MASTER BUILDERS QUEENSLAND

Addendum to
Review of the Queensland Development Code MP 4.2 Water Saving Targets

Submission to
The Department of Infrastructure and Planning

ABN 96 641 989 386

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Introduction

Master Builders is Queensland's premier building and construction representative organisation. Master Builders represent over 11,000 businesses within the Industry, including builders, subcontractors, supplier / manufacturers, certifiers, consultants and students.

Due to the depth and scope of Master Builders' members spanning the spectrum of the building and construction industry (including development) we are able to offer a unique perspective on all facets of the operation and effectiveness of the Queensland Development Code MP 4.2 Water Savings Targets (The Code) together with recommendations for its improvement.

In this submission Master Builders comments on the modelling used to determine water savings targets and the acceptable solutions to meet those targets.

In summary, we believe the water savings targets have not been correctly determined, are generally greater than expected consumption and are backed by acceptable solutions that are prescriptive and not designed to meet the water savings targets.

Our view is that no minimum tank sizes or catchment areas be set, rather that a range of acceptable solutions be allowed that are consistent with the achievement of water savings targets based on local rainfall conditions. This would be consistent with the intention of the regulation being performance based and incentivising innovation in the delivery of acceptable solutions.

1.1 Background to this review

Master Builders provided a Submission to the Department of Infrastructure and Planning on the Review of the Queensland Development Code MP4.2 Water Savings Targets. Following that submission, Building Codes Queensland ("BCQ") provided responses to Master Builders' recommendations including rejections, acceptances and requests for further information.

Two of our recommendations (11 and 15) referred to the water savings targets and acceptable solutions for achieving those targets and are replicated as follows with the response provided.

Recommendation 11
Part A2 of the QDC is amended to include reference to a new acceptable solution for increased roof collection area.

Recommendation 15
The Department of Infrastructure and Planning in collaboration with industry stakeholders review the water savings targets under the QDC and re-establish the rationale for the levels that have been imposed upon the residential sector.

Response:
Extensive modelling was undertaken by the Department of Environment and Resource Management (formerly Department of Natural Resource and Water) prior to the implementation of QDC part 4.2.

This modelling was undertaken to determine the appropriate tank size, required roof catchment area as well as the water saving target for each local government area within Queensland. Local government areas were grouped into 7 different bands depending on climatic conditions and local rainfall statistical data to determine the water saving target.

The department welcomes any modelling available that may demonstrate that the current requirements need to be reviewed.

1.2 MBA Methodology

1.2.1 Rainfall by Local Government Authority ("LGA")

MBA undertook to collect from the Bureau of Meteorology average annual rainfall data for each LGA. Clearly , a very large volume of rainfall data exists from multiple collection points so we have limited our analysis to rainfall data for the town or city that forms the council seat for the LGA, where that information is available, or an alternative town or collection point where necessary.

While some LGAs have substantial land area which may make this methodology not reflective of the LGA area as a whole (particularly for LGAs that have a diversity of rainfall), it nonetheless is appropriate where possible to use more densely urbanized areas given these areas are representative of where new developments and proscribed water tanks will be installed.

Our source of BOM data was Climate Data Online[1] which for each rainfall site had various time series of data available with many over 100 years but some with a shorter and more recent time series or in some cases data from sites that are now closed.

Data collected is shown in Appendix 1 and summarized by average rainfall by the grouping used in the QDC MP4.2 as in the below.

MP4.2 Group	Average Rainfall (mm)	Water Saving Target (litres)	Harvest (litres)	Savings %
1	300.20	16000	30020	53.3%
2	686.48	24000	68648	35.0%
3	618.20	36000	61820	58.2%
4	1663.48	44000	166348	26.5%
5	906.42	51000	90642	56.3%
6	1167.17	59000	116717	50.5%
7	1046.20	70000	104620	66.9%

The water savings target shown in [table x] above are those in MP4.2 by the grouping applied. The column showing 'harvest (litres)' is the potential annual rainfall harvest based on a 100m^2 collection area, assuming all water is available to harvest and none is lost to soaking the roof or by other means. The 'savings %' column shows the percentage of potential harvest that is intended to be saved as a result of the water savings target for that group.

