rainfall is 1 in 10^{12} or 1 in a trillion years.

Table 3.1 Management for vacant allotments

Soil Category	Soil, Geology & Topography	Indicative permeability (Ksat)	Waste water management system	Design Loading rate	Area required for waste water management system
1	Calcareous Dune Sand (Qrd) Deep calcareous sands Gently sloping but irregular topography	> 3 m/day	Absorption trenches & beds Standard 0.5 m wide; unit length 10 m; spacing 2 m + 2 m envelope	Not appropriate due to excessive permeability	n/a
			Evapo-Transpiration Absorption – Seepage Trenches & Beds EPA CA 01.2/3 for annual rainfall 850 mm AS/NZS 1547:2000 Annual rainfall is not a factor for sizing in AS/NZS.	Not appropriate due to excessive permeability	n/a
			Mounds AS/NZS 1547:2000	Not appropriate due to excessive permeability	n/a
			Irrigation Systems AS/NZS 1547:2000 Secondary treated effluent only	Irrig'n area DIR = 2.5 L/m^2.day but preferably less	Disinfection desirable to protect groundwater 1 br: 230 L/day – 120 m^2 2 br: 345 L/day – 153 m^2 3 br: 460 L/day – 185 m^2 4 br: 575 L/day – 217 m^2
			Irrigation Systems MAV Model for Sensitive Sites Secondary treated effluent only		MAV Spreadsheet; Parameters: Crop N Uptake 150 kg/ha; Crop P Uptake 40 kg/ha; P sorption 400 mg/kg soil; Bulk Density 1.5 c/cm^3; Depth of soil allowing for water table 1.0 m

Comments – Soil and other terrain features:

Dune Sand & Dune Limestone Soils (Qrd) - loose, single grain well-sorted highly permeable dune sands, mostly strongly calcareous, with low water holding capacity, prone to wind erosion if vegetative cover is removed.

Mapped as Discovery Bay Land System, Baudin Land Unit, in the Glenelg Hopkins Catchment Regional Soil Health Action Plan.

Table 3.2 Management for existing premises

Soil Category	Soil, Geology & Topography	Indicative permeability (Ksat)	Waste water management system	Design Loading rate	Area required for waste water management system
1	Calcareous Dune Sand (Qrd) Deep calcareous sands Gently sloping but irregular topography	> 3 m/day	Absorption trenches & beds Standard 0.5 m wide; unit length 10 m; spacing 2 m + 2 m envelope	5 mm/day, 35 mm/week	Upgrade by installing an AWTS, and extend trenches to maximum possible, install pressurised dose loading and install water saving appliances, disinfection desirable to protect groundwater
			Evapo-Transpiration Absorption – Seepage Trenches & Beds EPA CA 01.2/3 for annual rainfall 850 mm -------------------- AS/NZS 1547:2000 Annual rainfall is not a factor for sizing in AS/NZS.	Loading Rate as per EPA CA 01.2/3. ------------------ Calculate Water Balance as per AS/NZS Appendix 4.2D for each month and full year.	Upgrade by installing an AWTS, and extend trenches to maximum possible, install pressurised dose loading and install water saving appliances, disinfection desirable to protect groundwater
			Mounds AS/NZS 1547:2000	5 L/m^2.day	Upgrade by installing an AWTS, and extend trenches to maximum possible, install pressurised dose loading and install water saving appliances
			Irrigation Systems AS/NZS 1547:2000 Secondary treated effluent only	Irrig'n area DIR = 2.5 L/m^2.day or less	Extend irrigation area where possible and reduce loading rate; install water saving appliances, disinfection desirable to protect groundwater
			Irrigation Systems MAV Model for Sensitive Sites Secondary treated effluent only		

Comments – Soil and other terrain features:

Dune Sand & Dune Limestone Soils (Qrd) - loose, single grain well-sorted highly permeable dune sands, mostly strongly calcareous, with low water holding capacity, prone to wind erosion if vegetative cover is removed.

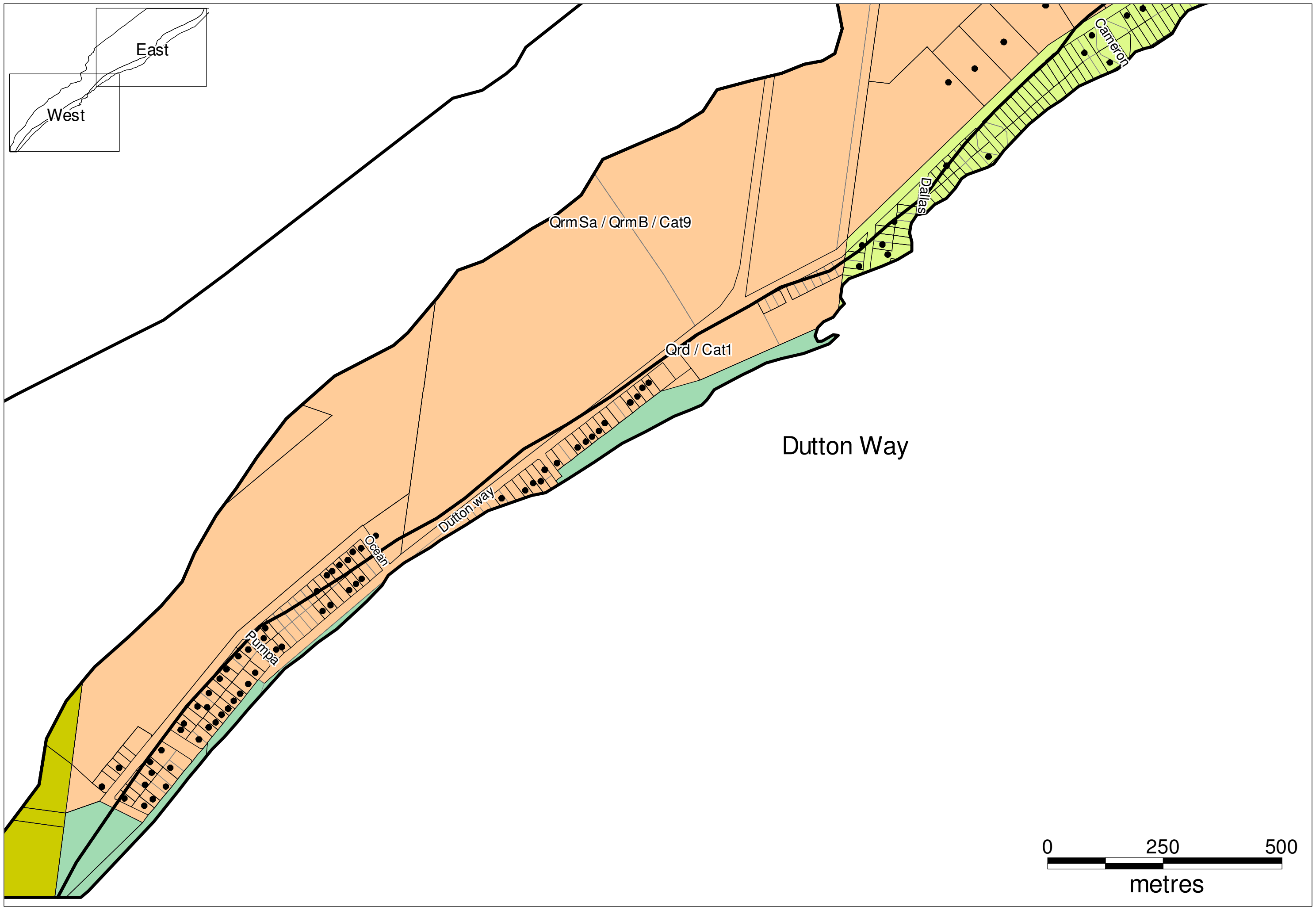
Mapped as Discovery Bay Land System, Baudin Land Unit, in the Glenelg Hopkins Catchment Regional Soil Health Action Plan.

