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Queensland Floods Commission of Inquiry.

Submission from the Queensland Greens

Thank you for the opportunity to make a public submission. The Queensland Greens for many years have been concerned about a number of development decisions that impacted upon the recent floods.

This submission responds to the following terms of reference for the inquiry:

- All aspects of the response to the 2010/2011 flood events, particularly measures taken to inform the community and measures to protect life and private and public property, including:
  - Immediate management, response and recovery;

However its main concern and proposals are regarding the term of reference which covers:

- All aspects of land use planning through local and regional planning systems to minimise infrastructure and property impacts from floods.

1.0 Introduction

We are greatly concerned about the flooding of mines and gas drilling operations of which there have been several instances over the last three years and the downstream effects caused by the resulting discharge of highly polluted waters from these mines and wells. Their harmful effects on both river ecosystems and communities living within these catchments have been reported at several official inquiries. The floods of December 2010-January 2011

have seen similar issues, with the flooding of 36 mines and two gas operations for which the Department of Environment and Resource Management gave 39 Transitional or Amended Environmental Approvals to release mine-affected and "produced" water into the tributary rivers of the Fitzroy.[1] This submission brings together the cumulative evidence from other state and federal inquiries as well as recent scientific data on floods and land clearing. These include:

- The report of the Senate's Environment, Communications and Arts References Committee, *The Impacts of Mining in the Murray Darling Basin*, 2009.

- Senate Select Committee on Agriculture and Related Industries, Interim, second, third and final reports: Food production in Australia, 2010.

- Department of Environment and Resource Management, *A study of the cumulative impacts on water quality of mining activities in the Fitzroy River Basin*, 2009.

- Prof. Barry Hart, *Report to Queensland Premier: Review of the Fitzroy River Water Quality Issues*, 2008.

- Environmental impact statements and Coordinator General reports on various mining and gas proposals.

We submit that the evidence regarding the harmful impacts of mining on floodplains, the land use changes caused by mining and its impact on flood frequency and costs, is unequivocal and that the state of Queensland must use its planning laws to prohibit any future mine or gas developments on river floodplains or river recharge areas.

2.0 Land Use Management on Floodplains

2.1 Impact of Mining and Drilling operations on Floodplain Hydrology

Evidence of water re-routing was presented to the recent Senate inquiry by Geoff Penton, CEO of the Queensland Murray-Darling Committee, who argued that in the case of the Fitzroy River, levee banks erected to protect mine sites altered the flow of the floodplains. This has not only increased the height of floods in particular areas but also led to heavy polluting of the flood waters. In his testimony to that committee he stated that:

> As the floods came down, that [levy banks] reduced the width of the floodplain. So, instead of the flood breaking out of a river and spreading out over two, three, four or up to seven kilometres in some places, it is then restricted down to two or three kilometres wide. So that volume of water now does not have a floodplain to flood across; it is restricted. In a number of cases those levy banks did not hold in the Fitzroy and those mines were flooded. There are some fairly spectacular photos of draglines being flooded and so forth. That had a couple of impacts. It was obviously pretty devastating for those mining operations, but it also meant that several of those mining operations were given approval by the state

> government to pump their mines back to being dry again. That has created a range of issues in terms of water quality in the Fitzroy River. [2]

Many landholders are also gravely concerned about the impacts of drilling and mining on underground aquifers. As they are displaced and dislodged surface water patterns are also likely to change in intensity. As a New South Wales authority expressed it to the Senate Inquiry:

> You are talking about three-dimensional alteration of landscape. Miners actually drop the landscape by a metre to two metres, depending on the development. You may fracture; you may discompact. These are flowing streams underground. They are pools of water that aggregate and flow, sometimes through constrictions and sometimes quite broadly. You cannot alter the entire landscape and expect those flows to continue.[3]

Behaving in a similar pattern to mine levees are the massive holding dams and effluent ponds which have been constructed on the floodplains of the Condamine, Moonie and Fitzroy Rivers, to hold 'produced' water from coal seam gas drilling. All of these rivers systems suffered from flooding during the 2010/2011 wet season and like the mine levees, water was re-channelled round their massive walls. Queensland Gas Company (QGC) has one holding pond covering 40 hectares on their Windibri property but all the gas fields require 'ponds' with depths from 2m to 4m for various de-watering purposes.[4] The Australia Pacific LNG Project operated by Origin Energy in partnership with Conoco Phillips, for example, has plans for brine ponds covering 370 ha on parts of the Condamine-Balonne river system by 2014.[5]

