Response to the RWS presentation held in South Grafton 08-06-2022

Or why a Dam on the Clarence River at The Gorge is essential for the long-term prosperity of the Clarence Floodplain.

John Ibbotson 16-06-2022

Response the RWS presentation held in South Grafton 8-06-2022

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16-06-2022

Introduction:

Firstly, thank you for providing the opportunity to comment on the latest RWS report. It was an excellent presentation, but it seemed to be more relevant to west of the ranges, than the coastal Clarence.

Unfortunately, and unlike the 2021meeting, only a few locals were present. I received an email, probably because I made a submission in 2021, but that was the only indication I had that it was on.

These comments are broken into:

The real problem, which needs to be addressed in the north coast in general, which is flood mitigation.

Comments that using modelling as a biased basis for predicting our future climate, rising sea levels is overall misleading and incorrect. (The validity of modelling depends largely on the assumptions fed in.)

But firstly, the RWS Objectives – the basis of my reply. They are listed to show that flood prone communities have been ignored, often by trivialities.

From the Draft Regional Water Strategy North Coast Consultation Paper:

The NSW Government is committed to managing our state's water, improving water security and better preparing our communities ***for future droughts****. Our towns, industries, and natural and cultural assets all rely on water, and the way we manage it deeply affects the lives and livelihoods of the people of NSW.*

Priority 1: Take a holistic approach to land and water management

- Action 1.1: Develop ongoing collaboration with local Aboriginal people in water management
- Action 1.2: Support place-based initiatives to deliver cultural outcomes for Aboriginal people
- Action 1.3: Support improved governance
- Action 1.4: Deliver a river recovery program
- Action 1.5: Support landholder adoption of best practice land management
- Action 1.6: Assess the vulnerability of surface water supplies to sea level rise and saltwater intrusion
- Action 1.7: Identify environmental water needs to support healthy coastal waterways
- Action 1.8: Characterise and plan for climate change and land use impacts on coastal groundwater sources
- Action 1.9: Protect ecosystems that depend on coastal groundwater
- Action 1.10: Improve monitoring of water extraction

Priority 2: Ensure water resource development and use is sustainable and equitable

- Action 2.1: Improve fish passage
- Action 2.2: Implement fish-friendly water extraction
- Action 2.3: Establish sustainable extraction limits for surface water and groundwater sources
- Action 2.4: Implement daily extraction limits
- Action 2.5: Reduce the take of low flows
- Action 2.6: Support Aboriginal business opportunities
- Action 2.7: Address catchment-based impacts of increased harvestable rights limits

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Priority 3: Prepare for future climatic extremes

- Action 3.1: Support local councils to provide a secure and affordable water supply for towns
  (*as long as it doesn't include taking any new water from the rivers*).
- Action 3.2: Provide better information about water access, availability and climate risks
- Action 3.3: Review water markets
- Action 3.4: Investigate increased on-farm water storage
- Action 3.5: Increase use of recycled water for intensive horticulture
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Yet for the 3,900GL +/-, which passes by Grafton in a typical year, most of it flows out to sea, with only 30GL (1/130) being stored for human consumption, plus some farm pumping.

Even so, droughts are not the main problem for the Clarence Catchment, it's floods.

That is the real problem, which needs to be addressed in the Clarence (and Richmond), catchments.

For example, for the week 25/2/22 -03/3/22 the volume of flood water, which passed through Grafton from the Orara and Clarence was, 3,906GL, which is about a normal year's total for the Clarence!

1										
2	25/02 - 03/03/22	3-Mar-22	2-Mar-22	1-Mar-22	28-Feb-22	27-Feb-22	26-Feb-22	25-Feb-22	Dayly Av	Weekly
3		Flow (ML)	Flow (ML)	Flow (ML)	Flow (ML)	Flow (ML)	Flow (ML)	Flow (ML)		Total
4	Clarence River Lilydale	186,287	340,177	980,626	653,468	311,114	282,905	384,511	448,441	3,139,088
5	Orara R Bawden Bridge	113,035	163,926	176,611	115,420	81,861	66,107	50,681	109,663	767,641
6									0	0
7		299,322	504,103	1,157,237	768,888	392,975	349,012	435,192	558,104	3,906,729
8									0	0
9	Number of Shannon Creek Dams	10	17	39	26	13	12	15	19	130
10	Number of Olympic Swimming Pools which hold 2.5ML	119,729	201,641	462,895	307,555	157,190	139,605	174,077	223,242	1,562,692

Table I Flood flows through Grafton during the Feb-Mar 2022 flood

This was the largest, but big deluges and floods are quite common.

So how significant are the day by day flow variations during an average year?

Based on the combined weekly flows over 313 weeks of flow data, for the Clarence at Lilydale and the Orara at Bowden Bridge:

The flow of the top 5% of the weeks contributed 60% of the total volume

The flow of the top 10% of the weeks contributed 74% of the total volume

The flow of the top 50% of the weeks contributed 96% of the total volume

The flow of the bottom 50% of the weeks contributed 4% of the total volume

Also taking the flow for the bottom 5 weeks (972ML) of the 313 weeks, compared to the top 5 weeks (7,128,660ML) produced a ratio of 1/73,340.