Map 1 (east): Air photo of Allestree / Dutton Way overlaid with our soil interpretation. Soils are Qrd geology and AS/NZS category 1 along the coastline and QrmSa / QrmB inland. The QrmSa / QrmB area is an uncategorized soil in the Standard because it is constrained by a high water table.

Map 1 (west): Caption as above.

Map 2 (east): Planning zones in the area are the Rural Living Zone (RLZ), Public Park and Recreation Zone (PPRZ), Rural Conservation Zone - Schedule 2 (RCZ2) and Special Use Zone - Schedule 3 (SUZ3). Dots represent dwelling locations.[3]

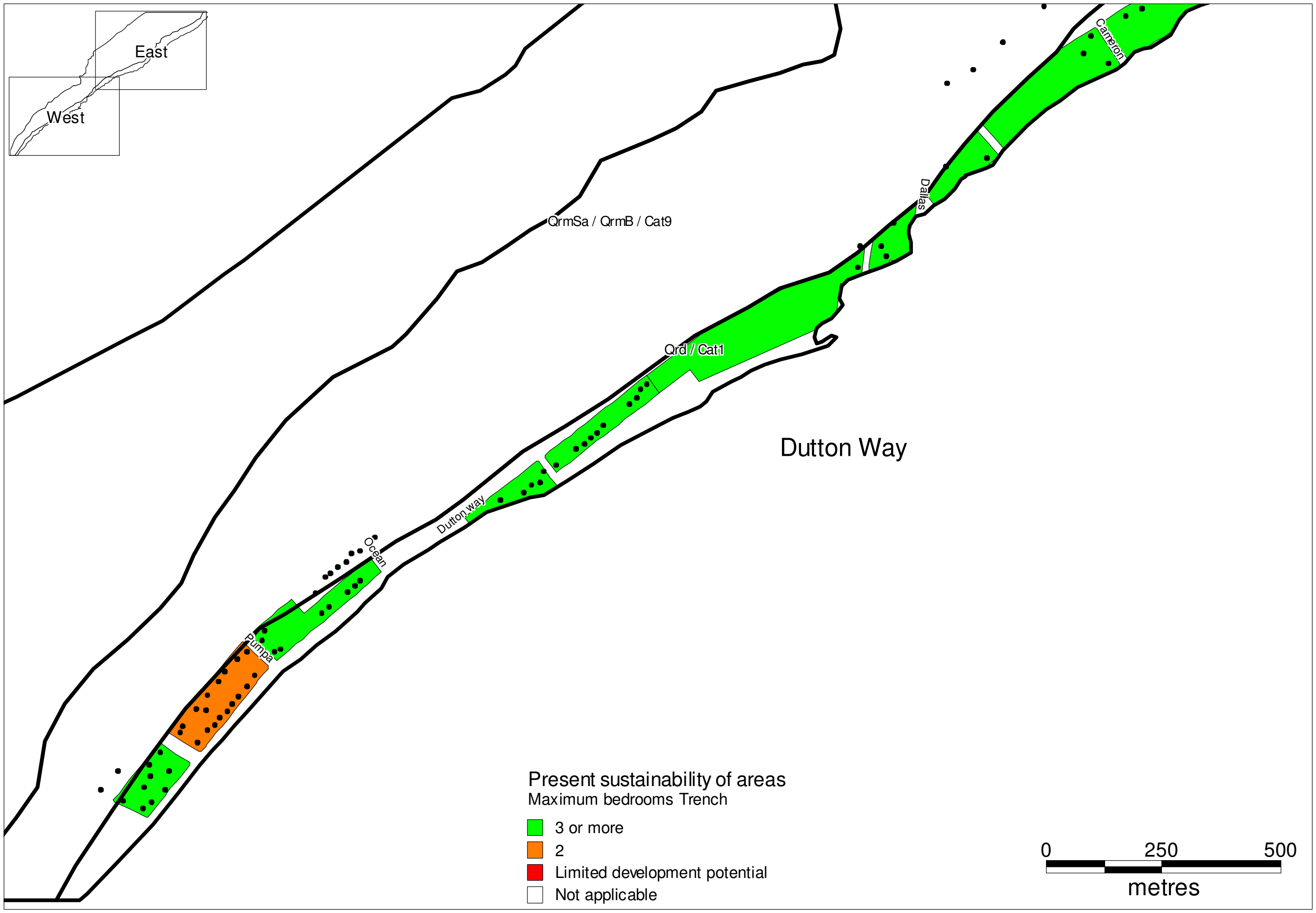
[3] Dwelling locations were digitized from air photography and have not been field validated.



Map 2 (west): Caption as above.

