

RURAL ROAD ASSET MANAGEMENT PRESERVING OUR FUTURE

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ABSTRACT

This paper puts into perspective the challenges faced by road authorities in South Africa to maintain one of the country's most vital assets, its roads. Preliminary results indicate that the province's road network requires a long term sustained maintenance plan.

Coupled with the state of the province's roads is the fact that there are 2.5 million unemployed people in KwaZulu-Natal with 1.5 million of these having not finished high school. The only solution for these individuals is to obtain employment in menial tasks and to then try to complete their education while they are employed.

The maintenance of rural road assets unlocks these opportunities by targeting the very people who are living in rural municipalities and providing them with long term employment opportunities.

The paper describes the milestones achieved over the last 2 years by the role players in the Rural Road Asset Management (RRAMS) Project, namely the National Department of Transport (NDOT), the KwaZulu-Natal Department of Transport (KZN-DOT) and the 10 District Municipalities.

The paper also uses the data obtained from this work to present a possible way forward for the various authorities to achieve the country's stated aims of providing all weather access to the majority of its inhabitants.

INTRODUCTION

There are 67 950 km of paved and unpaved vehicular roads in KwaZulu-Natal. The South African National Roads Agency (SANRAL) is responsible for 1 735 km of national roads, the KZN-DOT is responsible for 19 950 km of provincial roads and the remaining 46 265 km fall within the boundaries of the KwaZulu-Natal's 10 district municipalities.

Of the 46 265 km of roads 5 640 km are surfaced and 40 625 km are gravelled. This is a national asset with an estimated Current Replacement Cost (CRC) over R100 billion.

Before the South African National Treasury can allocate funds for the maintenance of this national asset, they needed to know the exact length of these roads, the value of the infrastructure on it and the condition of the road and its infrastructure.

In 1 February 2011 the S'Hamba Sonke Programme was adopted by the government. One of the key outputs of the grant is to ensure that district municipalities implement and maintain road asset management systems to support investment decisions in roads. This stems from the Road Construction and Maintenance Summit which was held by the Department of Transport which highlighted the lack of reliable road condition data to support decision making.

Through the RRAMS, 21 district municipalities were selected from the 23 poverty stricken presidential nodes and in KwaZulu Natal, all ten (10) District Municipalities were included.

This paper describes the steps taken by the role players in KwaZulu-Natal to meet this challenge.

THE RURAL ROADS ASSET MANAGEMENT (RRAMS) GRANT

Through the RRAMS, 21 district municipalities were selected from the 23 poverty stricken presidential nodes and in KwaZulu Natal, all ten (10) District Municipalities were included. The details of the RRAMS project were presented in the Government Gazette Notice No. 34280 – 10 May 2011 which allocated funds to 21 district municipalities in South Africa over a three year period:

- Eastern Cape 5 district municipalities;
- KwaZulu- Natal 10 district municipalities;
- Limpopo 4 district municipalities; and
- NorthWest 2 district municipalities.

Budgets for the RRAMS Project were set for 3 years and a framework was detailed with goals, outputs, responsibilities and conditions stated.

The strategic goal of this grant is to ensure efficient and effective investment in rural roads through the development of Road Asset Management Systems (RAMS) and collection of data.

The KZN-DOT's mandate was to assist district municipalities to set up systems of road and traffic data capture. This included detailed data for the road and its assets and the condition of the various assets such as road pavements, bridges, drainage structures, guardrails and sidewalks. The standards were in line with the Road Infrastructure Strategic Framework for South Africa (RISFSA) guidelines.

For the past 2 years the NDOT and KZN-DOT have been assisting the 10 district municipalities in KwaZulu-Natal to collect inventory and condition data of their roads. Although there is much more road asset capturing ahead, the district municipalities have progressed to a stage where some decisions on the way forward can be made.

EXTENT OF KWAZULU-NATAL'S ROADS

Before the start of the RRAMS project the KZN-DOT undertook an extensive survey of all roads in the province which culminated in a spatial database comprising 20 662 km of paved and 97 162 km of unpaved roads.

These roads have been classified according to TRH 26 – South African Road Classification and Access Management Manual (RCAM).