There are a number of observations with this data at the summary level, in particular:

- there is not a consistent increase in average rainfall between groups. Notably Group 7 has lower average rainfall than Group 6 and even Group 4;
- the water savings targets, when expressed as a percentage of the available harvest, have even greater variation from 26.5% to 66.9%

Group 1 with the lowest rainfall average of 300mm (and thus potential harvest over 100m2 of 30,000 litres) has a required savings target of 53.3% of available harvest while the highest average rainfall group (Group 4) has a savings target of 26.5% of potential harvest.

On correlating the average rainfall and water savings targets across groups, we find a relatively low correlation between potential harvest (or rainfall) and the water savings target of 62%; not surprising given our comments above.

Assessment of individual LGA's within their respective group throws further light on the analysis. Group 4, for example, contains Innisfail, the town in the data set with the highest average annual rainfall of 3568mm, and Emerald with average annual rainfall of only 535.5mm. Group 4 thus has a standard deviation of 1137mm, whereas Group 1 has a standard deviation of only 100mm.

In summary, there is significant variation within some groupings (represented by the standard deviation) that suggest not all of the groupings are alike within group. That is, the assignment of LGAs to a particular group appears erroneous. Further, the methodology applied to select water savings targets by Group appears unrelated to the available rainfall harvest.

[1] http://www.bom.gov.au/climate/averages/#climatemaps. Accessed June 2009

1.1.1 Water usage from water tanks

While Master Builders has noted that the methodology for determining water savings by LGA group may have been incorrectly applied, and that the water savings as a proportion of potential rainfall harvest appear also to not be applied correctly, we have further commentary on the "right sizing" of water tanks and collection areas.

The appropriate sizing for a mandated water tank should be related primarily to the volume of usage to which the harvested water can be applied. Clearly, water tanks with plumbing to toilets and washing machine can be used for flushing and clothes cleaning as well as any number of outdoor uses including pool-filling, irrigation and car-washing.

However, the Queensland Development Code MP4.2 has not been developed for the primary purpose of saving water used outside of the home, and nor should it since the Queensland Water Commission ("QWC") and LGAs set rules (and fines) for how water is to be used outdoors. To include water consumption for outdoors use within the water savings targets would result in double-dip regulation; namely the same usage would be regulated both by water savings targets in the QDC and by LGA or QWC regulation. Instead the QDC MP4.2 concerns itself primarily with connecting to toilet cisterns and washing machines.

Clearly, water usage, by type of use, is the least prescriptive inside the home where it cannot be directly observed but is considerably much more prescriptive on type of use outside the home. The QWC and LGAs typically include specific use restrictions in relation to car-washing, plant and lawn watering, house surface and driveway cleaning and topping up of pools. Internal consumption is typically advisory on timing of showers, filling of dishwashers, installation of efficient shower heads, cisterns or washing machines.

In determining water usage from plumbed-in water tanks, the most relevant use is therefore for purposes within the home as available for use as a result of MP4.2; namely only for cistern and washing machine usage.

Estimating water usage

Master Builders has attempted to make some estimates of water usage from cisterns and washing machines in order to inform the debate about required water savings targets and acceptable solutions. We understand that other bodies with greater access to such data may have alternate views.

Our estimates are therefore intended to be a representation, as opposed to based on observation, not least because any data on water usage necessarily depends in part on water availability. That is, areas with abundant supply will tend to consume more water and areas that are, or have been, under severe water restrictions will tend to be more efficient. In South East Queensland, for example average consumption per person per day remains below 140 litres even though the daily target has now increased to 200 litres per day and the combined Wivenhoe dam levels are above 75%.

On the assumption of heavy load washing machine use of five washes per week, but efficient water use of 50 litres per load we assume a total of 13,000 litres used per annum for washing purposes. For toilet flushing we have assumed ten flushes per dwelling per day at six litres per flush and therefore 21,900 litres per annum. In total, based on our assumptions, some 35,000 litres per annum could be consumed from cisterns and washing machines connected to water tanks.

Of course, this usage could be considerably lower with greater water efficiency. We note, however, that on our relatively high numbers of 35,000 litres, water usage is below the intended water savings for Group 7 (70,000 litres) through to Group 3 (36,000 litres).