This indicates that for most of the time the river flows are quite low, interspersed with significantly higher short-term deluges. Also, during the low flows, it is possible to walk across the Clarence in many locations.

As for future changes to the climate, for which the models are unreliable, but if you insist don't go ahead and just plan for hotter and drier, but also colder and wetter, or any combination of the four. Preferably just look at the actual figures for the last 30-40 years, which will be a good indicator of the future.

Flood Mitigation:

In the report mitigation is mentioned 7 times, but none were applicable to reducing floods. So what is mitigation? ***Mitigation: to make (something bad) less severe or less serious.***

"The options for flood mitigation are to:

A: Build levees for events up to their designed capacity;

This overall, is a false option because all it does is to move the flood waters to elsewhere in the community.

B: Reduce flood levels;

This can be achieved with flood mitigation dams, which releases excess water over a longer period, thus reducing severity of the flooding. This is the only viable option for minimizing Clarence flood plain floods.

C: Exclude floodwaters from areas under threat;

This can be achieved by rerouting the river to other rivers or by building mitigation canals. Widening, the river bed at choke points can provide some benefits at specific locations. This is the perfect option for the Wilson-Richmond, at Lismore- Coraki, but based on the Clarence's topography, it is not an option."

Having grassy fields to slow flows into the creeks and rivers, and logs in creeks to slow the flow, sounds great, but their impact is not existent by the time a Clarence flood reaches the estuary.

Flood Responsibility:

In the 2021 report there was a statement, (see Floods and Flood Responsibilities on P8), which indicated the local LGAs were responsible for flood mitigation in their communities.

This was effectively repeated in 2022, because there was no mention of flood mitigation for the communities.

This is something, which is quite unfair to the local LGA's and is completely beyond their capabilities as shown by the flows going past Grafton during the week of 25/2/2022 - 03/03/2022. (Back to Table I on P3.)

Droughts:

The Department for the Environment seem to base many of their decisions on manmade climate change, a hotter world and rising sea levels. They are all furphies. But unfortunately, this radically effects their decisions.

For example, they highlighted that there was a **Clarence "drought" from 2018 through 2020**.
*Our **state** (but not necessarily all of it), is no stranger to extremes – we have always had to manage our water resources through floods and **prolonged** droughts. In the face of an increasingly variable climate future**, we must prepare for even longer and more severe wet and dry periods. Data shows that the North Coast region will experience hotter days and more extreme conditions in future.*** (See Table II on P5, which shows it even rains lots in "drought" years.)

Rising Sea Levels:

There were concerns expressed about rising sea levels, but at least the document used feasible, but still unlikely figures (0.31m–0.59m) by 2070. And even if it did, due to tidal variations, it would hardly be noticeable.

Based on actual levels over the last 140 years levels (at least), have not increased, as shown by the Statue of Liberty and Sydney Harbour. (See Table III on P5). There are many other examples. And even if it did, all the Clarence water flowing into the sea has already mixed with sea water for 108km up the estuary.

"Experts" have been spreading scaremongering misinformation about the sea level and our climate for over 50 years. The practice still continues. Here is one of the classics:

In 2005 Tim Flannery in *The Bulletin*, (went one better than Al Gore's projected sea rise of 12m), when he warned that "***We have only a decade or so to avert a rise in the oceans of 25m. Picture an eight story building by the beach and then imagine waves washing over its roof. That's what a 25m rise looks like.***"

He also advised that "***It would never snow again, and that it would be so hot that any rain, which did fall, would evaporate as soon as it hit the ground***".

And what was worse was that Tim, and his "foresight" was made 2007's Australian of the Year. And what is worser is that predictions like this, are still prevalent and are still being swallowed hook line & sinker.

	Rainfall	Figures			Rain	Rain
Clarence	Ibbo's	Gulmarrad	Figures	Seq	in	in
Year	mm/Year	Lowest to	Highest	No	mm	inches
2008	1,496	2019	612	1	612	24.1
2009	1,870	2016	953	2	953	37.5
2010	1,696	2018	1,067	3	1,067	42.0
2011	1,921	2014	1,112	4	1,112	43.8
2012	1,413	2015	1,278	5	1,278	50.3
2013	1,657	2012	1,413	6	1,413	55.6
2014	1,112	2008	1,496	7	1,496	58.9
2015	1,278	2021	1,512	8	1,512	59.5
2016	953	2013	1,657	9	1,657	65.2
2017	1,912	2010	1,696	10	1,696	66.8
2018	1,067	2020	1,712	11	1,712	67.4
2019	612	2009	1,870	12	1,870	73.6
2020	1,712	2017	1,912	13	1,912	75.3
2021	1,512	2011	1,921	14	1,921	75.6
Total	20,211					-
Average	1,444	14 yr Av	1,444		1,444	56.9
Pre 1908	1,301					-
Drought	Years???	5 yrs Incl 3	Drought	Years	mm	Inches
		2017	1,912	13	1,912	75.3
		2018	1,067	3	1,067	42.0
		2019	612	1	612	24.1
		2020	1,712	11	1,712	67.4
		2021	1,512	8	1,512	59.5
		2018-20 Av	1,130		1,130	44.5
		2017-21 Av	1,363		1,363	53.7
	"3 Drought" yrs	Only 22%	less than	14 yr av!		-
	The following	shows that	there is a	Difference	across	Clarance
						-
	Ibbo's	Ibbo's at Gul	1,444		1,444	56.9
	Official	Gulmarrad	1,463		1,463	57.6
	Official	Yamba	1,447		1,447	57.0
	Official	Maclean	1,061		1,061	41.8
	Official	Grafton	882		882	34.7
	Official	Coutts Xing	1,066		1,066	42.0
	Official	Tabulam	1,023		1,023	40.3
	Official	Glen Inness	821		821	32.3
Home	Official	Finley SW NSW	457		457	18.0
Town						

Table II: Annual Rainfalls

Table III Sea Level Changes.