The Co-ordinator General's report on the Environmental Impact Statement for Gladstone LNG (Santos Ltd in joint venture with Petronas) recognised that such structures should not be approved in areas likely to experience 1 in 50 year flooding events [ARI (average recurrence interval) 1:50].[6] The Co-ordinator General's report on the Australia Pacific LNG Project says that permanent infrastructure that may concentrate or divert flood flows, or increase the risk of environmental damage (e.g. risks overflow of brine ponds or other storages) should be precluded from areas of ARI 1:100.[7]

This view is also supported by the Senate Select Committee on Agricultural and Related Industries. In their second interim report on Food Production in Australia, the committee explicitly made the following recommendation:

> Recommendation 1:The committee recommends that the NSW Government investigate the total prohibition of mining under the floodplains of the Liverpool Plains and other areas of the state where similar conditions prevail, especially where evidence indicates that there will be damage to the floodplain or aquifers and the agricultural productive capacity of the floodplain in question.
> **2.99: The committee considers that other jurisdictions should consider similar measures to protect their vital agricultural resources from mining and other activities in their respective jurisdictions.[8]**

2.2 Vegetation Clearing and Floodplains

The impact of vegetation clearing has been the subject of heated debate. Definitive research comes from Bradshaw (2007) in the first broad global study of its type which shows that a 10% decrease in natural forest coverage results in a 4%-28% increase in flood frequency. This section of our submission discusses the scientific evidence regarding land clearing and floods and the clearing that has taken place for mining and drilling for activities such as wells, pipelines and roads. Significant vegetation and land disturbance had already taken place in the catchment prior to coal and gas development, but one gas Environmental Impact Statement alone admits to 5.6% clearing.[9] The cumulative impact of the three major projects approved so far are therefore likely to be considerable.

2.2.1 Evidence of clearing impacting upon flooding

International and domestic research suggests that vegetation clearing significantly impacts on the frequency and intensity of flood events, with the loss of natural forest cover of 10% resulting in a concomitant increase in predicted flood frequency ranging from 3.5% to 28.1%.[10] Hill slopes with relatively high mean cover, but with small patches bare of vegetation, are shown to have between 6 and 9 times more runoff, and up to 60 times more sediment loss than similar hill slopes that do not contain bare patches.[11] The scientific literature also emphasises that, given the empirical links between deforestation and flood risk and demonstrated severity, politicians and landscape planners must implement tangible actions, such as protection of existing natural forests and reforestation activities.[12]

However it is not simple matter to re-plant and repair landscapes after clearing. Scientific literature indicates that reforestation may not always bring about only positive effects – for example, extensive reforestation in monsoonal climates can lead to severely diminished stream flows during the dry season that may engender a suite of other problems, potentially offsetting any advantages gained by flood reduction.[13]

These results have important implications for the management of Queensland's floodplains. Planning regulations should require firstly, medium to high cover patches at the bottom of hill slopes bordering the floodplains for trapping and storing sediment and therefore reducing its entry into the stream network; and secondly maintenance of ground cover on hill slopes during the dry season to reduce sediment concentrations in runoff occurring early in the wet season.[14] Such practices are familiar to rural producers with long experience in Landcare and soil erosion management but need to be explicitly required for new developers in Queensland's rural heartlands.

2.2.2 Clearing rates and land disturbance for new projects

Environmental Impact Statements for the three major gas projects so far approved for the Surat Basin are inconsistent on the question of tree clearing for infrastructure, however it is possible to draw some conclusions about the amount of land disturbance in regions covered by the recent floods by comparing the Coordinator General's reports for each project.