RURAL CLASSES		URBAN CLASSES		URBAN SUBSET	
R1	Rural Principal Distributor	U1	Urban Principal Arterial		
R2	Rural Major Distributor	U2	Urban Major Arterial		
R3	Rural Minor Distributor	U3	Urban Minor Arterial		
R4	Rural Collector Road	U4	Urban Collector Street	U4a	Commercial Collector Street
				U4b	Residential Collector Street
R5	Rural Local Road	U5	Urban Local Street	U5a	Commercial Local Street
				U5b	Residential Local Street
R6	Rural walkway	U6	Urban Walkway	U6a	Pedestrian priority Street or Area
				U6b	Pedestrian only Street or Area

Table 1: Road classification according to the RCAM model

	Paved		Unpaved	
	Class 1-5	Class 6	Class 1-5	Class 6
National (tolled)	1 341.11	0	0	0
National (untolled)	393.60	0	0	0
Provincial	7 044.42	0	5 903.38	0
Metropolitan (Ethekwini)	6 227.52	0	3 922.07	1 894.23
Municipal (Remainder)	5 639.07	16.23	37 479.59	47 962.56
Total	20 645.72	16.23	47 305.04	49 856.80

Table 2: Extent of road network

This data reflects the fact that the majority of roads in KwaZulu-Natal are not maintained by a recognised roads authority and also that majority of roads in KwaZulu-Natal are still unpaved.

4. THE KZN RRAMS PROJECT

From the RRAMS Grant the district municipalities were advised to appoint service providers experienced in road asset management to fulfil a vital role in the development of strategic and operational capacity within the municipalities. Roles and responsibilities were assigned:

Assignment of responsibilities, functions and tasks	
Role player	Responsibilities
Municipal Authority	<ul style="list-style-type: none"> expenditure of grant according to Division of Revenue Act (DORA) overall responsibility for RRAMS Project during all its phases initiate project business plan appoint service providers control budgeting, accounting and internal auditing processes operate and maintain information management systems conclude learnership agreements
Provincial Authority	<ul style="list-style-type: none"> coordinate project interact with all role players and stakeholders coordinate graduate training and mentorship (Graduate Academy) interact with national authorities monitor planning and implementation processes explore innovative ideas
Service Provider / Project Manager	<ul style="list-style-type: none"> manage project formulate and manage communication plan interact with municipal authority as well as role players and stakeholders train and mentor graduates co-ordinate all reporting to municipal authority monitor progress and submit reports and cashflows
Graduates	<ul style="list-style-type: none"> commit to learnership and mentorship programme carry out field assessments, desktop studies and project selection reports

Table 3: Assignment of responsibilities, functions and tasks

5. SKILLS DEVELOPMENT THROUGH GRADUATE TRAINING

One of the biggest challenges faced was the lack of experienced personnel to assist district municipalities to manage their road assets. To address this issue the RRAMS project set up a process of identifying and training unemployed S3/S4 civil engineering candidates who were seeking experiential learning.

In time the district municipalities recruited the following numbers to carry out the day to day tasks of the RRAMS project.

District Municipality	No of Graduates
DC21 Ugu	6
DC22 Umgungundlovu	7
DC23 Uthukela	6
DC24 Umzinyathi	6
DC25 Amajuba	4
DC26 Zululand	3
DC27 Umkhanyakude	6
DC28 Uthungulu	6
DC29 Ilembe	6
DC43 Sisonke	3
Total	53

Table 4: Number of graduates employed



Figure 1: Graduation class photo



Figure 2: Graduates assessing an unpaved road

5.1 Graduate of training

In order to ensure that minimum competencies are achieved, graduates have been exposed to the all aspects of road asset management:

- Road inventory data collection;
- Road condition assessments;
- Quality assurance and control;
- Analysis of visual condition data;
- Selection, adaptation and training related to network decision support systems;
- GIS in RAMS;
- Tools to develop strategic and annual maintenance plans; and
- Management of RAMS

5.2 Planned Outcomes for Graduates

The goal of training the graduates is to produce a technically qualified person who can fulfil a meaningful role within the municipal organisation regarding the management of their road assets.