"The devastation caused in the region over the last 5 years –the fires, ***the extended drought of 2018 to 2020****, and extensive flooding – are a stark reminder of the type of natural disasters which could increasingly play out in the future."*

Realistically, three years are not a drought, particularly when there was still 1,130mm or 44" per year for the three years as shown in Table II. The north coast of NSW is quite different from western NSW. In fact, a drought in the Clarence would be considered a great year along the Darling. As for extensive flooding, it has been around for eons, and as pointed out elsewhere, it has to be controlled.

Key Priorities:

Take a holistic approach to land and water management
Ensure water resources and use are sustainable and equitable

Holistic: ***The whole is greater than the sum of its parts.***
Holistic Ecology: These view humans and the environment, as a single system

From the RWS report:

The key priorities for addressing the challenges in the North Coast region include taking a holistic approach to water management, ensuring water resources are used ***sustainably and fairly****…",*

But then limits communities to 1/130th of the annual flow.

We do have water problems. This is not because of low rainfall, but the fact that we let 95% of it go uncontrolled out to sea. In the process of allowing this, many of the flood plain communities are subject to serious flooding. The disruption, the physical, sociological and financial damage are significant. They can take years to resolve. There is nothing in the report, which addresses this.

"There is generally enough water across the North Coast region to meet urban and rural water demands each year, on average. However, competition for low flows during the drier spring months places many of the region's rivers and creeks under increased hydrologic stress.

Over the last 20 to 30 years, there has been a major shift away from rain-fed crops to high-value horticulture crops with increased irrigation demands. This has placed a great stress on rivers. With projected climate change, the modelled reduction in low flows and the subsequent increase in demand for irrigation, this pressure on low flows is likely to increase in the future.

Unreliable water supplies can seriously threaten the long-term viability of existing industry and discourage future investment in emerging industries."

Great comment! So why aren't steps being planned to increase water security, by storing it during high flows, for use during low flows? Here are your 2022 priorities, which still ignore communities.

Priority 1: Take a holistic approach to land and water management
(But apparently not for cities, towns and villages, horticulturists and other large users, even though *Holistic is defined as "To view humans and the environment, as a single system*.)

- Action 1.1: Develop ongoing collaboration with local Aboriginal people in water management
- Action 1.2: Support place-based initiatives to deliver cultural outcomes for Aboriginal people
- Action 1.3: Support improved governance
- Action 1.4: Deliver a river recovery program
- Action 1.5: Support landholder adoption of best practice land management
- Action 1.6: Assess the vulnerability of surface water supplies to sea level rise and saltwater intrusion
- Action 1.7: Identify environmental water needs to support healthy coastal waterways
- Action 1.8: Characterise and plan for climate change and land use impacts on coastal groundwater sources
- Action 1.9: Protect ecosystems that depend on coastal groundwater
- Action 1.10: Improve monitoring of water extraction

Priority 2: Ensure water resource development and use is sustainable and equitable

- Action 2.1: Improve fish passage
- Action 2.2: Implement fish-friendly water extraction
- Action 2.3: Establish sustainable extraction limits for surface water and groundwater sources
- Action 2.4: Implement daily extraction limits
- Action 2.5: Reduce the take of low flows
- Action 2.6: ***Support Aboriginal business opportunities ??***
- Action 2.7: Address catchment-based impacts of increased harvestable rights limits

Priority 3: Prepare for future climatic extremes

- Action 3.1: Support local councils to provide a secure and affordable water supply for towns **(*as long as it doesn't include new storage and distribution for fresh river water*)**.
- Action 3.2: Provide better information about water access, availability and climate risks
- Action 3.3: Review water markets
- Action 3.4: Investigate increased on-farm water storage
- Action 3.5: Increase use of recycled water for intensive horticulture

If your aim is to deal with the water resources, it needs to deal, not only with when there is insufficient water but when there is too much water.

The Solution:

So, what can be done to provide a realistic amount of water for people, businesses, the environment and also to minimise flooding? The only viable option is to build a dam on the Clarence just above the gorge, which would achieve flood mitigation as well as having many other benefits.

The dam and associated infrastructure, would not be cheap, but it needs to be looked at as,

Not how much it costs, but how much it costs, not to build it.

And until this is addressed then the effectiveness of the RWS and their plans for the Clarence are meaningless.

The following "To Dam or not to Dam the Clarence", provides an overall picture of the dam. It is a condensed version of what was submitted in 2021 (Item 38)

To Dam or not to Dam the Clarence
It is a question, which needs to be debated?

