

**JOHANNESBURG ROADS AGENCY
UPGRADING OF GRAVEL ROADS TO SURFACED ROADS PROJECT IN
GREATER JOHANNESBURG 2002-2005**

EXECUTIVE SUMMARY

The City of Johannesburg is faced with a tremendous backlog in terms of roads in formal townships that are not paved. Of the total approximately 12 000 kilometers of road infrastructure under management of the Johannesburg Roads Agency (JRA), 977 kilometers was classified as formal gravel roads with a further 405 kilometers classified as informal gravel roads in 2002. The capital requirement for upgrading to surfaced roads, together with the maintenance cost associated with gravel or unpaved roads, presented a serious challenge to the JRA.

In an effort to simultaneously, expedite delivery at minimum cost and reduce present and future maintenance costs, the Johannesburg Roads Agency opted for an **innovative delivery approach** in calling for turnkey proposals during their 2002/03, 2003/04 and the 2004/2005 financial years. Due to the success of the process in 2002/03, nine different consortia were appointed on sixteen different projects for a value exceeding R280 million, all managed by a separately appointed programme manager in the 2003/04 financial year. In 2004/2005 seven different consortia were appointed for a total value exceeding R100 million.

In total 242 kilometers of road and associated local and bulk storm water infrastructure were constructed. In total over 200 000 person days of work was created and in excess of R80 million was retained by the communities upon completion of the contracts. In addition to this numerous local subcontractors have been empowered as a result of these contracts and 1161 community members have been trained in various skills.

Emphasis on the older parts of Soweto proved to be politically correct with the following townships receiving a complete level of service with regards to roads and storm water for the first time since establishment:

- Klipspruit (Established 1904)
- Pimville (Established 1917)
- Orlando East (Established 1932).

The third phase of this programme will ensure that the entire older part of Soweto have access to tarred roads and complete storm water infrastructure by December 2005.

In a number of areas the installation of local and substantial bulk storm water infrastructure was required which had a significant positive impact on the environment.

BACKGROUND

During its first year of existence (2001/02) the JRA let 35 fast track design and open market construction contracts. Although 80% of the capital budget was spent, several problems were experienced as a result of letting so many contracts to so many companies, several of which were inexperienced and lacked financial backing. This ultimately placed undue risk with the JRA. As a result of this and the success of their turnkey approach to the developments required for the World Summit, the JRA opted for a turnkey approach in 2002/03 and again in 2003/04.

The JRA through their vision realized that for a program of this nature and magnitude the design and construct process first called for the appointment of a programme manager, who is required to act in the interest of the client where the traditional role of the consulting engineer is affected through its relationship with the contractor.

The programme manager acted as an extension to the Client, providing independent support which would normally be provided by the design consultant in its conventional role

The JRA appointed iNtatakusa Consulting as the programme manager for the 'Upgrading of gravel roads to surfaced roads 2003/2004' programme in August 2004, after the company successfully performed the function during turnkey projects rolled out in the previous financial year.

Through their demands on the programme manager the JRA was provided with innovative solutions with regard to the following:

- Development of turnkey tender evaluation criteria,
- Preparation of relevant standard contract documentation,
- Preparation of standard monthly reporting formats,
- Evaluating and implementation of innovative designs,
- Co-ordination of site and design meetings in order to optimize the input of JRA officials,
- Co-ordination and negotiating with regard to variations,
- Monthly project reports,
- Co-ordination and certification of all payments,
- Monitoring of quality on site,
- Identification of roads for construction for future programmes
- Administration and evaluation of ad-hoc quotations and tenders included under the programme,

- Development of OHSWA specification and standard documentation
- Marketing of the JRA initiative through publications in the printed media
- Feedback to the learned fraternity
- Ad-hoc support on an as and when required basis.

In 2002/03 the JRA awarded contracts to only five design and construct consortia on eleven different contracts with a total value of approximately R91 million. A total of approximately 68 kilometers of roads were constructed in the areas of Soweto, Orange Farm, Vlakfontein, Ivory Park and Kaalfontein.