Certain planned outcomes for the graduates were outlined at the start of the project. These were

- Knowledge of road infrastructure related matters;
- Good understanding of policies related to road infrastructure issues - Road Infrastructure Strategic Framework for South Africa (RISFSA);
- Knowledge of regulatory elements of integrated transport planning, including ribbon development, traffic engineering, road construction and routine road maintenance;
- Report writing skills; and
- Development of standards and guidelines

5.3 Skills Reporting

Each district municipality is required to provide comprehensive skills transfer reporting. The district municipalities report on each graduates progress in their theoretical and practical training.



Figure 3: Graduates receiving field training



Figure 4: Graduates assessing an urban road



Figure 5: Graduates doing GIS training

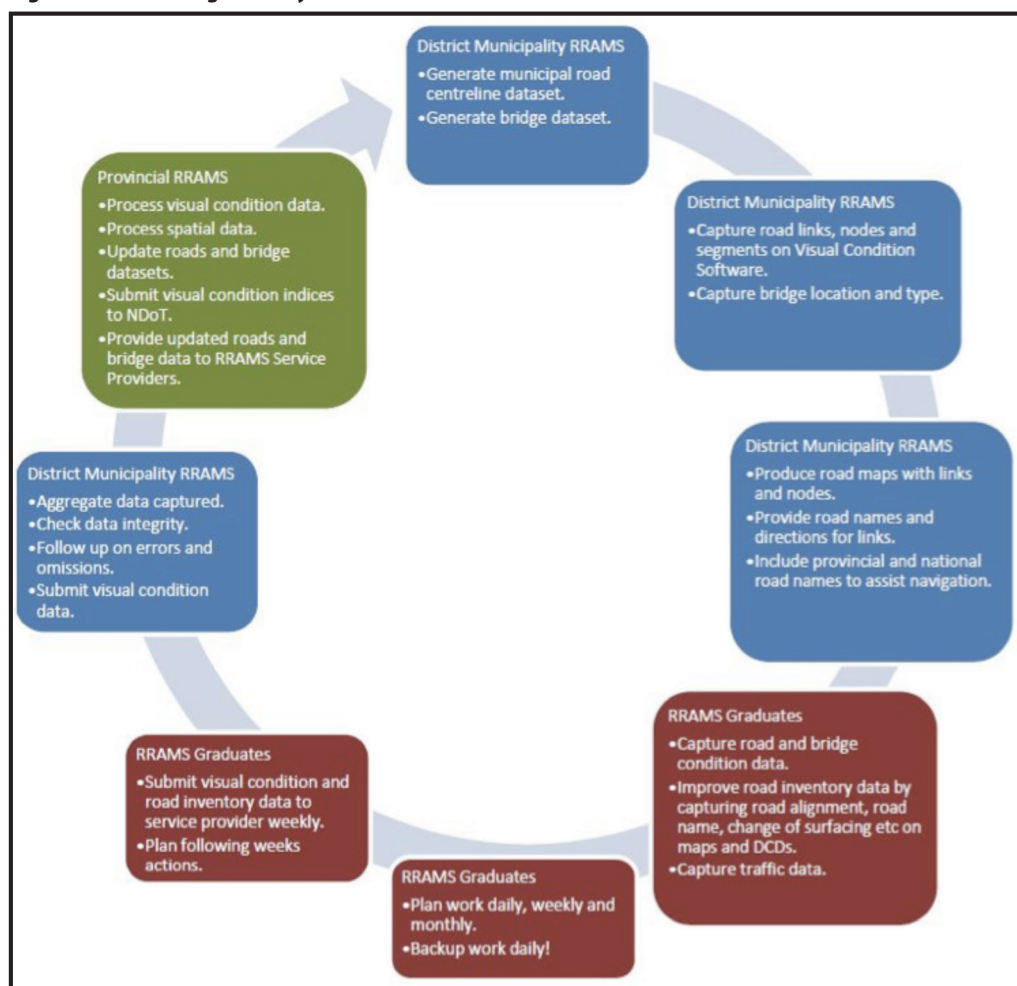
6. DATA COLLECTION AND UPDATING

One of the primary functions of the RRAMS project is to keep both the road spatial and inventory data up to date. This process covers the following:

- Checking road alignments in the field and correcting on GIS;
- Checking road surface types in the field and updating on GIS;
- Normalising all road links and correcting on GIS;
- Adding local information to roads such as road names and adding on GIS; and
- Reclassifying roads according to the methodology outlined in the RCAM document.

Additions and modifications to the roads dataset are recorded.