Santos – Gladstone LNG

The largest project, the Santos-Gladstone LNG development states in its EIS that total operations will cover 690,000 hectares but gives no figure for how much is currently covered by vegetation. Mirroring the lack of data about vegetation cover is an absence of detail about land clearing for different aspects of the project. The Coordinator-General therefore estimated a footprint of 6,400 hectares for well sites, roads and tracks,[15] in contrast to the company's claim of total land clearing of a mere 1,972.24 ha over the entire project.[16] Clearing for dams, compressor stations and pipelines still need to be calculated.

BG/QGC - Qld Curtis

QGC report a development area of 468,700 ha with existing vegetation cover of 171,253 ha (37%). Their report acknowledges vegetation clearance in the vicinity of 9,577 ha for gas fields alone, or 5.6% of their project area. While these figures certainly seem more realistic than the much larger Santos-GLNG project, the Coordinator-General's report draws attention to the fragmentation of vegetation communities and notes that this activity will cause further loss of vegetation. Additionally the Coordinator-General's report concedes that the total area of land to be disturbed is approximately 26,760 ha.[17] This makes a sizeable contribution to the state's already large legacy of land disturbed by mining activities, currently amounting to 146,000 ha.

Evidence from landowners already affected by QGC's pipeline development leads to even more pessimistic assessments of their disturbance of floodplain. At least one Tara land owner is in dispute with the company which had contracted with him to clear a 10 metre wide corridor for a pipeline over his land but instead the company has cleared up to 30 metres wide.[18] So company claims for land clearing and disturbance could possibly be understated by one-third.

Origin/CoconoPhillips - Asia Pacific LNG

Origin's total field development area is 572,700 ha of which they claim approximately 38% retains vegetation cover or 215,260 ha. Calculations of clearing for gas fields (6,012 ha) and for pipelines (1,759 ha) amount to 7,771 ha or 3.6% of total development area but the Coordinator-General notes a total land disturbance area of 26,700 hectares.[19]

This figure is similar to that used for QGC and is possibly only an estimate by the Coordinator-General's department. Given the proportionally larger scale of Santos' operations, it is reasonable to assume a land disturbance area of 39 306 hectares, giving a total figure for the three operations approved so far of some 92,766 hectares. While gas fields are less visible landmarks than open cut coal mines, they nonetheless have a very large footprint and associated vegetation clearance. Cumulatively, these clearing levels may play a major role in future flooding events in Queensland.

3.0 Management of Water Release from Flooded Mines

3.1 Background

There have been significant issues around the flooding of mines built on flood plains (in the Fitzroy Basin in particular) and the release of this saline and toxic water into river systems under Transitional Environmental Programs approved under the Environmental Protection Act. Studies of past releases which occurred during dry periods have highlighted problems of inadequate dilution owing to low river levels but nonetheless indicate the range of problems mine contaminants pose to human health and the environment. These releases caused harm to drinking water, aesthetic and community health, as well as on downstream aquatic ecosystems and breeding zones.

In 2008, 16 out of 39 mines in the Fitzroy Basin released mine waters which DERM categorised as medium to very high risk (leading to potential effects on water supplies, downstream ecosystems and grazing and irrigation water).[20] During the following 2009/10 wet season more than 20 coal mines saw unauthorised water releases caused by heavy rainfall.[21] Then in the most recent floods of 2010/2011, 36 coal mines and 2 coal seam gas operations again breached their environmental authority conditions through their release of contaminated mine and gas water, requiring DERM to approve 'Transitional Environmental Programs' for their operations. These TEPs allow mine and gas sites 'to complete actions outside of its agreed Environmental Authority (EA) conditions.'[22]

There appears to be a general unpreparedness of mining companies to deal with flood events, and major problems with water release planning by both mining companies and the government.

Ensham Coal Mine

When Ensham Resources submitted planning documents for expansion of the Ensham coal mine in 2006, the company claimed that they considered their levee banks more than adequate for a 1/50-1/100 year flood. However in three successive wet seasons, 2008/2009, 2009/2010 and 2010/2011, this mine along with several others in the Fitzroy basin, have breached their environmental authorities through release of flood waters from mines. All this points to a serious lack of understanding of the nature of flooding in the Fitzroy, and how significant further impacts might be with increased flooding frequency.

