



Pennyville Extension 1

A new benchmark project for low-cost housing developments

ALTHOUGH FROM 1988 to 2000 the City Engineering Department of Roodepoort investigated the possibility of developing the farm Paardekraal in Soweto, this was never realised due to difficulties experienced with bulk engineering services in the area. The site was also zoned as mining land and later rezoned as industrial land. Due to the high demand for low-income housing in Gauteng, the process of rezoning the land as residential commenced in 2005 when the Pennyville Extension 1 project was launched.

The project resulted from a land exchange agreement between Pennyville Zamimphilo Relocation Pty (Ltd) (PZR) and the City of Johannesburg Metropolitan Municipality (COJ). This agreement required PZR to develop the Pennyville land on behalf of the COJ's Department of Housing and, in exchange, PZR received the Riverlea Extension 3 land on which all civil engineering services had been constructed by the Northern Metropolitan Local Council in the 1990s. Riverlea required limited upgrading and maintenance

of the roads and storm water infrastructure in order to market and build bonded houses on the development.

EXTENT OF THE PENNYVILLE PROJECT

The Pennyville Extension 1 property is 99,5 hectares in extent and consists of 1 117 RDP-type units on Residential 1 stands and 1 693 units in two-storey and three-storey buildings on Residential 3 stands. The Residential 3 stands are being registered as Section 21 companies under the names of the Johannesburg Social Housing Company (Pty) Ltd (JOSHCO) and ABSA, who will manage the units as 'rental stock' to the public.

The layout also makes provision for one school site, three crèche sites, one business site and five public open space sites.

PZR appointed a professional team of consultants and contractors to assist them in implementing the project. As there was some urgency to the project, it had to be undertaken in four phases in order for design and construction work to run concurrently.

1 An aerial view of Pennyville Extension 1. The three-storey buildings are nearing completion

The scope of works for the construction of all civil engineering infrastructure was as follows:

- one signalised intersection with New Canada Road to give access to phases 1 and 2
- 7 500 m of roads, 7 m, 6 m and 5 m wide, which would be bitumen-surfaced, with kerbs, and a combination of storm water channels and pipe systems
- 3 800 m of paved access strips, 2,4 m wide
- 3 500 m of pedestrian paths along main routes in all phases
- one storm water attenuation pond per phase
- 11 640 m of internal water reticulations and 10 228 m of sewer networks
- 1 187 m of link sewers and the upgrading of the existing Noordgesig link sewer from a diameter of 160 mm to 200 mm
- upgrading of the existing Noordgesig bulk water meter, pressure-relief valve



and associated fittings from a diameter of 100 mm to 150 mm (belonging to Johannesburg Water (Pty) Ltd (JW))

- new bulk water connection (300 mm diameter) for Rand Water (Pty) Ltd (RW), including meters, pressure-reducing valves and associated fittings and chambers
- cathodic protection for the new steel link water pipeline (350 mm diameter) and RW/JW valve chambers
- 4 238 m of boundary walls around all phases of the development

Other projects that form part of PZR's contract with COJ are the construction of a new outfall sewer (2 km long) with diameters ranging between 160 mm and 600 mm to serve phase 4 and future developments to the north of phase 4, and a pedestrian bridge over New Canada Road to link the Pennyville community with the New Canada Metrorail station and the future Bus Rapid Transit (BRT) station on New Canada Road. The environmental impact assessment process is reaching completion, with the Record of Decision expected by September 2008 for the outfall sewer and the pedestrian bridge having gone out on tender at the end of August 2008. The design of the realigned New Canada Road, including the BRT and the civil services for the BRT station, has also been completed.

The project is funded by COJ's Housing Department through the Municipal Infrastructure Grant and has a construction value of approximately R60 million, excluding VAT and professional fees.

PEDESTRIAN ACCOMMODATION

One of the main objectives of the town planning approach was to create a pedestrian-friendly development where the community would be able to move around

freely with a limited risk of being run over by motor vehicles. The main aim was to utilise to the full most of the areas between houses for pedestrian movement.

This was done by limiting the number of 5 m wide internal roads and constructing 2,4 m wide access strips between rows of houses. A typical block with four rows of stands will have three access strips between the rows of stands to link pedestrians and the occasional vehicle to the 5 m wide internal roads. In order to accommodate storm water between the houses, the access strips were constructed with 60 mm interlocking paving blocks to a V-channel shape with a 3% fall to the centre of the strip. The storm water is discharged onto the internal roads at the end of the access strip, from where it is drained to a storm water pipe or channel leading to an attenuation pond. The access strip creates the impression of a private walk or driveway to the houses and is shared by the inhabitants of the two rows of houses. Due to the low-income nature of the development, the access strips are used almost exclusively by pedestrians, thus creating a safe environment for children to play around their houses.