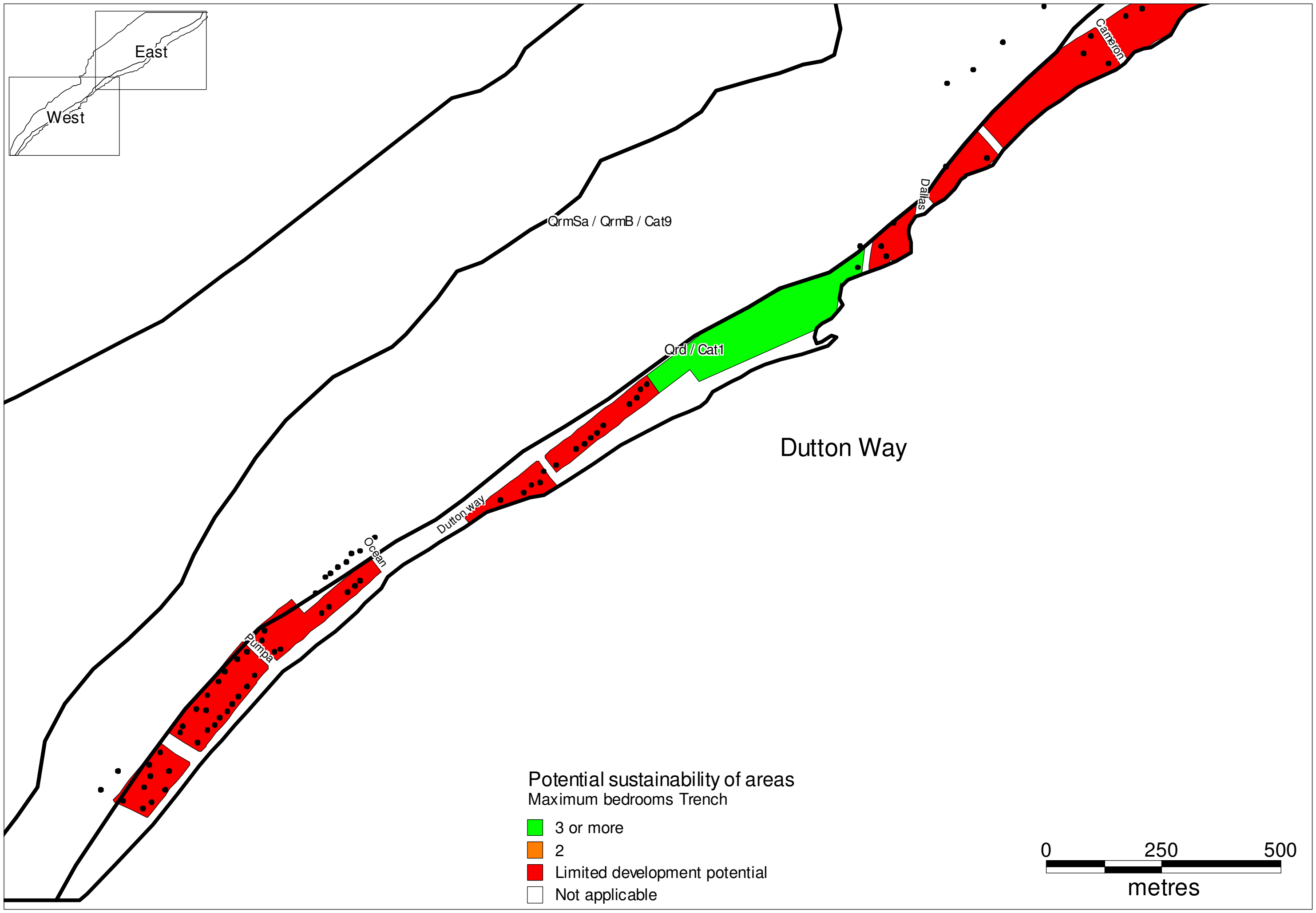
Map 3 (east): Present sustainability of trench systems in areas within a fully developed Allestree and Dutton Way.[4] The map incorporates a reserve field and assumes that each dwelling would use an all-waste system and a dosing pump. It takes into account the absorption field recommendations for AS/NZS category 1 soils in table 6 of the report introduction, and an allowance of 450m^2 for impervious surfaces for each development. The constraints shown in map 6 are not considered. Ignoring impacts on groundwater, most areas on category 1 soils should be performing acceptably. However, it is likely that those areas shaded amber are not. Category 9 soils are constrained due to a high water table. Dots represent dwelling locations.

[4] Areas representative of a wastewater field-of-influence (eg adjoining titles not separated by a road reserve and on the same soil type) form the basis of maps 3 thru 5. Each area was related to the AS/NZS soil category disposal area requirements, and allowing 450m^2 of impervious surfaces for each existing (or potential) development and a reserve area, the average sustainable bedrooms for that area was calculated and mapped.