Given that these groups represent the majority of the dwelling in the state then we are concerned that the water savings targets themselves may not be achievable and are thus too high.

Clearly dwellings could of course consume more water than that described above, including for other purposes. The intention of the water savings target, and its acceptable solutions, is of course to save water that would otherwise be consumed from reticulated supplies.

1.1.2 Modelling the required tank size

Again assuming water usage of 35,000 litres per annum then some 2,916 litres would be consumed each month. That rate of consumption implies that the same would need to be harvested across a month. Of course, that does not imply a required tank size of 3,000 litres. Assuming consumption is constant across the month at roughly 100 litres per day then only 100 litres needs to be available in the tank each day.

However, rainfall does not tend to fall consistently and there is significant variation in monthly average rainfalls. A tank, where mandated, needs to be of sufficient scale to store water for usage in periods when rainfall is insufficient to meet usage.

Modelling tank size

Master Builders tested for the effect of changing tank size in Brisbane using average monthly rainfalls and retaining the assumption of use of 3000 litres per month for cistern and washing machine. For the purpose of initial modelling, it is assumed that tank water is only used for these purposes, that the catchment area remains at 100m2 and that the tank can only be refilled to a maximum of the tank size (i.e. not all rainfall can necessarily be harvested).

To illustrate some of the issues in greater detail, we have provided below some modelling based on Brisbane rainfall and the towns with the lowest average rainfall (Boulia) and highest (Innisfail).

Brisbane

Based on the above assumptions and a tank size of 5000 litres, we find, not surprisingly, that not all rain can be harvested, with rainfall across the 100m^2 catchment area collecting as much as 12,280 litres (in May) but a maximum tank capacity available of 5000 litres. Even in the lowest average rainfall month of July, with 29.96mm of rainfall, there is a potential harvest of 2,996 litres (over the 100m^2 catchment) which is marginally below the 3000 litre consumption assumed.

BRISBANE	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Avg rainfall (mm)	118.9	121.6	76.1	63.5	122.8	72.5	29.9	40.1	36	68.1	111.5	120	**981**
Tank Level (A)	5000	5000	5000	5000	5000	5000	5000	4990	5000	5000	5000	5000	**NA**
Consumption (litres)	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	**36000**
Tank Level (B)	2000	2000	2000	2000	2000	2000	2000	1990	2000	2000	2000	2000	**NA**
Potential Harvest (litres)	11890	12160	7610	6350	12280	7250	2990	4010	3600	6810	11150	12000	**98100**
Actual harvest (litres) (A-B)	3000	3000	3000	3000	3000	3000	2990	3010	3000	3000	3000	3000	**36000**
Tank Level (C)	5000	5000	5000	5000	5000	5000	4990	5000	5000	5000	5000	5000	**NA**
Reticulated consumption (litres)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Tank Size (litres)	**5000**												
Catchment area (m2)	**100**												
Rainfall data source:	http://www.bom.gov.au/climate/averages/tables/cw_040842.shtml												

Adjusting the tank size to 3000 litres (as shown below), and retaining all other variables, including the 100m^2 catchment area, causes 10 litres of reticulated water to be consumed in July reducing the annual water savings from 36,000 litres to 35,990 litres.

BRISBANE	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Avg rainfall (mm)	118.9	121.6	76.1	63.5	122.8	72.5	29.9	40.1	36	68.1	111.5	120	**981**
Tank Level (A)	3000	3000	3000	3000	3000	3000	3000	2990	3000	3000	3000	3000	**NA**
Consumption (litres)	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	**36000**
Tank Level (B)	0	0	0	0	0	0	0	0	0	0	0	0	**NA**
Potential Harvest (litres)	11890	12160	7610	6350	12280	7250	2990	4010	3600	6810	11150	12000	**98100**
Actual harvest (litres) (A-B)	3000	3000	3000	3000	3000	3000	2990	3000	3000	3000	3000	3000	**35990**
Tank Level (C)	3000	3000	3000	3000	3000	3000	2990	3000	3000	3000	3000	3000	**NA**
Reticulated consumption (litres)	0	0	0	0	0	0	10	0	0	0	0	0	**10**
Tank Size (litres)	**3000**												
Catchment area (m2)	**100**												

Boulia

Boulia, in the Cassowary Coast LGA has the lowest average rainfall of only 262mm per annum. Of course, with a 100m^2 catchment area this is sufficient to potentially harvest 26,260 litres and the current savings target set by QDC MP4.2 is only 16,000 litres.