Original 2021-04-14 updated for 2022 Submission

Preamble:

Many years ago, my geography teacher told us the best place in Australia to live was the NE corner of NSW.

Its only natural negative seemed to be what happens when it rains too much. And looking at all the natural factors, which justify that remark, he was correct. Which is the best of the best catchments though, is a moot point, they all have pluses and minuses.,

In the case of the Clarence, a negative is the shape of its catchment. It is like a large wrinkled bathtub, and when it rains the water careens down the slopes and rushes out to sea. From a little to a lot and back again. If there is too much rain it results in damaging deluges across the delta, with short- and long-term negative effects.

And Since 1839 there has been a flood event every 1.5 years so it is not as though they are a rarity.

Based on the historic volumes and longevity of the rain events, it is possible to control the damage that each one causes. For the Clarence this can be achieved with a dam, whose primary function would be for flood mitigation. (Taming the Orara is a separate problem to be addressed, but would be difficult.)

Over the years there have been a number of proposals for building mini-Snowy schemes across the catchment, whose function would be to water the west. For numerous reasonable reasons none were viable nor acceptable.

Sir Earle Page put forward a sensible single dam proposal, whose function would be to provide a source of electric power between Sydney and Brisbane. Coal fired power generation made it unnecessary.

There has been a vibrant anti-dam movement in the Clarence, which was highlighted by the Not A Drop campaign. This was understandable for the mini-Snowy proposals, but it has become an anti-any-dam movement. The green-environmental movement also has an anti-dam philosophy, which is prioritised in the RWS 2022 Report.

It started out as a NOOMBY (Not Out Of My Back Yard), which was sensible but selfish, to being a NIMBY (Not In My Back Yard), which is more a case of shooting ourselves in the foot.

It has got to the point of being so irrational that the palindrome of dam and mad would seem to be quite appropriate.

Is that a bit harsh? Based on the anti-dam alternatives, which have already been implemented or planned it would seem to be justified. Read on.

The North Coast Draft Regional Water Strategy Reports.

The strategy of what happens in the North Coast areas, and particularly the Clarence catchment is being determined by the State Government. Effectively it takes the Not-A-Drop and Not-A-Dam ideals and sets out what this will really mean for life in the Clarence.

The Clarence River is the giver (its water), and the taker (its floods), of this paradise, yet dealing with this truism in the reports is ignored.

The above documents suggest we to go out and get our food from a dumpster and our water from the sewer or the sea, while paying homage to the untouchable river. This is not acceptable.

The 2021 Strategy's Vision:

"Our vision for the strategy is to support the delivery of healthy, reliable and resilient water resources for a liveable and prosperous North Coast region. To achieve this, we need to position the region so there is the right amount of water of the right quality delivered in the right way for people, Aboriginal communities, towns, industries and the environment.

Reads like a grand plan, but then it gets qualified a little:

The current long list of options focuses on:

Maintaining and diversifying water (But not from our rivers!)
Protecting and enhancing natural systems (which means?)
Supporting water use efficiency and conservation." (By not allowing any in stream dams and reusing "used" water or seawater, even in our potable water.)

Floods and Flood Responsibilities:

It seems that as floods have been occurring since day dot, and they will continue to do so.

Since 1839 there have been 121 Clarence River floods, (compared to 41 in Kempsey), or one flood every 1.5 years. Hence flooding cannot be considered a rare and unusual occurrence.
In the last 11 years there have been three major floods (2011, 13, 21 (Plus two in 2022), and a few minor ones.

The disruption, the cost, the hardship created by these have a significant impact on the current and future liveability and viability of the Clarence, but it seems we need to just learn to live with them.

The 2021 reports tell us it is all under control if our councils "*Improve flood management for regional towns and communities*". They then tell our councils how to achieve this:
"...It identifies that local councils are primarily responsible for managing flood risk in their communities, and their responsibilities include":

Developing and implementing floodplain risk management plans to better understand and manage flood risk to the community
Providing information to, and improving the awareness of flooding in, the community
Operating and maintaining their floodplain risk management assets (for example, drainage and levees)
Consider flooding in development and infrastructure decisions
Supporting NSW SES in emergency management and associated planning."

Or putting it another way: Flood mitigation dams won't be allowed to be built, but councils are responsible for the impact of the floods. Talk about passing the buck. **Apart from which, it seems difficult to imagine how plans, awareness, and a few drains will actually, hold back the water.**

Why not? Let's look at the power of the current flood:
The table shows the major Clarence Catchment river volumes from 21-3-2021 through 27-3-2021 and the huge volumes of water, which came and went during that week.

Using the pertinent figures from the table flood water enters the estuary from two main sources; the Clarence after amalgamating the water from all its tributaries just above Lilydale, and the Orara River, which flows directly into the estuary.