In January-February 2008 significant rainfall events across the Fitzroy River basin resulted in the flooding of mines. The Ensham coal mine was one of those given permission to discharge mine water over a 7 month period when river flows were very low. In order to increase the rate of dilution, the company purchased some water from Fairbairn Dam. The volume of flood water from the mine, totalling 138 gigalitres was more than the amount of water expected to be present in the entire Fitzroy system in the dry period (117GL).

- This discharge added around 100,000 tonnes of salt to the river system. Estimate of the annual salinity for the entire river system was 850,000 tonnes.
- The result was that the water quality in Bedford and Tartrus Weirs (July-Oct 2008) suffered from increased conductivity (2800-1060uS/cm as opposed to Australian and New Zealand Environment and Conservation Council [ANZECC] guidelines which

recommend 20-250uS/cm). Aluminium was the only heavy metal concentration significantly above ANZECC guidelines (60-1000 ug/L as opposed to 55 ug/L).[23]

3.2 Human Impacts

Mine-affected water reached the Fitzroy Barrage in early September 2008, and during October essentially stabilised at a conductivity of around 825 uS/cm and sodium concentration around 120 mg/L.[24]

In October-November 2008 increased salinity and sodium concentrations were as high as 200mg/L at river barrages which provide Rockhampton's drinking water. These levels in drinking water put residents with cardiovascular disease, high blood pressure, and chronic kidney failure at risk. Australian Drinking Water Guidelines state that sodium concentrations should not exceed 180mg/L.[25] The levels had been around 20mg/L prior to the flood. Salinity limits (EC – electrical conductivity) are 746uS/cm for human drinking (aesthetics) but were above 1200uS/cm in parts of the Fitzroy River system from July-November 2008.[26] Some of the health consequences from the mine discharges were:

- an outbreak of viral gastroenteritis in communities in the Central and Western Queensland Health districts, ie townships affected by the mine water discharges, that may have been aggravated by the poor quality drinking water
- The conductivity (salinity) of drinking water supplied to residents of Blackwater, Bluff, Tieri, Middlemount and Dysart was in excess of 1000uS/cm (600-700mg/L) between June-November 2008. This placed pressure on Rockhampton's Dialysis Clinics and home dialysis services which require pure water with very low ionic concentration. Queensland Health issued warnings to potentially affected people not to drink the town water. Many residents were forced to resort to the expense of bottled water.
- Problems also arose in the Central Sterilizing Supply Department at the Rockhampton Hospital owing to calcium carbonate residues on disinfected instruments.[27]

The Department of Environment and Resource Management reported that their assessment of the cumulative impact of the discharges from 39 mines following the early 2008 flood event in the Fitzroy River system was that:

- 16 of the mine discharges were in the medium to very high risk category in terms of water quality with an additional 10 designated low risk.
- The conductivity levels of drinking supplies downstream from these 16 discharge sites were too high for safe human consumption and for irrigation for certain crops such as beans and oranges.[28]

3.3 Impact on Aquatic Ecosystems

Professor Barry Hart was commissioned by the premier to investigate the water quality issues that arose from the Ensham mine discharges. His report noted the river ecosystem had already been drastically altered but that increased water flows from mine discharges put more pressure on its ecological health. It is difficult to be precise about effects because no

biological monitoring was conducted during the mine water discharge. Some of the issues of concern following the 2008 discharges were:

- the high likelihood that there will be serious adverse effects on the spawning success of Fitzroy Golden Perch (intolerant to higher salt levels). Fish in the Tartrus Weir were in poor health most likely from the effects of heavy metal concentrations – fish tissue contained elevated levels of iron, aluminium and zinc. [29]

- Possibility of algal blooms in the Fitzroy Barrage due to clearer than normal water (due to coagulation of colloidal particles by the higher calcium and magnesium concentrations.)