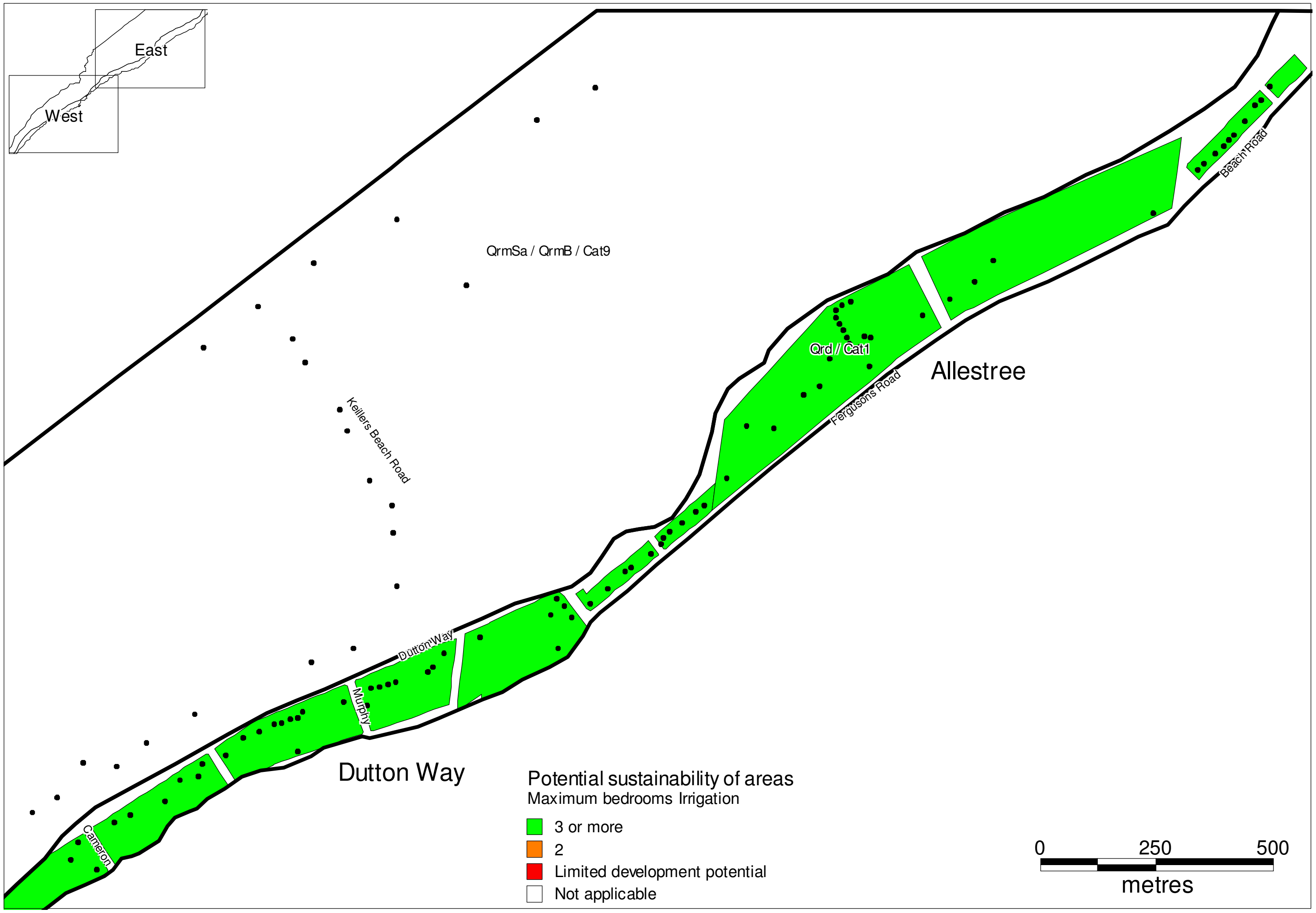


Map 3 (west): Caption as above.

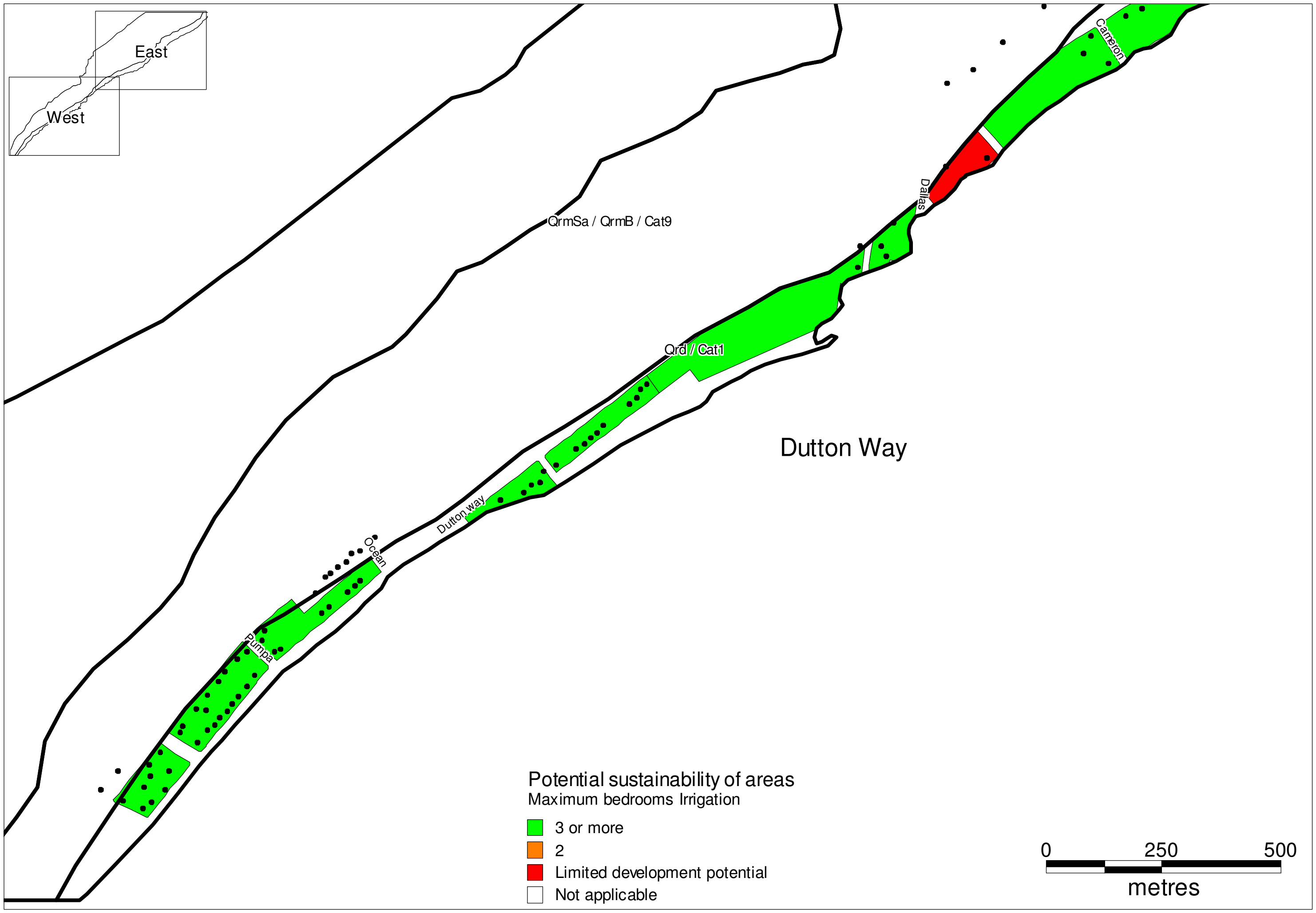
Map 4 (east): Potential sustainability of trench systems for areas in Allestree and Dutton Way. The map assumes that each parcel has a dwelling with an all-waste system and a dosing pump, and does not consider the constraints shown in map 6. Many areas change their status under this scenario. Category 9 soils are constrained due to a high water table. Dots represent dwelling locations.