And 24-Mar-21 was a doozy of a day

Wednesday 24-Mar-21	Level (m)	Flow (ML/day)
CLARENCE @ TABULAM (204002)	9.85	266,631
TIMBARRA @ DRAKE (204046)	3.56	65,781
CLARENCE @ BARYULGIL (204900)	11.01	426,763
NYMBOIDA D/S WEIR (204069)	7.44	82,298
MANN @ JACKADGERY (204004) XXX	7.11	329,129
CLARENCE @ LILYDALE (204007) XXX	14	675,197
ORARA @ BAWDEN BDGE (204041) XXX	19.12	143,167
ORARA + CLARENCE		818,364

Putting the Orara + Clarence into perspective:
On 24/3/21, (the same day as the cancelled WRS meeting!) 675,197Ml from the Clarence and 143,167Ml from the Orara, for a total of **818,364Ml or 818Gl**, gushed into the estuary. This was equal to more than half of the Clarence's last year's total flow!

It's also equal to 27 times the capacity of Shannon Dam or 327,200 2.5Ml Olympic pools, which is 234 pools/minute.
And remember that was all in one day.

Without a dam able to absorb at least 1,500Gl, then these floods will keep occurring.

The doco also suggested levees but they can do more harm than good: This is because, if for example Grafton's levees were upsized, it just means that downstream communities receive a larger flood.

No as big as the 2022 floods, but still significant)

So, what needs to be done?

The folks involved with this strategy need to go back to square one and come up with a new vision, which is:

How do we wisely control, manage and utilise the Clarence Catchment rivers, for both mankind and the environment?

Background:

A public meeting was to be held on 24-03-21 to allow discussion on the "*Options for the Draft North Coast Regional Water Strategy*".

They are significant documents, but they ignore discussing a cross-river dam.

In some catchments flood mitigation dams are not necessary, or possible, but this is not the case for the Clarence.

They also made it clear that dams were a no-no after earlier meetings: "*The only item not progressed was a Clarence River Dam to supply the entire NE NSW area*". (It was to be upstream from Duck Creek, which was a non-viable option anyway).

Shannon Creek Dam was mentioned but it is not a cross river dam and is not capable of supporting our future water and mitigation requirements.

Then Huey (the Weather God), stepped in and gave us a major of a flood.
It was poetic justice and so appropriate, when the 24-03-2021 meeting was postponed due to flooding.

There are 5 main functions for a dam:
Water Supply, Flood Mitigation, power-generation, recreation and the environment.

Some dams try to provide the conflicting requirements of Water Supply and Flood Mitigation. Warragamba (Sydney) and Wivenhoe (Brisbane) are examples of trying to do both but it doesn't work very well.

The Gorge Dam would be able to handle this conflict due to its geography and low water supply requirements.

It would not be suitable for power generation.

Family friendly fresh lake water recreation could become a major activity. One reason for this is that fresh water recreation areas, east of the ranges in NSW are a rarity. (Many visitors prefer fresh water to the sea. Townsville's Ross River Dam surprisingly, attracts more visitors than the famous Magnetic Island.)

There were some appropriate suggestions put forward in the documents, but the need,

"To control the flow of a river during a flood event" was ignored.

Why is a dam the only solution for minimising floods in the Clarence?

The 22,716sqkm Clarence catchment is like a large cistern. It's enclosed, it has steep sides and the water from the two main rivers, the Mann/Clarence and the Orara flow into the Clarence estuary, in a very short time span.

When it rains the water rushes downhill from river to river until they eventually all come together when the Mann and the Clarence merge near Lilydale.

Based on 5 years (over 7 years), of daily figures the daily flows at Lilydale have varied from 11ML to 675,000 ML., a ratio of 1/61,000. Even when comparing the highest 3 months of 5,230,000Ml compared to the lowest 3 months of 3,000ML, still gives a differential 1/1,750. That's erratic.

Note: The Orara River is not part of the Clarence River as it flows directly into the Clarence Estuary, but it is part of the catchment and what its future should be, needs to be evaluated.

Putting that into perspective:
As outlined earlier on Wednesday 24/3/21 over 800GL gushed into the estuary. in one day.

As a result: Two major communities, Yamba an Iluka were isolated for days and all the river-side communities were flooded. And the Clarence ferries didn't run for over week.

Many major roads were closed and damaged, with most of the damage resulting from the flooding not the rain. Schools and businesses closed. Buildings were inundated. Treasures and memories were lost.

It would seem that 3 major floods and some minor ones in 11 years, (Now 5 in 12 Years), should create some interest in flood mitigation. It's not as though they're a rare occurrence.

And flood mitigation is more than paperwork, plans and a levee or two; it requires a mitigation dam.

But no:
It seems like the responsible departments determining what is needed for our communities either don't understand or don't care as long as the rivers are left untouched.

Why only One Dam?

Over time there have been proposals to build a multi-dam with tunnels and viaducts across the catchment. They all seem to be a grandiose version of the Snowy Mountains scheme. None of them would have worked.

After pouring through river flows and contours, it appeared that the only viable place for a dam, which would allow control of the water flowing on to the flood plain, was just above The Gorge.
It must have been a good guess as I then found that Sir Earle Page's proposal, was for a dam in the same spot.

Pro's:

It is the best (only) place on the catchment where enough water consistently flows, to support a dam.

It is only 30km from the estuary and has little, if any effect on upstream tributaries and the real wild rivers we are so proud of.

Once filled to an everyday level (one large rain event), current flows into the estuary would continue.
Based on historic water flows during large rain events, it would flood proof the lower Clarence. The importance and positive outcomes of this are significant and should not be underestimated.

