APPENDIX D

RESPONSE FROM AQUATIC SPECIALIST

1) Introduction

As part of DEA's comments on the Final EIA Report, the Department indicated that the recommendations in the Aquatic Impact Assessment are deemed incomplete as they do not adequately quantify and assess the cumulative and residual impact of the proposed development on aquatic species as well as wetland habitats, on and around the proposed site. The response from the Aquatic Specialist (Enviross) follows.

2) Response from Enviross

The establishment of Smithfield Dam will create an impassable migratory barrier. The cumulative impact at the local scale is small (as there are only minor barriers at present within the river system), but is large at the regional/national scale. Habitat fragmentation is regarded as one of the leading causes of fish population declines and fish conservation in general throughout the country (and globally). The barrier (i.e. dam wall) falls within a river reach that does not support fish species that are considered to be of conservational significance. Although the barrier will preclude access to spawning areas for breeding fish and inhibit recruitment from downstream to increase populations and genetic variation of the populations located upstream of the barrier, this will not put species under threat. There are many alternative spawning areas and areas suitable as nursery areas for young fish within the river reach. It will, in the long term, weaken the vigour of the populations through limiting genetic diversity, however. This is something that is a characteristic consequence of all major migratory barriers and not just that if Smithfield Dam.

Creating an impassable barrier within a river relatively close to the coast means that eel migrations will be cut off. Again, at the local scale where no other barriers to this group exists, the cumulative impact is low. At a regional/national scale, the cumulative impact is rated as high. There is a direct consequence to the survival of this group of species through the establishment of an impassable barrier. A portion of the population will survive by inhabiting the riverine habitat downstream of the barrier, but it will impact the populations. The distance of Smithfield Dam from the coast is such that the significance of this impact is reduced as habitat remains available to them downstream of the barrier. These are all impacts that cannot be realistically quantified. The significance of establishment of the gauging structures associated with the dam is reduced/negated by the existence of the actual dam.

The transformation of a riverine (lotic) to standing water (lentic) habitat and the subsequent drowning out of habitat – relatively shallow, flowing water with a cobble/gravel substrate is

common throughout the river reach. This habitat type (biotope) is regarded as one of the most productive biotopes within a freshwater aquatic environment. Under natural conditions, sunlight is able to penetrate the water column to allow for balanced algal growth on the substrate that supports high populations and diversity of aquatic invertebrates (a food source and substrate for breeding), which, in turn, supports fish. It is also used as breeding and feeding habitat for fish. This habitat type therefore provides the platform for an important step in the aquatic food chain. Maintenance of this biotope relies on hydraulic functionality of the river (maintenance of adequate baseflow in order to inhibit undue settlement of sediments and consequent smothering of the substrate, as well as regular flood events to flush sediments that have settled). Reducing the velocity of the water through inundation (drowning out) will cause sedimentation and ultimate smothering of this substrate. Reduction of flow also reduces oxygen saturation within the substrate areas. This, together with settlement of silts, debris and sediment, creates a dead zone. This compounds with depth. Loss of this productive habitat leads to displacement of habitat-specific species and substrate-dwelling invertebrates, making the overall system generally less productive. Inundation of this habitat type also has in influence on water quality as a productive system tends to be able to self-regulate (to within limits), but removal of oxygenation and associated biological activity means that there will be a deterioration of water quality and the capacity of the system to self-regulate and to buffer imbalances. This habitat type is relatively common throughout the river system and therefore, at the local scale, this will not be overly significant, but the cumulative loss of this habitat type at the regional/national scale is regarded as being high.

Another consequence of habitat transformation will be the transformation of aquatic biota species community structures. As mentioned, substrate-dwelling invertebrates will be displaced. Substrate-dwelling fish species will also be displaced. Fish species that inhabit the riffle/rapid habitat types will also be displaced. The transformation to a lentic environment will favour certain species such as some exotics within the system (common carp, bass, etc) as well as some indigenous species (catfish, tilapian species, etc.). Although yellowfish require riffle habitat for breeding purposes, they often do well within impoundments. From an ecological perspective, this shift in community structures is deleterious, but from a socio-economic perspective, it could be beneficial. The species that do well within impoundments are generally target species for angling – especially for subsistence. This could benefit the residents that reside along the watercourse.

Other water quality implications resulting from the habitat transformation will also impact the downstream river reach. Water chemistry within the impoundment is modified through being retained within the actual impoundment. Changes in temperature, sediment load, electro-conductivity and total dissolved/soluble solids, oxygen content and pH are all as a result of the impoundment. The severity of this is largely determined by the depth of the draw-off within the

impoundment. If deeper water is released, then the significance is higher, and conversely, if shallower water is released, then the significance is lowered. It is thought that the overall impacts of transformation of the water quality as a result of the dam over the long term will not have an overly significant impact on the aquatic biota inhabiting the system downstream of the site. The severity of this, however, is largely dependent on the catchment management, with aspects such as erosion, toxicants that enter the system, etc all having an impact.