Since public transport will be the major transport mode used by residents, pedestrian paths were constructed along all the main routes to lead pedestrians to the intersections with New Canada Road and the pedestrian bridge over this road. During peak periods, nearly 4 000 commuters will access public transport at various locations near Pennyville, most notably at New Canada Metrorail station, along New Canada Road and at the BRT station, which will be accessible from the pedestrian bridge.

To make it safe for pedestrians to walk

along the walkways at night, street lighting has been provided along all walkways on both sides of the road.

In order to discourage the community from going onto the adjacent N17 freeway, New Canada Road (class 3 minor arterial) and the railway reserves, walls are being constructed along all the boundaries of Pennyville.

CHALLENGES

Existing outfall sewers

The link sewers of each phase drain to four different locations where they discharge into the Klipspruit relief outfall sewer, the minor drop structure number 1 of the Bushkoppie outfall sewer and the Noordgesig link sewer. One of the prerequisites of JW before they would approve the township application was that it had to be proved that these sewers possessed the available spare capacity. A sub-contractor was appointed to do ultrasonic flow depth measurements which were then used to determine the existing flow rates and available spare capacities. The existing above-ground steel Klipspruit relief outfall sewer into which phase 4 would discharge had to be inspected by means of closed-circuit television (CCTV) and jetted clean of any evident blockages before the link sewer of phase 4 could be connected to it.

Developing on rock outcrops

The site is underlain primarily by relatively shallow quartzite bedrock of the Witwatersrand Supergroup which outcrops in phases 3 and 4 of the development. Due to the 80% to 95% rock in phases 3 and 4, a shortage of bedding material for pipe trenches was experienced. To solve this problem, excavated material from the storm water attenuation



- ② Members of the community making use of the 2,4 m wide access strips between houses
- ③ Mothers and children making use of the pedestrian paths on their way to the Pennyville Creche. The two-storey buildings in the background are nearing completion
- ④ Construction of the new 300 mm Rand Water connection to Pennyville. A 10 bar under pressure cutting of the 1 400 mm Rand Water steel main was required to install the new rig
- ⑤ Casting of the new 8 m long Johannesburg Water bulk water meter chamber

ponds of phase 1 and from a small borrow pit on the school stand in phase 2 were used as a source for bedding material and topsoil for finishing on the road reserves. The borrow pit had to be backfilled and rehabilitated at the end of the project. Blasted rock was processed by a mobile crusher plant on site to obtain material for the base and subbase pavement layers of selected roads.

The rocky areas of phase 4 meant very expensive service crossings for the two RW pipelines of 1 400 mm and 1 100 mm in diameter respectively. Controlled blasting near the RW pipelines was one of the critical safety aspects in which the measurement of seismic activities played an important part.

Two contractors

Having two contractors (civil and building) on the same site simultaneously posed a challenge in itself, with integrated planning, possible damage to infrastructure during construction and control of stand pegs being subjects for regular discussion

during site meetings. In retrospect one can say that the effective management of the two types of contractor is a very important aspect that can influence the successful implementation of a project and should not be underestimated during site supervision.

PROBLEMS ENCOUNTERED AND INNOVATIONS

Sealing of mine shafts

A portion of phase 2 includes a mining belt on which mining was practised in days gone by. The areas suspected of being undermined are zoned as public open space and the storm water attenuation pond for phase 2 is located on a portion of the undermined area. While excavations for the storm water attenuation pond and storm water pipe trenches were going on, three abandoned inclined mine shafts were exposed. These shafts were inspected by a senior inspector of mines from the Department of Minerals and Energy who declared it safe to seal the shafts. Guidelines for the permanent sealing

of mine shafts, according to the Mine Health and Safety Act, 1996 (Regulation 5.6.1), were followed in designing the sealing of the shafts. Two reinforced 28 MPa concrete slabs, 450 mm thick, were cast into the surrounding bedrock with backfill material being compacted on both sides of the slabs.

Extension of sewer breather pipe

The minor drop structure of the Bushkoppie outfall sewer is also situated on phase 2 of Pennyville and was designed to give the surrounding areas an access point for discharging sewage into this outfall sewer tunnel, which is up to 30 m deep in certain sections. An existing breather pipe for ventilating the structure caused an unpleasant smell and posed a health hazard to the adjacent crèche stand, which resulted in the pipe being extended to make it 5,5 m high.