During 2003/04 total length of 168 km of surfaced roads was constructed, which was 108 km more than the initial award expected length of 60 km. The entire programme was completed for approximately R280million.

INVOLVEMENT OF CIVIL ENGINEERS

The structure of turn-key projects requires the involvement of Civil engineers in a number of different and new environments each of which are discussed in more detail below.

Civil Engineers involved by the Client

A mayor contributor to the success of the programme was the fact that the client was knowledgeable in terms of the Civil Engineering industry. Particularly the JRA is managed by a Civil Engineer and the Capital Implementation Division is also run by a Civil Engineer. Further to this the Capital Implementation Division made available Project Management resources comprising four people also qualified in the Civil Engineering field.

The client further took on the responsibility of approving the detail designs which was performed in-house by a Civil Engineer.

Civil Engineers involved by the Programme Manager

The appointed Programme Manager was tasked with a number of functions normally associated with the Consulting Engineer in the conventional approach of design and then construction under separate appointments. This required their team to have the necessary skills to adequately provide these civil engineering functions and to advise the client on issues where the involvement of the traditional role of the consulting engineer is affected through its relationship with the contractor. The programme manager made available the services of seven qualified Civil Engineers on this programme.

Civil Engineers involved by the Contractor

The traditional role and responsibility of the contractor changed significantly when compared with the construction responsibilities associated with conventional construction projects due to the fact that he was now required to accept full responsibility for the construction and the design. This required that each contractor had to employ the services of a consulting engineer or had to enter in some sort of working agreement for the provision of such services. Typically a design team would consist of a design over viewer, a design engineer, design technician and or draught person and site supervisory personnel. In addition hereto the contractor would provide a contract manager and site agent normally from the civil engineering fraternity.

Considering the fact that sixteen different projects were awarded approximately 112 Civil engineering personnel was employed under this programme.

CO-OPERATION WITH COMMUNITY AND OTHER AFFECTED PARTIES

Communication structures

The size and nature of the programme required that the lines of communication be clearly defined at all times. In order to have the community informed at all times two parallel approaches were followed.

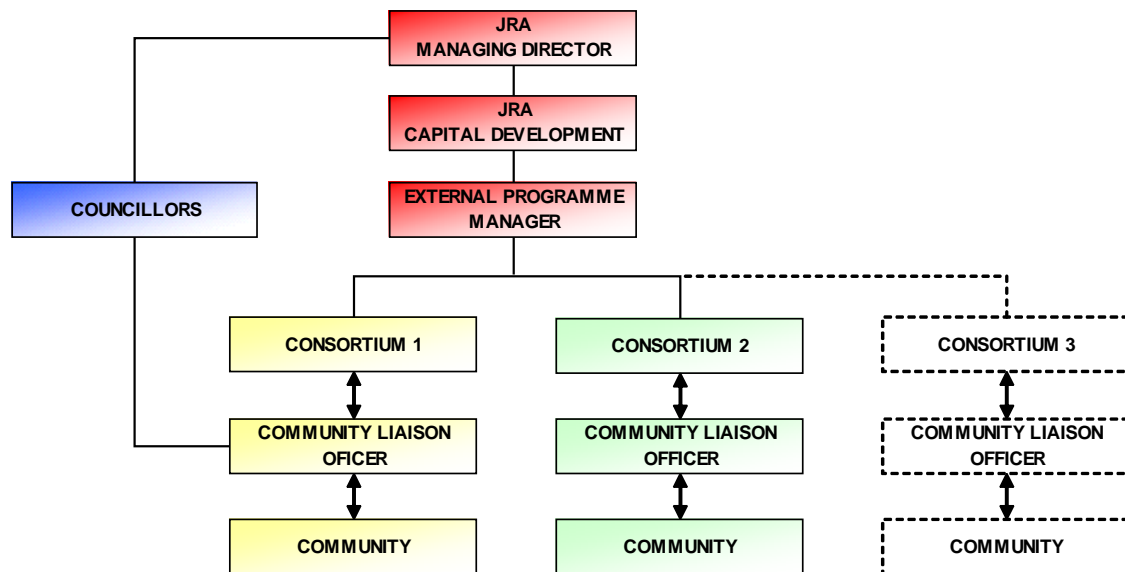
The first approach involved a councilor briefing session presented by the Managing Director of the JRA where the councilors were informed of the principles of the process, the contractors who were appointed, the lines of communication to be followed and the minimum service level that would be provided.