- Discharge limits were set significantly higher than ANZECC/ARMCANZ (2000) toxicant trigger values for aquatic ecosystems.[30]

- Since monitoring began, concentrations of aluminium in the Bedford Weir have consistently exceeded the aquatic ecosystem trigger limits, strongly indicating that the biota of Bedford Weir has been placed under significant environmental stresses. Iron concentrations and selenium levels have exceeded the aquatic ecosystem trigger limit on several occasions. Accurate determination of selenium levels is critical because of its potential to bioaccumulate in the environment. Copper and zinc concentrations have also exceeded the aquatic ecosystem trigger limit on several occasions. As the analysis was not sensitive enough to accurately determine concentrations less than 0.01mg/L, it is unknown to what extent the aquatic ecosystem trigger limits were exceeded for lead and cadmium.[31]

4.0 Management Changes

Since these reports were compiled in 2008, large volumes of saline coal and gas water have been released into the Fitzroy River in successive years, further concentrating heavy metals in Fitzroy storages and ecosystems. Little wonder that federal and state river authorities and primary producer groups refer to these events on the Fitzroy as 'the Fiztroy River disaster.' Furthermore, other southern Queensland river systems with local economies dependent on more sensitive and large-scale irrigated agriculture could not withstand these levels of salinity and heavy metal concentrations. Primary producer groups, community groups and the Minerals Council of Australia all made representations to the Senate committee on the impact of mining in the Murray Darling about the need for bioregional planning to manage cumulative impacts on river systems.

4.1 Taking Cumulative Impacts into Account

The Queensland Murray Darling Committee, responsible for the Condamine-Balonne and Queensland Border Rivers, made representations to the Senate Select Committee that the Fitzroy River disaster provides an example of the need to assess the cumulative impacts of mining on water resources. Similarly the primary producer representative body, Agforce, asserted that the cumulative impacts of mining and drilling activities in the Surat Basin where drilling for 40,000 gas wells has commenced is 'unappreciated' and presents 'a major policy problem'.[32]

The same concern about the lack of studies of cumulative effects of mining in the Murray Darling Basin (including the rivers of the Surat Basin of southern Queensland) was emphasised in the CSIRO submission to the Senate committee:

> The impacts of mining tend to be studied on a case by case, region by region or operation by operation basis. The results are initially encapsulated in Environmental Impact Assessments which are available at initiation for both existing and known projected mining operations. . . However, there has been relatively little quantitative assessment of the cumulative impacts represented by these data. . . The key issues in terms of cumulative impact will centre around how individual operations combine over time and over a large region to affect: water availability and variability; impacts on biodiversity; land and groundwater contamination; local and regional dewatering.[33]

In Namoi Water's view, the main problem was not polluted discharge from a discrete mine site but the alteration of the entire landscape with associated cumulative impacts that have the potential to flow thousands of kilometres through the Murray-Darling system. Namoi Water concluded that:

> … [this] is why we are here today. There is no other reason. The Water Management Act 2000, the Commonwealth Water Act 2007 and the National Water Initiative are all entirely deficient in terms of recognising and picking up the issue of mining and its impacts on water… It is something new; it has not been contemplated by the legislation. Effectively, the breakdown point is right there. There is no cross-referral.[34]

Stronger bioregional planning was put forward as a solution to the problem of impacts from diverse point sources. A range of stakeholders argued for planning processes that would operate at a regional level. This regional approach to planning was supported by the Minerals Council of Australia who had proposed it to a previous inquiry into the operation of the *Environment Protection and Biodiversity Conservation Act 1999.* At a public hearing on 9 December 2008 for the Senate inquiry on mining in the Murray Darling, the Minerals Council of Australia made the following comment:

> We therefore consider that a more appropriate role for the Commonwealth would be in strategic bioregional planning, pre-emptive of development pressure and across larger time frames. Individual projects would then be approved by states and territories, which would have responsibility to ensure that the project fits within the remit of the bioregional plan. The Commonwealth's role would then be to assess, list, monitor and report on ecological entities of national significance, to develop regional plans that cross-cut natural resource portfolios—for example, biodiversity, water, minerals and socioeconomic values—and audit states and developers on the subsequent implementation and compliance with these plans and approval conditions.[35]

4.2 Integrated Planning

International practices also favour integrated regional planning of river systems to cope with

floods. The best example is probably that of the Mekong River Commission which has developed Integrated Floodplain Management systems to integrate and coordinate measures for dealing with the flooding, flood risk and flood hazard characteristics of the particular floodplain, the specific social and economic needs of the flood-prone communities, as well as environmental and resource management policies for the floodplain.