BOULIA	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Avg rainfall (mm)	48.6	50.7	35.4	13.9	13.1	10.5	9.4	6.4	6.9	14.9	21.3	31.5	**262**
Tank Level (A)	5000	5000	5000	5000	5000	4977	4693	4300	3607	2963	3120	3917	**NA**
Consumption (litres)	1333	1333	1333	1333	1333	1333	1333	1333	1333	1333	1333	1333	**16000**
Tank Level (B)	3667	3667	3667	3667	3667	3643	3360	2967	2273	1630	1787	2583	**NA**
Potential Harvest (litres)	4860	5070	3540	1390	1310	1050	940	640	690	1490	2130	3150	**26260**
Actual harvest (litres) (A-B)	1333	1333	1333	1333	1310	1050	940	640	690	1490	2130	2417	**16000**
Tank Level (C)	5000	5000	5000	5000	4977	4693	4300	3607	2963	3120	3917	5000	**NA**
Reticulated consumption (litres)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Tank Size (litres)	**5000**												
Catchment area (m2)	**100**												
Rainfall data source:	http://www.bom.gov.au/climate/averages/tables/cw_038003.shtml												

Based on Boulia's monthly rainfall and assuming usage consistent with meeting the savings target of 16,000 litres (i.e. some 1,333 litres per month) we found that a tank size of 3370 litres would be sufficient. We found that by doubling the catchment to 200m^2, a tank size of 1400 litres would be sufficient to meet the savings of 16,000 litres.

Innisfail

In Innisfail, with annual rainfall of 3568mm, 356,000 litres can be harvested over 100m^2. Of course not all of this can be collected by a 5000 litre tank. However, the Group 4 water savings target only requires 44,000 litres to be saved, or 3,667 litres per month. Even though this is higher than we believe would be used for washing and cistern use (3000 litres a month), to achieve it in Innisfail, with a collection area of 100m^2 requires a tank size of 3,667 litres at a maximum.

INNISFAIL	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Avg rainfall (mm)	509.2	599.8	660.7	459.3	302.2	189.3	135.3	118	85.4	83.1	154.9	264.9	**3562.3**
Tank Level (A)	3667	3667	3667	3667	3667	3667	3667	3667	3667	3667	3667	3667	**NA**
Consumption (litres)	3667	3667	3667	3667	3667	3667	3667	3667	3667	3667	3667	3667	**44000**
Tank Level (B)	0	0	0	0	0	0	0	0	0	0	0	0	**NA**
Potential Harvest (litres)	101840	59980	66070	45930	30220	18930	13530	11820	8540	8310	15490	26490	**407150**
Actual harvest (litres) (A-B)	3667	3667	3667	3667	3667	3667	3667	3667	3667	3667	3667	3667	**44000**
Tank Level (C)	3667	3667	3667	3667	3667	3667	3667	3667	3667	3667	3667	3667	**NA**
Reticulated consumption (litres)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Tank Size (litres)	**3667**												
Catchment area (m2)	**100**												
Rainfall data source:	http://www.bom.gov.au/climate/averages/tables/cw_032025.shtml												

In summary, significant variations occur on a locational level in the suitable size of a water tank and its collection area. Even in Boulia a tank size of 1400 litres would be sufficient to achieve current water savings targets of 16,000 litres with a 200m^2 catchment area. Clearly, one size does not fit all.

1.3 Conclusions

The allocation of LGAs to particular Groups as used to apply water savings targets does not appear to be on the basis of rainfall received in those LGAs.

There is inconsistency between the actual average rainfall received by each Group and the water savings targets applied with some Groups required to save only 26% of the potential rainfall harvest and others as high as 67%.