The second approach involved the appointment of a local Community Liaison Officer (CLO) in consultation with the affected ward councilor and local community. This CLO then became responsible for channeling all communication matters such as

- Local labour,
- Sub contractors,
- Availability of local suppliers,
- Training requirements, and
- Community retained earnings.

The contractors were responsible to obtain all relevant way leaves and for all communication required in this process. The Programme manager did however oversee and co-ordinate this function on levels where it made sense to centrally co-ordinate the process e.g. arranging with Johannesburg Water for the co-ordination of their G'Cina Manzi programme which involved the upgrading of water and sanitation services.

The organogramme below graphically illustrates the lines of communication.



COMMUNITY RETAINED EARNINGS

It was a target of the contract that at least 30% of the project budget be spent within the affected community through the utilization of local labour, payment to sub-contractors, local purchasing of material and fuel, etcetera.

At project completion the total retained community earnings was 24.25%. The overall target of 30% was not met due to the fast track nature of the project, and the significant increases in the budget late in the financial year, (R39.9 million was added to the programme in February 2004 and R114,8 million was added during April 2004). As a result the consortia were forced to use less labour intensive construction techniques which had a negative impact on community retained earnings. The total amount spent within the community was R67.9 million compared with the target set at R84 million which in itself was a significant achievement considering the required construction rate.

LOCAL LABOUR

Local labour was utilised for all construction activities which involve labour intensive activities. The labour was sourced from the area agreed to by the local community and every consortium appointed a Labour Desk Officer (LDO) for assisting them in the appointment of these labourers.

In total this programme created 142 243 person days of work in the local communities. Based on a single job being 110 days of work, a total of 1293 jobs were created as a result of this programme. At an average rate of R72 per person per day this equates to R10.24 million which is a substantial figure considering the actual construction time available since the award of the contracts.

These figures exclude the local labour who was employed by the subcontractors and are therefore even more impressive should all these job opportunities be added to the above figures.

TRAINING

The programme made provision for both informal and formal (accredited) training. The training courses were selected by the community in collaboration with the contractor's requirements in terms of demand for special skills for the purposes of construction.

Where courses such as life-skills are for the general benefit of the community, the contents of these courses was selected by the community.

The people who were elected to receive training were identified by the community and their names were put forward through the Community Liaison Officer (CLO).

All CMIP funded projects received formal accredited training and the in many other instances formal accredited training was provided through the contractor. The table below summarises all the training provided through the programme. In total 1161 people received training.

Area	Consortium	Type	Training (No. People Attending)			
			Male	Female	Youth	Total
Orange Farm and Poortjie	Lefika UWP Nyeleti Consortium	Skills Training	6	6		12
		Supervisory Training	6	6		12
		Entrepreneurial Training	6	6		12
Vlakfontein Proper	Ulwazi Emyreal Consortium	Establish Health and Safety on site	5			5
		Concrete and Masonary work	4			4
Vlakfontein Ext 1, 2 and 3	Ulwazi Emyreal Consortium	Establish Health and Safety on site	9	1	0	10
		Concrete and Masonary work	8	1	0	9
Soweto - Doornkop, Dobsonville, Mofolo, Dube, Moroka, Zondi	Dicon Africa	On-site training (concrete , bricklaying, asphalt)	19	9	56	84
Soweto - Naledi, Zola, Jabulani, Moletsane, Chiawelo, Protea	Siyakha Umgwaqo Consortium	CLO Training	4	6	0	10
Jabavu	Twelopele Tseleng	Base Course Construction	4	4	4	12
		Kerb Laying	4	4	4	12
		Basic Financial Life Skills	4	4	4	12
Bram Fischerville	Dicon Africa	Kerb Laying and Trapezoidal drains	17	8	0	25
Meadowlands	MBS Blacktop Nabcat	Local Labour used and trained	12	6		18
Orlando East	Lifika UWP Nyeleti Consortium	Skills Training	7	1	0	8
		Supervisory Training	6	6	0	12
		Entrepreneurial Training	9	3	0	12
Pimville	V&V Consortia	Health and Safety Representative Course	74	24	379	477
		First aid Course		(Sub-contractors)		
Kaalfontein	Bophelong JBC	Technical	50	0	35	85
		Admin	5	0	5	10
		Life Skills	60	10	11	81
Ivory Park	Bophelong JBC	Technical	5	1	6	12
		Admin				
		Life Skills				
Diepsloot	Bophelong JBC	Technical	125	10	75	210
		Admin	1	0	0	1
		Life Skills	0	0	0	0
Meadowlands and Mapeta	Lifika UWP Nyeleti Consortium	Skills training	4	4		8
		Supervisory Training	4	4		8
TOTAL CUMULATIVE PEOPLE TRAINED TO DATE			458	124	579	1161