"But the delta needs floods to replenish the soils!" This is no longer the case. Modern farming techniques do a better job. Also, as communities expand more damage occurs, and the amounts of toxic stuff, washed out to sea is unacceptable.
This is validated by Yamba having to close its beaches due to contamination from flood waters.

Is this correct? Just a day ago Environmental officials verified this was correct. "Environmental officials have warned that the recent floods have had a "significant impact" on water quality, and there could be heavy contamination in the ocean. The heavy rain and floodwaters will have washed pollutants from our streets, including rubbish, bird and dog faeces, cigarette butts, leaf litter and oil into the stormwater system."

It would ensure that there would be a more even flow of fresh water into the estuary.

It would minimise or eliminate flood insurance levies.

It would allow flood prone land, which is currently not used, to be developed for housing, industries and farming. This would apply to all estuarine communities, many of who are already short of developable land.

The lake above the dam would become a major fresh water recreation area, one of the few in coastal NSW. (Townsville's Ross River Dam surprisingly, attracts more visitors than the famous Magnetic Island.)

Fish habit for the eastern cod and other fish would be improved, particularly during low flow periods.

For fish, which migrate from salt to fresh to salt, fish ladders would be built.

Cost: Compared to the benefits, both short and long term, the costs would be covered.

As the floods inundated the state from end to end in the last few weeks the flood insurers indicated they will consider not providing flood coverage or raising the cost of insurance significantly.

Even the PM suggested that that building on flood plains should be prohibited. With the mitigation dam, flood prone areas would diminish significantly,

Con's:

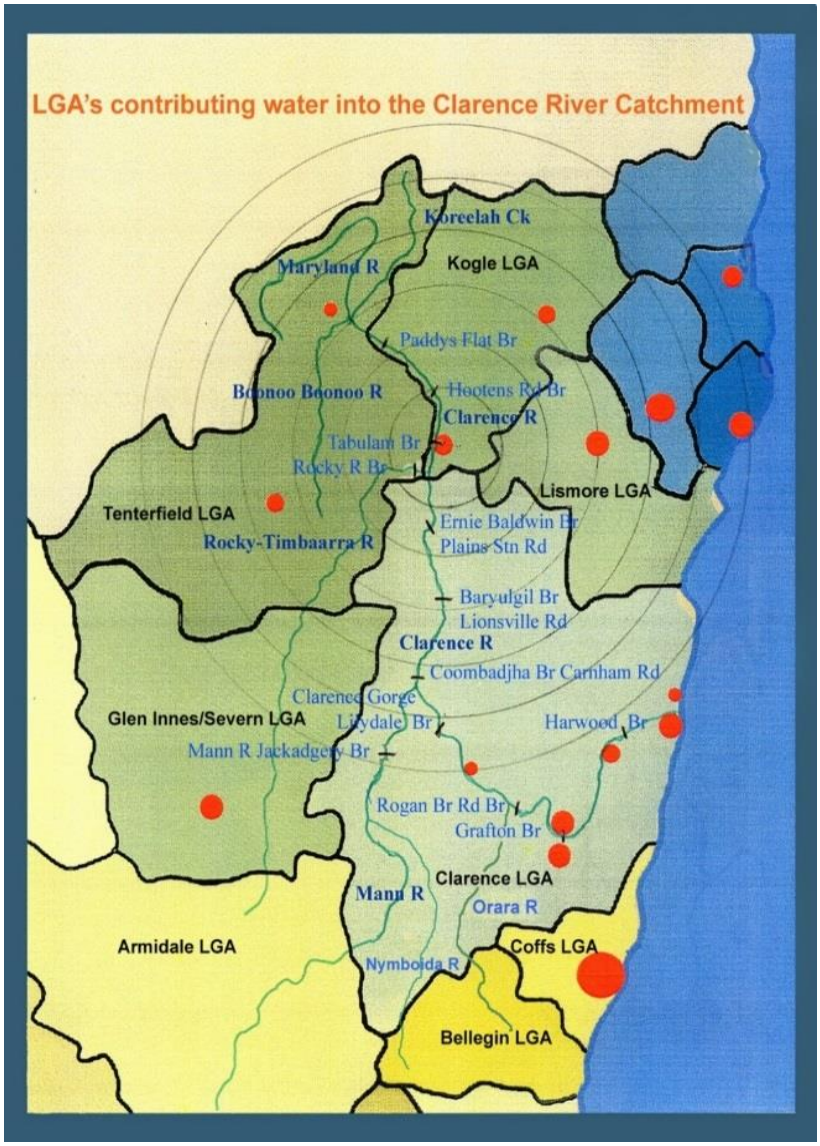
As well as the cost and maintenance of the dam and its infrastructure there would need to be a review/rebuild of the current upstream roads and bridges.

Farmers and others who currently own or use the land down to the river's current confines, would need to be compensated. although the lake would provide other business opportunities for them.

People who like having "exclusive" use of this part of the river, will have a hissy fit, but so be it.

Water Sharing:

The following is considered a Con but it is really a Pro:



. Northern Rivers LGA map

This could be achieved without any noticeable impact except for residential blood pressure.

Many locals consider it as "Our Water". It's not. About 50% of the water reaching the estuary enters the system in other LGAs.