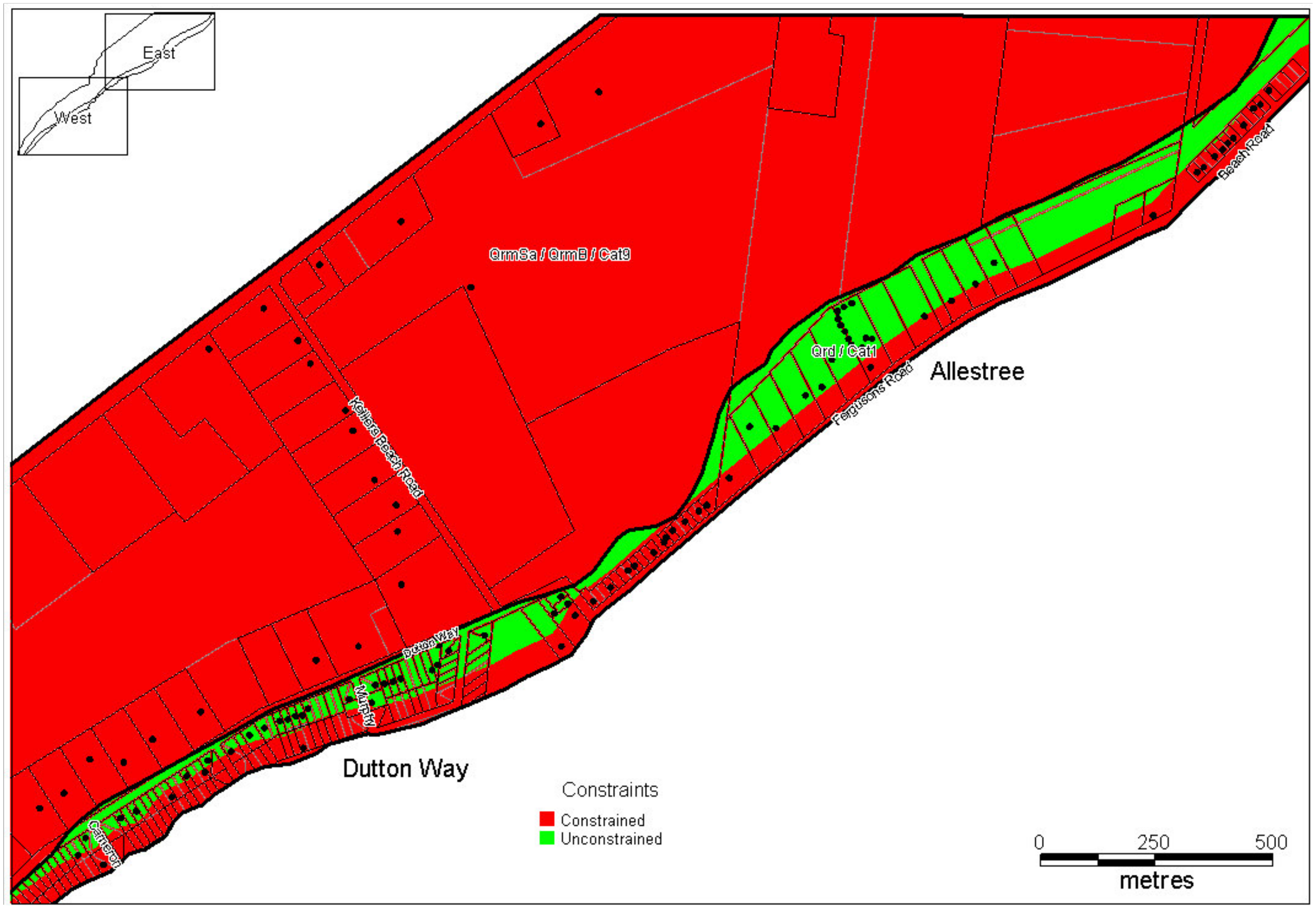
Map 4 (west): Caption as above.



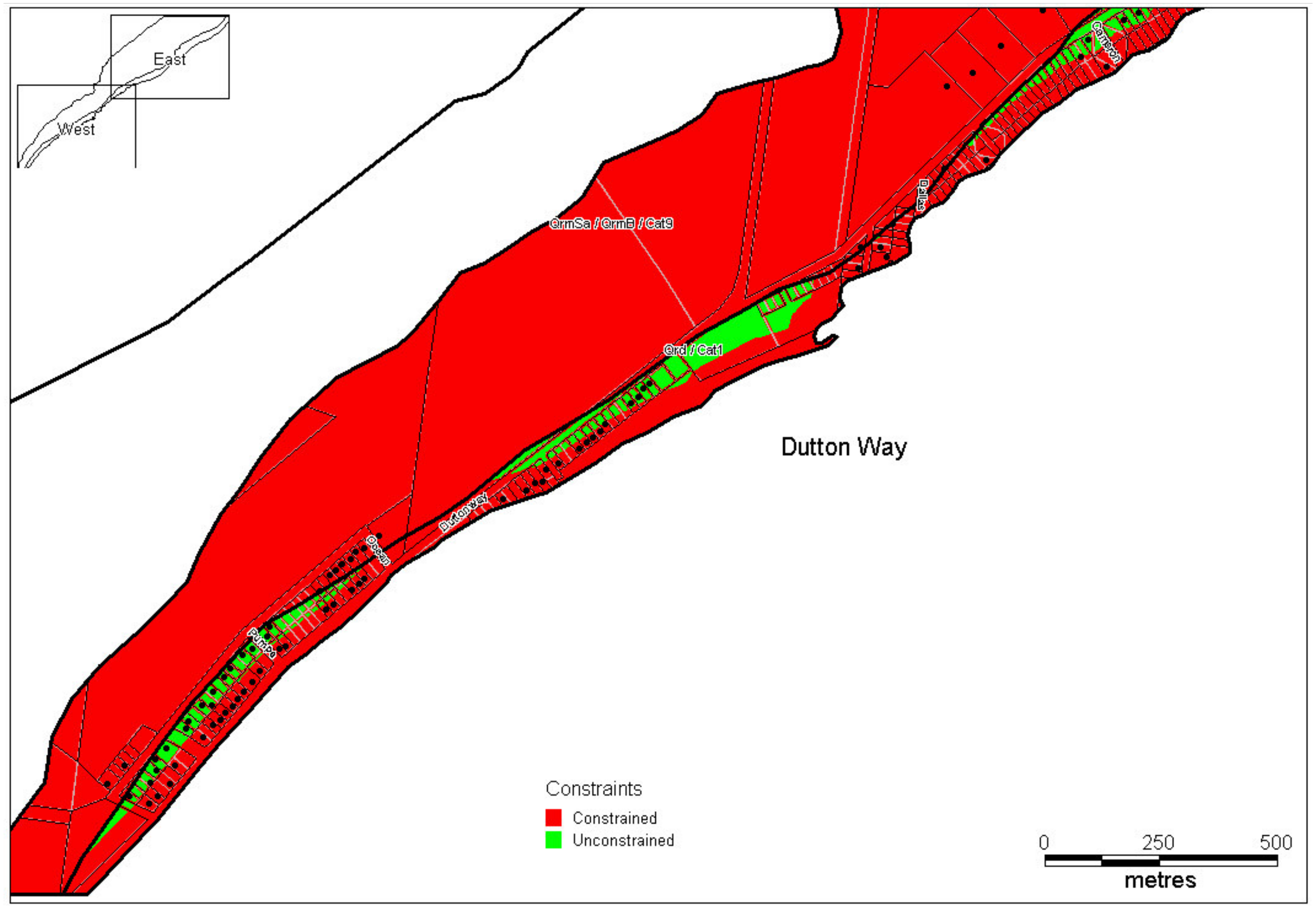
Map 5 (east): If all parcels in Allestree and Dutton Way were to be developed, and all existing and new developments were to use irrigation systems, in the absence of the constraints shown in map 6, and ignoring impacts on groundwater, onsite wastewater systems would not be sustainable in one area. Category 9 soils are constrained due to a high water table. Dots represent dwelling locations.