SCOPE OF THE WORK

The table below summarize the extent of the work constructed with regards to surfaced roads only.

Project Area	Original area to be Constructed (m ²)	Total area Constructed (m ²)	Total Length Constructed (km)
Orange Farm and Poortjie	49,058	75,974	11.84
Vlakfontein Proper	10,048	23,460	3.88
Vlakfontein Extensions	31,924	31,704	5.11
Soweto - Doornkop	28,222	154,752	30.95
Soweto - Naledi	14,837	105,754	21.08
Jabavu	2,924	27,692	5.04
Bram Fischerville	10,678	39,570	6.51
Meadowlands	22,455	85,667	16.71
Orlando East	48,637	51,291	10.26
Meadowlands and Mapetla	0	35,294	7.06
Ivory Park - LUN	0	39,216	7.84
Pimville	67,955	83,091	15.54
Alexandra	4,332	0	0.00
Kaalfontein	13,647	41,018	7.90
Ivory Park	6,499	69,288	13.21
Diepsloot	12,131	18,052	3.24
Orlando West	12,680	11,711	2.34
Total	336,027	893,534	168.53

A summary of the construction activities undertaken in the Soweto area only is given below to indicate the diversity of the programme

Soweto - Naledi, Zola, Jabulani, Moletsane, Chiawelo and Protea

The upgrading of gravel roads in these areas were done by the Siyakha Umgwaco Consortium who applied appropriate technology in the construction of the roads and associated works such as kerbs and storm water.

The design of the road layer works allowed for the preparation of a 150 mm road bed and construction of a 125 mm C4 cemented sub-base layer and a 125 mm C4 gravel base layer, which was mechanically modified using at least 30 % imported crushed stone and 3 % cement stabilization

The surfacing consists of 25 mm medium, continuously graded asphalt as per the JRA's minimum requirements.

The contractor further opted for the use of extruded concrete kerbs which involved the installation of kerbs by means of a concrete extruder placing the wet concrete on the layer works in the predetermined shape.

Kerb inlets were installed at various critical points to accommodate the draining of storm water.

The finishing off of the sidewalks involved backfilling and compaction behind the kerbs and shaping of the verges with the planting of grass where the slopes required additional containment.



Doornkop, Zondi, Jabavu, Motapato, Mofolo, Dube, Mapetla and Senoane

The contract for upgrading in these areas was awarded to Dicon Africa Pty (Ltd). The application of appropriate technology to construct roads in a short as possible time was again a priority for this consortium.

In general their final road pavement structure consisted of 25mm continuously graded asphalt on a C4 base and an in-situ ripped and re-compacted roadbed layer. On the roads where geotechnical investigations revealed clay or less dense in-situ material and additional 150 mm sub-base layer was added on top of the roadbed.

This contractor also opted for extruded kerbs with pre-fabricated kerbs installed on smaller radii and where extrusion was otherwise limited in terms of operational space.

The roads were deigned to accommodate a typical rainfall event of up to a 1 in 5 year recurrence interval on the road surface with the flow widt for such an event not exceeding 40 % of the road width. Where the road capacity could no longer accommodate this flow kerb inlets were provided and linked to the existing underground storm water system.