One of its most important aims for Land-use Planning is: "keeping people away from the floodwaters." That means developing land-use measures on the floodplain that aim to ensure that the vulnerability of a particular land-use activity is consistent with the flood hazard on that area of land, i.e. the objective is to keep people and vulnerable activities out of the most hazardous areas of the floodplain.

So development on flood plains as well as clearing and deforestation must be managed effectively to minimise the hazards of flood prone river systems.[36]

Conclusions and recommendations per terms of reference

- Immediate management, response and recovery

Releasing large amounts of contaminated mine waters into the Fitzroy river system is an inadequate solution to the problem of flooded mines and gas drilling operations. The problems of the coal and gas industries are being imposed on all communities and ecosystems dependent on the waters of the Fitzroy for their livelihood.

If, in the future, such approvals are given for the many mines and 40,000 gas wells planned for the Murray Darling Rivers of southern Queensland in the Surat Basin the economic and community consequences would be disastrous.

- All aspects of land use planning through local and regional planning systems to minimise infrastructure and property impacts from floods.

The scientific literature makes clear that we have nowhere near enough knowledge to claim that we can understand the hydrological dynamics of floodplains and thus plan for effective mitigation.

The only solution is to exclude any further coal and gas development on the floodplains of the Queensland Murray Darling and all other southern Queensland rivers which flooded during the 2010/2011 wet season, until we have sufficient knowledge about the cumulative impacts of mining and gas drilling.

It is not sufficient to simply exclude mines and wells from strategic cropping land given the catchment-wide damage that flooded mine and gas water releases cause.

Regional Land Use Planning is required to determine where and how many mines and gas wells that the Condamine Balonne and Queensland Border River catchments could possibly sustain before any further approvals are given.

Regional Land Use Planning should be undertaken for all catchments where the coal and gas sectors are currently exploring.

We need to follow the example of the Mekong River Commission and ensure that land-use activities are consistent with the flood hazards of particular regions.

Such planning decisions cannot be made until thorough studies have been undertaken of the cumulative impacts of mining and gas drilling operations on water resources. This would need to include the impacts of clearing and land disturbance.

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2 The report of the Senate's Environment, Communications and Arts References Committee, *The Impacts of Mining in the Murray Darling Basin*, 2009, p. 13. Available at http://www.aph.gov.au/senate/committee/eca_ctte/mining_mdb/report/index.htm . Accessed 28 March 2011.

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[4] QGC Environmental Authority.

[5] Coordinator-General's Report on the Environmental Impact Statement: Australia Pacific Liquefied Natural Gas—APNG Project, p. 87. Available at http://www.dip.qld.gov.au/resources/project/aplng/coordinator-generals-report.pdf. Accessed 28 March 2011

6 See conditions imposed in part 2 of the Coordinator-General's Evaluation Report for an Environmental Impact Statement: Gladstone Liquefied Natural Gas—GLNG Project, p. 202. Available at http://www.dip.qld.gov.au/resources/project/gladstone-liquefied-natural-gas/cg-report-gladstone-lng .pdf . Accessed 28 March 2011.

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[14] Bartley *et al*, 'Runoff and erosion', p. 3317.
[15] Coordinator-General's Evaluation Report for an Environmental Impact Statement: Gladstone Liquefied Natural Gas—GLNG Project, p. 87. Available at: http://www.dip.qld.gov.au/resources/project/gladstone-liquefied-natural-gas/cg-report-gladstone-lng_.pdf. Accessed 28 March 2011.
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[27] Hart, *Review of the Fitzroy River Water Quality*, pp. 15-16.

[28] *Study of the cumulative impacts*, pp. 19, 33.
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[29] Hart, *Review of the Fitzroy River Water Quality*, pp. 20-21.

[30] *Study of the cumulative impacts*, p. 28.
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[31] Hart, *Review of the Fitzroy River Water Quality*, p. 10; see also Queensland Conservation Council, Decline of the mighty Fitzroy River, Queensland's Murray, available at: http://www.qccqld.org.au/index.php?option=com_content&task=view&id=192&Itemid=36. Accessed 28 March 2011.

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[33] *The Impacts of Mining in the Murray Darling Basin*, p. 19.
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