Map 5 (west): Caption as above.



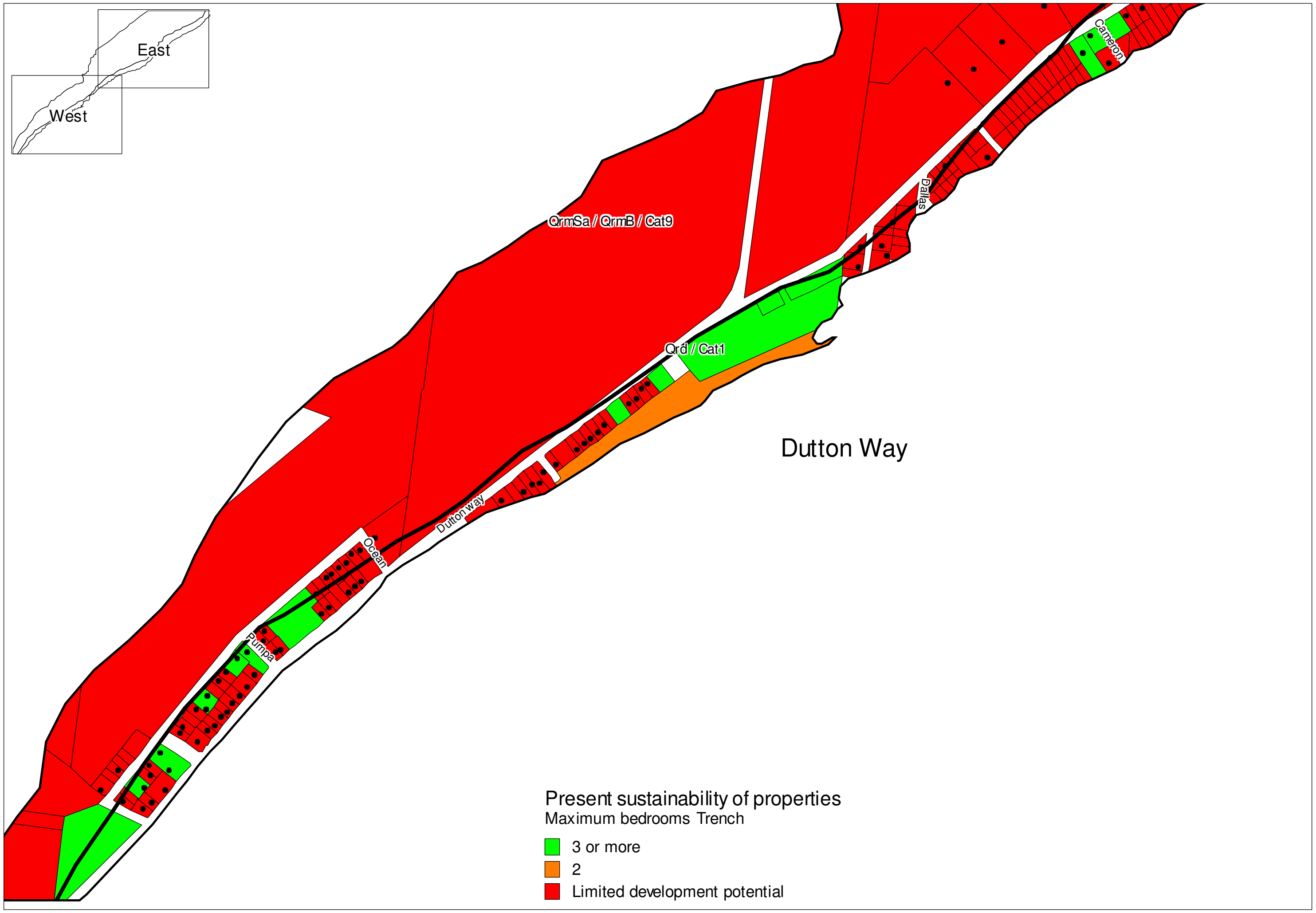
Map 6 (east): Category 9 soils are constrained due to a high water table and the Code prohibits the consideration of land for wastewater absorption fields within 60m of Portland Bay, or within 3 metres of an adjacent allotment for pressurised trench systems (red buffer), or 1.5 metres of an adjacent allotment for irrigation systems (pink buffer). Dots represent dwelling locations.



Map 6 (west): Caption as above.