New Canada Road

New Canada Road traverses Pennyville between phases 2 and 4 and will be re-



igned vertically and horizontally due to insufficient sight distances and to ensure safe access to Pennyville, the future N17 freeway that will cross below New Canada Road, and the additional road widening required for the implementation of the BRT project. The N17 freeway will traverse phases 3 and 4 of Pennyville.

New Canada Road is part of the BRT route currently being upgraded by the Johannesburg Roads Agency (Pty) Ltd (JRA) and the Johannesburg Development Agency (Pty) Ltd (JDA) on behalf of the COJ. The aim of the BRT project is to encourage commuters to make use of the BRT transport system and help alleviate the traffic congestion that the city is currently experiencing.

It includes the two centre lanes that will become dedicated bus lanes with bus stations placed strategically in the centre of the road.

At this stage it is almost certain that the realignment of New Canada Road and the two roads giving access to Pennyville will be constructed by the contractor appointed for the N17 freeway, as soon as a variation order for the same is approved by the COJ and the South African National Roads Agency Limited (Pty) Ltd (SANRAL). SANRAL has appointed the Nasweto Highway Joint Venture for the construction of the N17 freeway, the upgrading of Nasrec Road and realignment of New Canada Road.

Different design and construction phasing between Pennyville and the N17 (and New Canada Road) resulted in a four-month construction delay for Pennyville due to a scope overlap that could not be finalised in time by the authorities.

The completion of New Canada Road is expected only towards the end of 2009. A bypass road through phase 2 of Pennyville will ensure safe access to phases 3 and 4 while New Canada Road is under construction.

SETTING NEW STANDARDS FOR LOW-COST HOUSING DEVELOPMENTS Planting of trees and grass

PZR planted trees and grass around all the houses in the development, with the aim of uplifting the community's morale and setting a new benchmark for low-cost housing developments.

Storm water design

Storm water accommodation is one aspect of the civil services that makes Pennyville stand out above other low-income developments as acknowledged by the representative of the JRA in the area when he indicated, "Pennyville certainly has the most impressive storm water system I have ever seen in low-cost developments."

The minor and major storm water drainage systems were designed to accommodate 1 in 5 years and 1 in 25 years design floods respectively. The system is a combination of surface and underground pipe systems that collect storm water on roads, at low points and, where justified, before the intersections of roads. These pipe and surface systems connect to storm water attenuation ponds before discharging

- 6 Typical service trench during excavation and blasting in phase 4 showing large rock percentages
- 7 Rock breaking around the Rand Water bulk mains for a very expensive service crossing
- 8 One of the inclined mine shafts exposed while excavating for the storm water attenuation pond in phase 2 of the Pennyville project
- 9 The storm water attenuation pond for phase 1 under construction
- 10 The storm water attenuation pond for phase 1 nearing completion. All areas of the pond were hydroseeded to prevent soil erosion and limit silt washing into the streams
- 11 The outlet and overflow structure of the storm water attenuation pond in phase 1



into streams adjacent to the development. The aim is to prevent flooding or damage to adjacent property, as well as to allow emergency vehicles to travel on internal roads.

PROJECT PROGRAMME AND COSTS

Construction of the civil engineering services commenced on 31 July 2006. The scheduled completion date of 30 November 2007 was extended to 16 May 2008 due to the unfinalised planning issues regarding New Canada Road and the BRT. The total construction costs of the internal and bulk roads and the services for Pennyville amount to R35 million and R24 million (excluding VAT) respectively. The planned commencement date for construction of the pedestrian bridge is November 2008 and it has an estimated construction value of R5 million. The New Canada Road realignment has an estimated construction value of R73 million, which includes the bridge over the N17 freeway, and will commence as soon as a variation order has been issued to the Nasweto Highway Joint Venture.

CONCLUSION

Developing this low-cost housing development on rezoned mining land proved to be challenging, but has also turned out to be a very successful project by the COJ Housing Department and its implementing agents. Pennyville is proof that it is possible for private companies and government to work together in unconventional agreements to effectively reduce the backlog in low-cost housing and to create a low-cost development of high quality. □

PROJECT TEAM

Client: City of Johannesburg, Department of Housing

Developer/Turnkey contractor: PZR (Pty) Ltd

Town planner: CTE Regional and Town Planners

Consulting engineer: Bigen Africa Services (Pty) Ltd

Civil contractor: Civtek cc

Building contractor: Sea Kay Engineering Services (Pty) Ltd

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Source:

http://www.saice.org.za/downloads/monthly_publications/2008/CivilSep2008/#/0