The finishing off of the sidewalks again involved backfilling and compaction behind the kerbs and shaping of the verges for a width of at least 2m.

Jabavu and Senoane

Upgrading of the roads in the remainder of Jabavu in Senoane was entrusted to the Tswelopele Tseleng Consortium.

Similar to the other areas constructed their road design incorporated a 25 mm medium, continuously graded asphalt surfacing layer but their base layer consisted of either a C4 cemented base or G2 natural gravel imported base depending on the in-situ soil conditions. On the roads where geotechnical investigations revealed clay or less dense in-situ material and additional 150 mm G4 sub-base layer was added on top of the roadbed.



This consortium opted for the placement of pre-fabricated concrete kerbs with kerb inlets connecting to the existing storm water system.

Meadowlands

The upgrading of the gravel roads in Meadowlands was awarded to two consortia namely, LUN and Nabcat, NBS Blacktop consortium.

The Nabcat, NBS Blacktop consortium opted for either of two methods of constructing roads.

Where the existing conditions allowed the use of the Deep Insitu Recycling machine otherwise known as the milling machine, the roadway was prepared for deep insitu recycling and then recycled to a depth of 200 mm adding foamed bitumen.



Where the in-situ conditions were not favourable for deep insitu recycling, the road was constructed in the conventional manner with a 125 mm C3 cemented base, a 150 mm G6 natural gravel sub-base and an in-situ ripped and re-compacted roadbed.

LUN used conventional construction techniques with a 125 mm G4 natural gravel imported base, a 125 mm G5 natural gravel sub-base and an in-situ ripped and re-compacted roadbed.

The surfacing consisted of 25 mm medium, continuously graded asphalt and kerb inlets were installed at various critical points to accommodate the draining of storm water.

The finishing off of the sidewalks involved backfilling and compaction behind the kerbs and shaping.

Orlando East

The roads in Orlando East were upgraded by the LUN Consortium.

LUN used conventional construction techniques with a 125 mm G4 natural gravel imported base, a 125 mm G5 natural gravel sub-base and an in-situ ripped and re-compacted roadbed.

This consortium opted for the placement of pre-fabricated concrete kerbs. They accommodated the storm water by means of shallow v-shaped concrete lined side drains or kerb inlets and underground pipelines.

The sidewalk and verges were finished off similar to all the other areas for a minimum width of 2m.

Orlando West

The JRA Capital Works depot and V&V consortium was awarded the roads to be upgraded in Orlando West.



This area proved to be particularly rocky compared to the other areas and specifically V&V consortium experienced large quantities of rock which they had to remove by means of mechanical equipment.

The road layer works required that the rock be removed up to the founding level for the base layer which was then imported as a G5 natural gravel material for a minimum thickness of 150 mm.

The surfacing consisted of 25 mm medium, continuously graded asphalt and kerb inlets were installed at various critical points to accommodate the draining of storm water. Due to the low level of service which this area experienced until prior to the roll-out of this programme very little formal storm water drainage was in place and the contractor had to install major portions of bulk storm water pipes.



The finishing off of the sidewalks involved backfilling and compaction behind the kerbs and shaping.

Pimville

V&V consortium was awarded the roads to be upgraded in Pimville and because of the favourable existing conditions predominantly made use of the Deep Insitu Recycling machine.

The roadway was prepared for deep insitu recycling and then recycled to a varying depth of between 150 to 300 mm depending of subsurface conditions, with the top 150mm layer always stabilised with cement.

This consortium opted for the placement of pre-fabricated concrete kerbs. They accommodated the storm water by means of shallow v-shaped concrete lined side drains or kerb inlets and underground pipelines.