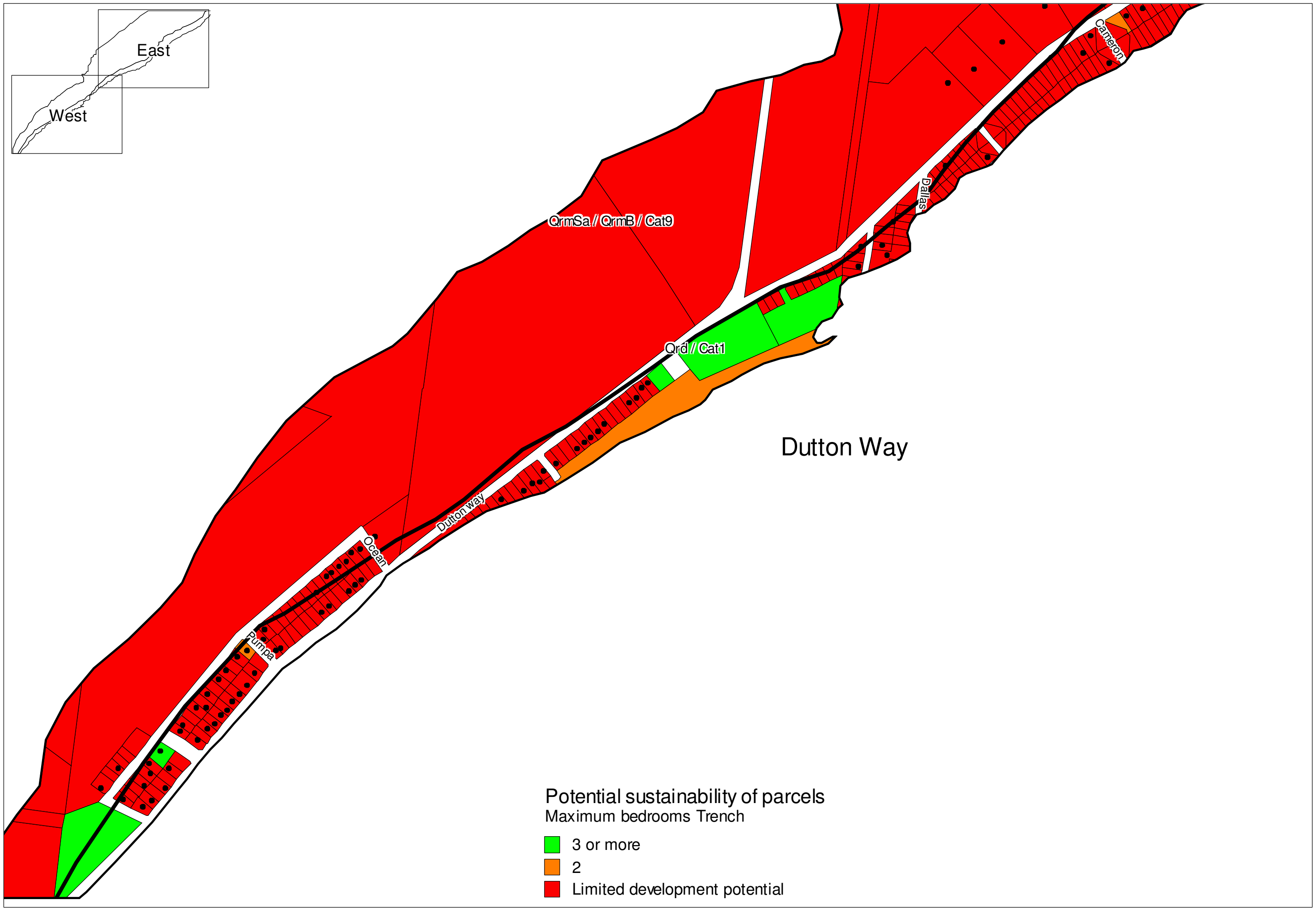
Map 7 (east): Present sustainability for properties using trench systems. The map incorporates a reserve field and assumes that each dwelling would use an all-waste system and a dosing pump. It takes into account the absorption field recommendations for AS/NZS category 1 soils in table 6 of the report introduction, an allowance of 450m^2 for impervious surfaces, and the constraints shown in map 6. It is possible that some blocks shaded green should be red on the basis of a high water table. Most properties are too small to accommodate a trench system and a reserve field suggesting that there are probably already wastewater problems in the town. Dots represent dwelling locations. *

*** In maps 7 thru 10, a block's sustainability reflects the likely size of its wastewater disposal envelope, and is expressed as Maximum Number of Bedrooms.**