From the North, most of the Clarence's water comes from north of the Rocky-Timbarra River and is outside of the Clarence LGA. Interestingly a major contributor to major floods is Koreelah Creek, which originate just west of the Gold Coast.

Likewise, for those coming from the South much of the input is from other LGA's.

Also, the Clarence River geographically ends just NW of Copmanhurst, where it meets the sea. There is no harm in calling it the Mighty Clarence River, but in reality, it is an estuary and the real river is quite different. Most of the time it not very mighty. They don't call Port Phillip "The Mighty Yarra" or Sydney Harbour part of the Paramatta River. This is quite irrelevant, but is a point to ponder.

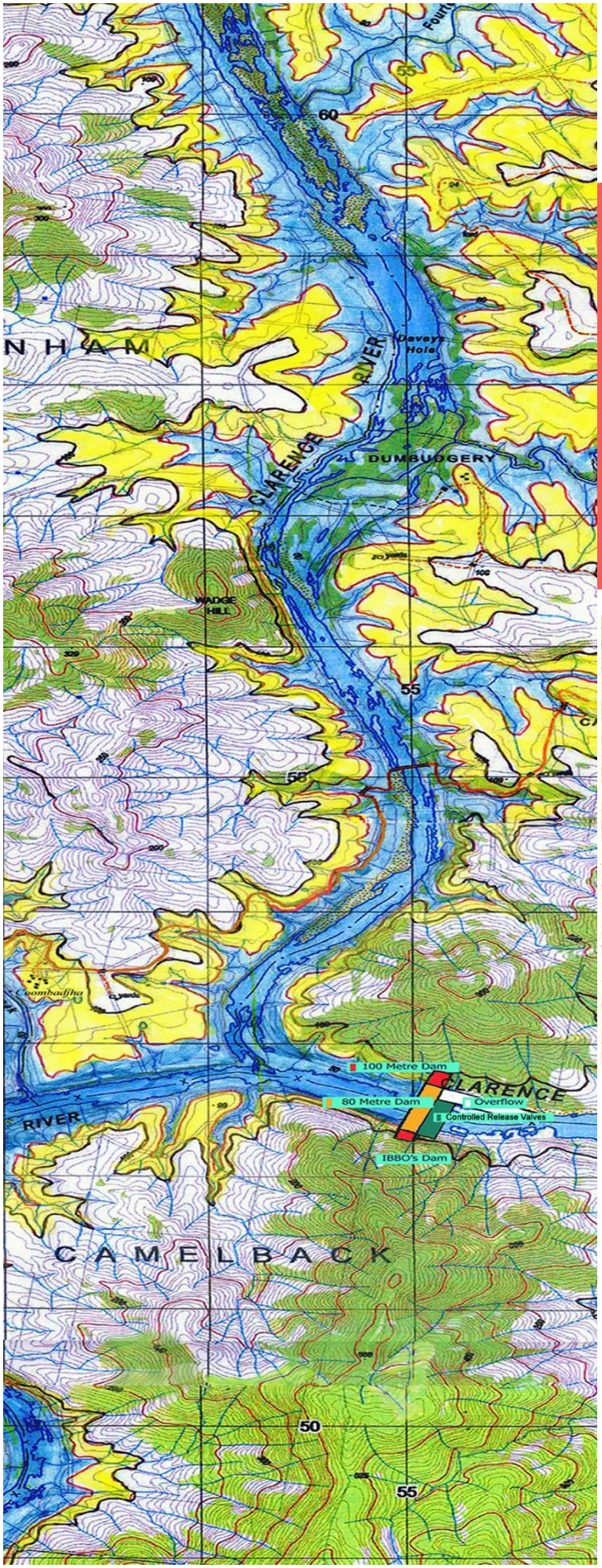
The proposed water sharing would only involve pumping up to 200ML/day, which is only 1 - 3% of the Clarences annual flow

Water could be pumped up to the top of the range from the proposed dam. It would require a 70km pipeline, with a lift of 1,050m going into a small holding dam on Kneipps Creek.

Based on other pipelines lifting 100-200Ml of water/day could be done with a single pump station.
The pumping operation costs would be paid for by the end users. The water would then be dispersed through pipelines to western slopes communities for non-agricultural use. None would be released into the westward flowing rivers.

At 200Ml/day (73Gl/yr), it would only be 3% of an annual average flow at Lilydale of 2,500Gl.

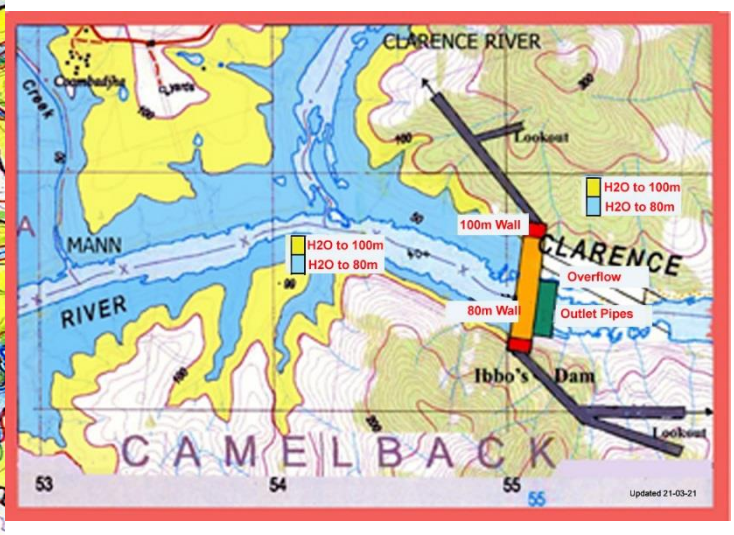
Water could also be gravity piped to the delta. It would provide additional fresh water for Northern River communities, horticulture, without adversely affecting the tourism and flood mitigation and would reduce the pressure on the Nymboida/Shannon Dam facility.