The sidewalk and verges were finished off similar to all the other areas for a minimum width of 2m

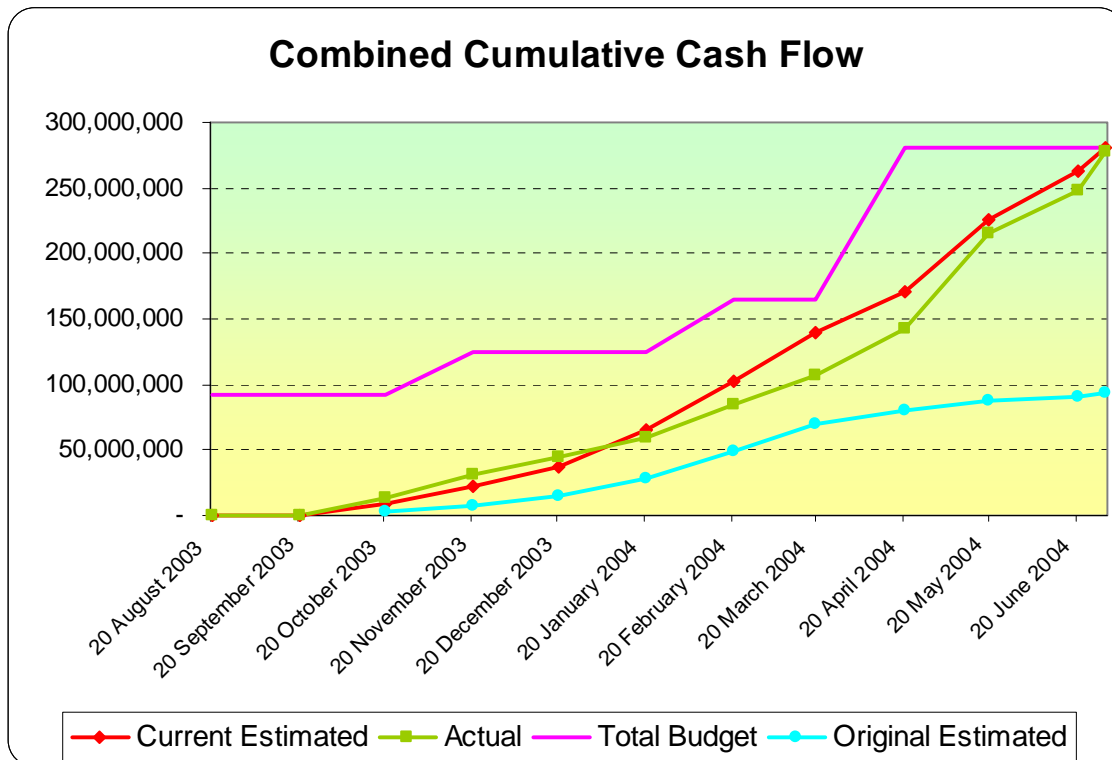
MANAGEMENT & QUALITY CONTROL

Cash flow

Of the total R 280.2m project budget, 99.8% expenditure was achieved, leaving only R0.5m unspent at project completion.

The figure below shows a graphical representation of the estimated and actual cash flows in comparison to the total budget available. The graph clearly shows the increase in the available budget from October through to April, with the original and revised projected cash flows. It is

notable that the rate of expenditure increased significantly from April to May. In the first half of June there was a slight slow down in the rate of expenditure however this increased significantly at the end of June, as the final surfacing of the roads was completed.



Quality control

Quality audits were carried out on each project to ensure that the consortia were complying with the required standards in terms of Earthworks and Layer Works, Asphalt, Concrete, Drainage, Services and Access to properties. In addition to the quality audit each consortia was required to supply quality control summaries with their monthly progress reports and a complete set of quality control test results prior to the taking over inspections on any roads.

SUMMARY

The fast track turnkey approach adopted by the JRA has resulted in the following benefits:

- Expansion of the projects to include additional (approximately R187m) funding thereby increasing delivery.
- Highly visible delivery (construction of approximately 168km of road with black surfacing and kerbing).
- Lower risk for the JRA (less contracts).

- High involvement of the local community in that approximately 25 % of the total budget was spent on labour, skills, and materials sourced from within the benefit community.
- High level of training to the local communities
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- Experience gained for the roll-out of similar programmes in future years.

ANNEXURE A

Layout plans indicating roads
constructed under programme