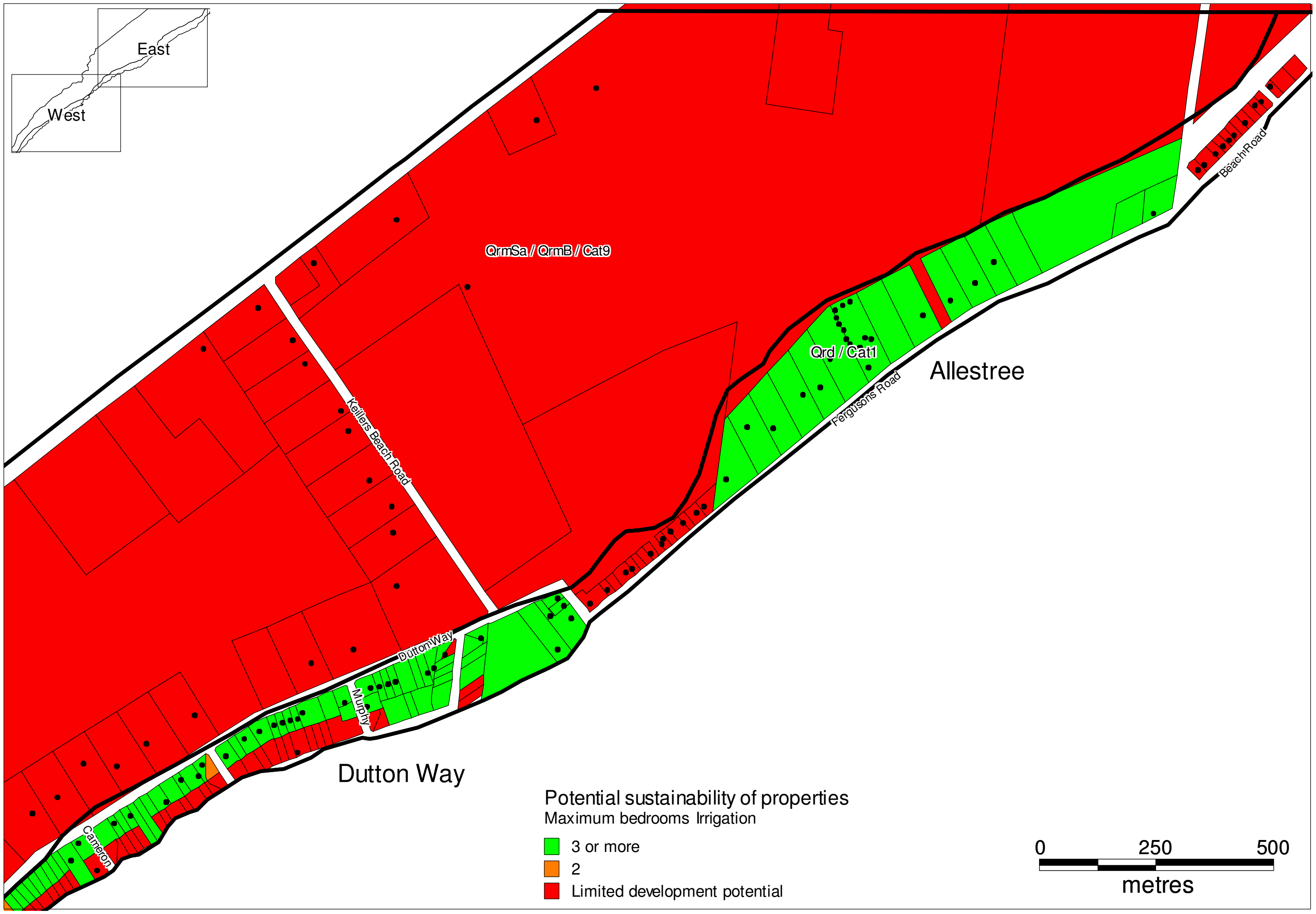


Map 7 (west): Caption as above.

Map 8 (east): Potential sustainability for parcels using trench systems on AS/NZS category 1 soils. The map takes into account the absorption field recommendations for AS/NZS category 1 soils in table 6 of the report introduction, an allowance of 450m^2 for impervious surfaces, and the constraints shown in map 6. The map incorporates a reserve field and assumes that each dwelling would use an all-waste system and a dosing pump. It is possible that some blocks shaded green should be red on the basis of a high water table. This is map of onsite system sustainability should each parcel be developed and indicates that severe problems might emerge Allestree and Dutton Way were to be fully developed using traditional trench technologies. Dots represent dwelling locations.



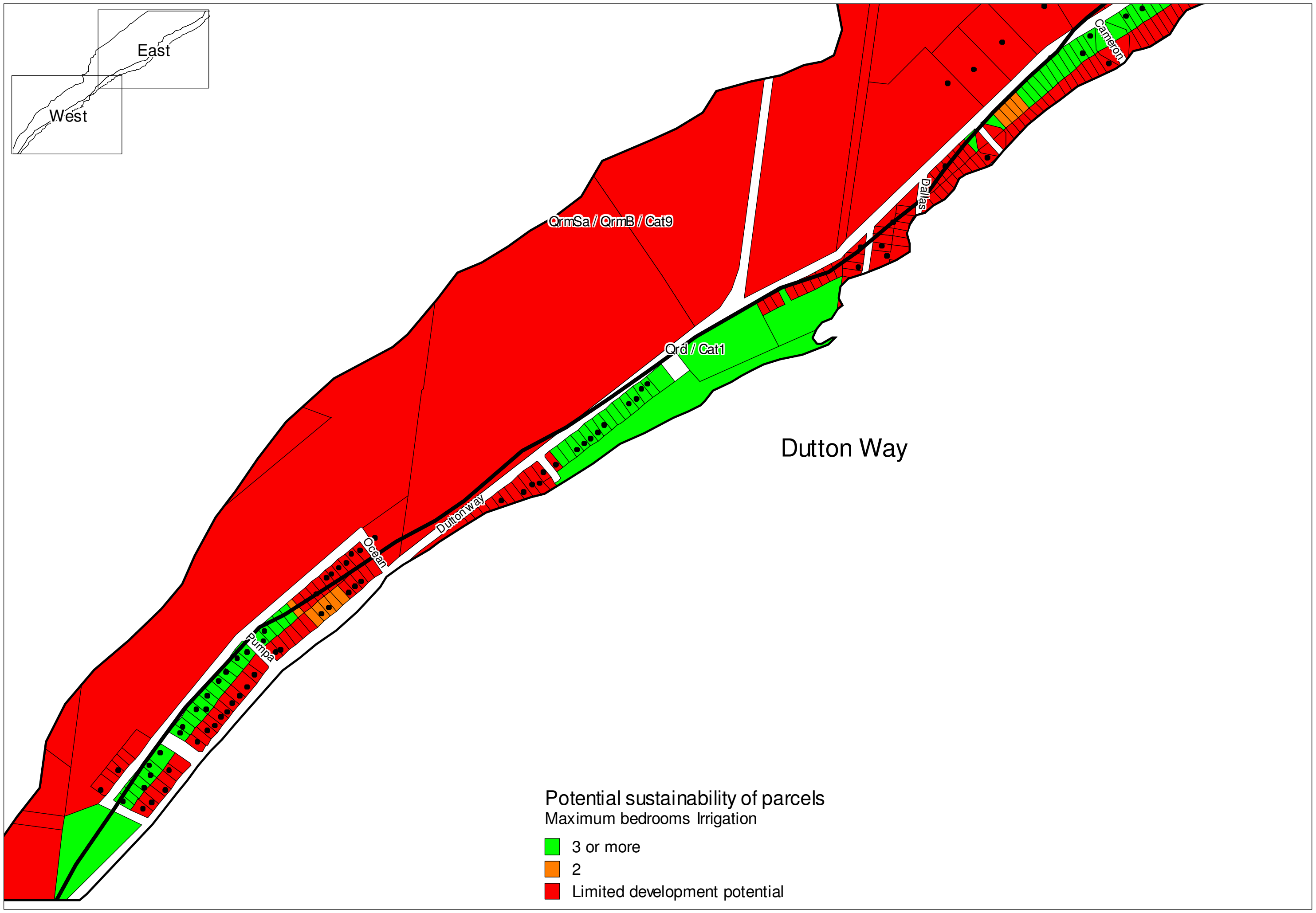
Map 8 (west): Caption as above.



Map 9 (east): Potential sustainability for properties using irrigation systems. The map takes into account the absorption field recommendations for AS/NZS category 1 soils in table 3, an allowance of 450m^2 for impervious surfaces, and the constraints shown in map 6. Even if upgraded to irrigation systems, clusters of developed properties would remain constrained. It is possible that some blocks shaded green should be red on the basis of a high water table. Dots represent dwelling locations.

Map 9 (west): Caption as above.

Map 10 (east): Potential sustainability for parcels using irrigation systems. The map takes into account the absorption field recommendations in for AS/NZS category 1 soils in table 3, an allowance of 450m^2 for impervious surfaces and constraints in map 6. It is possible that some blocks shaded green should be red on the basis of a high water table. Dots represent dwelling locations.



Map 10 (west): Caption as above.