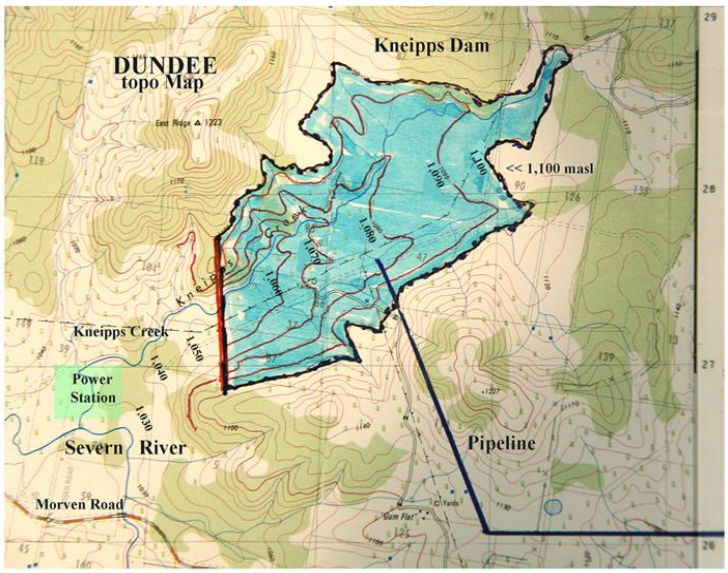


Maps of Clarence Gorge Dam

The Clarence River Dam between the confluence of the Mann and Clarence Rivers and The Gorge (circa 2010).

(overall and Close up)





Map of Kneipps Dam

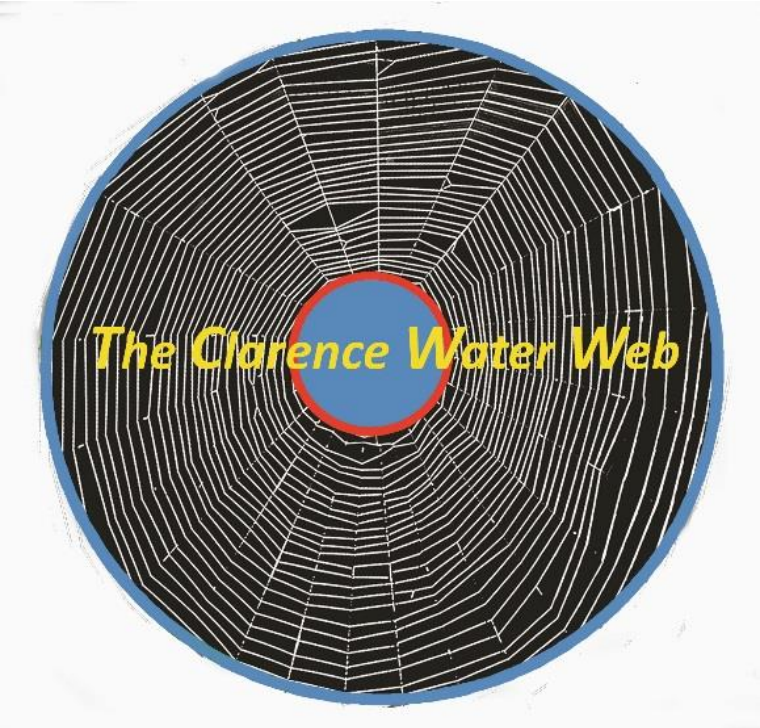
The dam would be at the 50m contour with a wall height of 50m (?). Based on volume and area calculations done by a hydraulics engineer it was possible to calculate the water volumes, which the dam would hold.

Capacity of a	Clarence River	Dam above Gorge
Water Level (m AHD)	Lake Surface Area (sq Kms)	Cumulative Volume (GL)
50	0	0
60	5.1	36
70	20.3	153
80	40	454
90	70.1	1,004
100	129.4	2000

It could also be used to supplement Casino's, Lismore's and Ballina's and Coffs Harbour water supplies.

It would also negate the need for desalination or unnecessary recycling of waste water, except for farming as they do in Werribee in Victoria.

It could be called **The Clarence Water Web**



And after providing all of the benefits outlined here it would still allow 90% of the Clarence's water to just pass in controlled manner, on its way to the sea.

Thank you for the opportunity to submit my recommendations for water management in the NSWs Northern Rivers area. I would be delighted to discuss them further with you.

John Ibbotson
31st March 2021 (Updated 15th June 2022)