All of these impacts mentioned above will remain as residual impacts and will remain throughout the lifespan of the infrastructure. The infrastructure is of a scale that removal and rehabilitation of the watercourse is highly unlikely in the future.

The wetland units associated with this inundation footprint of Smithfield Dam area are dominated by floodplain wetlands (limited in extent due to the river valley) and some seep zones. Wetland habitat is generally limited in extent as the river within the survey area is a mature riverine watercourse. Some side tributaries do occur where hillslope seep zones dominate, but these are not within the inundation footprint area and will therefore not be impacted. Wetland loss due to the inundation of the dam will be relatively insignificant. The cumulative loss of wetland habitat within the area will also be relatively minor. The periphery of the dam will have shallow areas with emergent vegetation that will allow for the continued support of most riparian/wetland biota.

Wetland loss due to the establishment of the balancing dam will be a of greater significance. Established wetland areas will be lost as a result of the construction of the dam. The proposed dam area occurs within the upper reaches of the watercourse, where wetland habitat units dominate and feed the watercourse further downstream. Provision of habitat for wetland-dependent species is one of the major functions of these units. This will be largely lost due to the inundation of the area and species will be displaced. Cumulative loss of wetland habitat within the area is relatively high as it falls within an agricultural and forestry area. Farmers within the area, however, tend to farm with conservation in mind and therefore existing wetland units tend to be conserved. All of the wetlands within the agricultural area, however, do suffer fringing impacts from agriculture and forestry. The cumulative loss of a functional wetland unit does remain relatively high. Again, the periphery of the inundation footprint area will provide emergent vegetation, which would be regarded as a habitat substitute for the wetland-dependent species. Once the construction phase is complete and the disturbance impacts are greatly reduced, the biota would re-inhabit the area. Although at a lesser density, the biota is expected to return and re-establish. Much of the wetland flora will, however, be lost, and will be limited to a band around the periphery of the waterbody rather than being dominant as it was originally. This is also a residual impact that will remain.

The general impacts of the construction phase will not be limited to only the inundation areas and infrastructure footprint areas. Services, access and support areas will also be required further afield to accommodate the construction. Once the construction phase is completed, and all the support infrastructure (onsite offices, storage facilities, etc.) and equipment has been removed, then those impacted areas can be rehabilitated. Within a relatively short period those areas could show little to no residual impacts.

3) Biodiversity Offsets

The freshwater resources within the four target recipient sites were assessed on a systems level, and were found to be in moderately modified condition, although of high to very high Ecological Importance and Sensitivity despite the decreased ecological integrity.

A like for like riparian zone offset initiative was developed. Riparian areas have been identified in three areas adjacent to the Smithfield Dam for rehabilitation at three strategic points around the dam. These areas can be summarised as follows:

- A length of the uMkhomazi River of 9km downstream of the proposed dam wall;
- A length of 3km on a tributary of the Umkhomazi River to the south of and entering the proposed dam; and
- A length of the uMkhomazi River of 4.5 km upstream of the full supply level of the dam.

For Smithfield Dam the wetland target was determined to be 11:1 with a minimum offset ratio of 5:1 which will lead to the conservation of 248 ha. The same targets were determined for the Langa Balancing Dam, which will lead to the conservation of 176 ha. The envisaged interventions to take place as part of the offset to achieve the functional wetland hectare equivalent targets include wetland and watercourse restoration measures such as alien vegetation management and erosion control.

4) Ecological Water Requirements

Smithfield Dam's outlet works are designed to release water for the Ecological Water Requirements (EWR) and downstream water users.

The EWR downstream of Smithfield Dam was determined from the daily flows as measured at gauging weir U1H005. Flow gauging weir U1H005 latitude 29°44', longitude 29°54' and catchment area 1 744 km² is located approximately 11.4 km upstream of the proposed Smithfield Dam site. These daily flows were patched, naturalised and provision for catchment development to 2050 was modelled in these flows. The target flows to be released from Smithfield Dam to meet the EWR are provided in Section 9.3.3.2 of the Final EIA Report.

5) Fishway

The establishment of Smithfield Dam will result in a substantial migratory barrier within an otherwise open system. The viability of implementing a fishway as a means to mitigate habitat fragmentation was explored through meetings where project managers, engineers and ecologists workshopped various options and alternatives. It was concluded that the implementation of a fishway was not feasible due to economic, technical, operational and topographical constraints. The EIA recommended that the Resource Management Plan to be developed for Smithfield Dam should needs to investigate the feasibility of trap-and-haul or selectively catching appropriate fish species downstream of the dam and physically transporting and releasing these fish upstream of the dam wall, which may serve as a more practicable option than a fishway. This needs to be explored with the involvement of a suitably qualified ichthyologist.