When applied, many of the Group water savings targets appear to be higher than what could be reasonable consumption for the purpose of washing machine and cistern use. Master Builders estimate a maximum usage of 36,000 litres per annum or 3,000 litres per month, yet Groups 3, 4, 5, 6 and 7 have water savings targets in excess of that.

The selection of a 5000 litre tank size and 100m^2 catchment area appear to be arbitrary and not consistent with the water savings targets that they are intended to meet. Even in Boulia, with

the lowest average rainfall, a tank size of 3,667 litres would be sufficient to meet the target and the target could be met with a 1,400 litre tank if the catchment were increased.

Based on the analysis presented, Master Builders stands by its original recommendations to review the data on which water savings targets are based and to remove minimum tank size and catchment areas to allow acceptable solutions that meet local requirements throughout Queensland.

Appendix 1

LGA	BOM Climate data site	Rainfall (mm)	QDC MP4.2 LGA Group		
BARCOO	Windorah	289.5	1	300.20	Average (mm)
BOULIA	Boulia	262	1	101.02	STD (mm)
DIAMANTINA	Birdsville	167.2	1		
LONGREACH	Longreach	441.2	1		
QUILPIE	Quilpie	341.1	1		
BARCALDINE	Barcaldine	497.7	2	686.48	Average (mm)
BULLOO	Thargomindah	285.7	2	377.19	STD (mm)
BURKE	Burketown	785.2	2		
CARPENTARIA	Normanton	921.7	2		
CHARTERS TOWERS	Charters Towers	660.6	2		
CLONCURRY	Cloncurry	532.1	2		
COOK	Cooktown	1675	2		
CROYDON	Croydon	739.9	2		
ETHERIDGE	Georgetown	824.3	2		
FLINDERS	Hughenden	492.4	2		
McKINLAY	Julia Creek	458.8	2		
MOUNT ISA	Mount Isa	458.7	2		
PAROO	Cunnamulla	373.6	2		
RICHMOND	Richmond	477.9	2		
TABLELANDS	Atherton	1387.5	2		
WINTON	Winton	412.6	2		
BALONNE	St. George	516.8	3	618.20	Average (mm)
BLACKALL-TAMBO	Blackall	527.5	3	140.29	STD (mm)
ISAAC	Moranbah	596.4	3		
MURWEH	Charleville	487.5	3		
ROCKHAMPTON	Rockhampton	798.2	3		
ROMA	Roma	566.2	3		
WHITSUNDAY	Bowen	834.8	3		
BANANA	Biloela	663.1	4	1663.48	Average (mm)
CAIRNS	Cairns	2010.1	4	1137.15	STD (mm)
CASSOWARY COAST	Innisfail	3568.1	4		
CENTRAL HIGHLANDS	Emerald	535.5	4		
HINCHINBROOK	Ingham	2069.6	4		
TOWNSVILLE	Townsville	1134.5	4		
BUNDABERG	Bundaberg	1007	5	906.42	Average (mm)
DALBY	Dalby	615.3	5	442.69	STD (mm)
GOONDIWINDI	Goondiwindi	602.8	5		
NORTH BURNETT	Gayndah	762.7	5		
SOUTHERN DOWNS	Warwick	692.1	5		
TORRES	Thursday Island	1758.6	5		
BURDEKIN	Burdekin Shire Council	1045.3	6	1167.17	Average (mm)
GLADSTONE	Gladstone	878.7	6	364.99	STD (mm)
MACKAY	Mackay	1577.5	6		

BRISBANE	Brisbane	978.7	7	1046.20	Average (mm)
FRASER COAST	Maryborough	1151.6	7	230.81	STD (mm)
GOLD COAST	Staplton	1238	7		
GYMPIE	Gympie	1126.3	7		
IPSWICH	Ipswich	876.6	7		
LOCKYER VALLEY	Gatton	770.9	7		
LOGAN	Logan Central	1063.8	7		
MORETON BAY	Redcliffe Council	1064.1	7		
REDLAND	Dunwich PO	1065.1	7		
SCENIC RIM	Beaudesert	905.5	7		
SOMERSET	Somerset Dam	990	7		
SOUTH BURNETT	Kingaroy	776.4	7		
SUNSHINE COAST	Tewantin	1695.8	7		
TOOWOOMBA	Toowoomba	944	7		