Figure 6: Data management cycle



Regular updates to and from the provincial datasets are managed by the KZN-DOT.

7. VISUAL CONDITION SURVEYS

The majority of the district municipalities have completed the first assessment of the condition of their paved and unpaved roads. This exercise was carried out by the graduates according to the Technical Recommendations for Highways TRH9 and TRH12 manuals.

The graduates were all given theoretical and practical training on the methods of assessing roads. The subsequent field work was overseen and supported by individual service providers appointed for the task. The service providers supported the graduates and focused on quality and acceptance control.

The fieldwork highlighted the fact that the geospatial databases needed substantial correcting with the added challenge that the roads were sometimes not accessible to normal vehicles due to their poor condition.

The captured data was submitted to the NDOT who are the custodians of all road condition data for the country.

8. TRAFFIC SURVEYS

Traffic on municipal roads ranged from medium densities in towns to very low densities in rural areas. Traffic count locations were selected from desktop studies to determine the representative traffic volumes over the district municipalities.

The graduates were all given theoretical and practical training on traffic counting. Local inhabitants were employed on a temporary basis as traffic enumerators.

The captured data was submitted to the NDOT who are the custodians of all road condition data for the country.

9. UPDATING SPATIAL DATA

The goal of the Municipal Infrastructure Grant (MIG) is to provide all weather access to within 500m of a dwelling in rural areas and access to all in urban areas.

Provincial goals have been set at halving the number of people who do not have an all season road to within 2km of their dwelling and to improve access to social facilities (schools, health care facilities etc).

In assessing the visual condition of road classes 1 to 5 the graduates have highlighted an issue regarding the class 6 roads in KwaZulu-Natal:

- There are approximately 48 700km of class 6 roads in KwaZulu-Natal;
- A proportion of these roads were constructed for vehicular access in the past but have become inaccessible due to lack of maintenance;

- Roads which can be traversed by vehicle have been cut off either by the loss of access over a bridge or culvert or by local erosion; and
- Most of these inaccessible roads are located in rural areas.

These roads were not included in the initial visual assessments as they were considered inaccessible according to TRH 22. They nevertheless do play a role in providing access for the rural population and therefore must be considered an asset.

Assessments of these roads have been carried out in a way which yields the most results with the minimum amount of effort. It was not expected that the entire length of each road be inspected as some of them were only accessible by foot.

Graduates located these roads, assessed the possibility of the road being classified as 5 or higher and then described the present limitations to vehicular access. This exercise has and will continue to add Class 6 road to the district municipality.

Figure 7: Visual condition ratings for road authorities

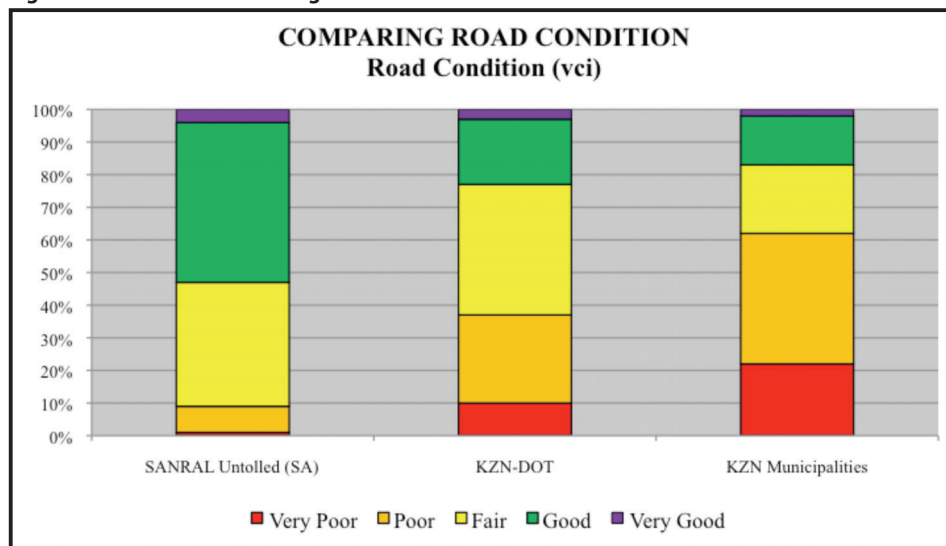
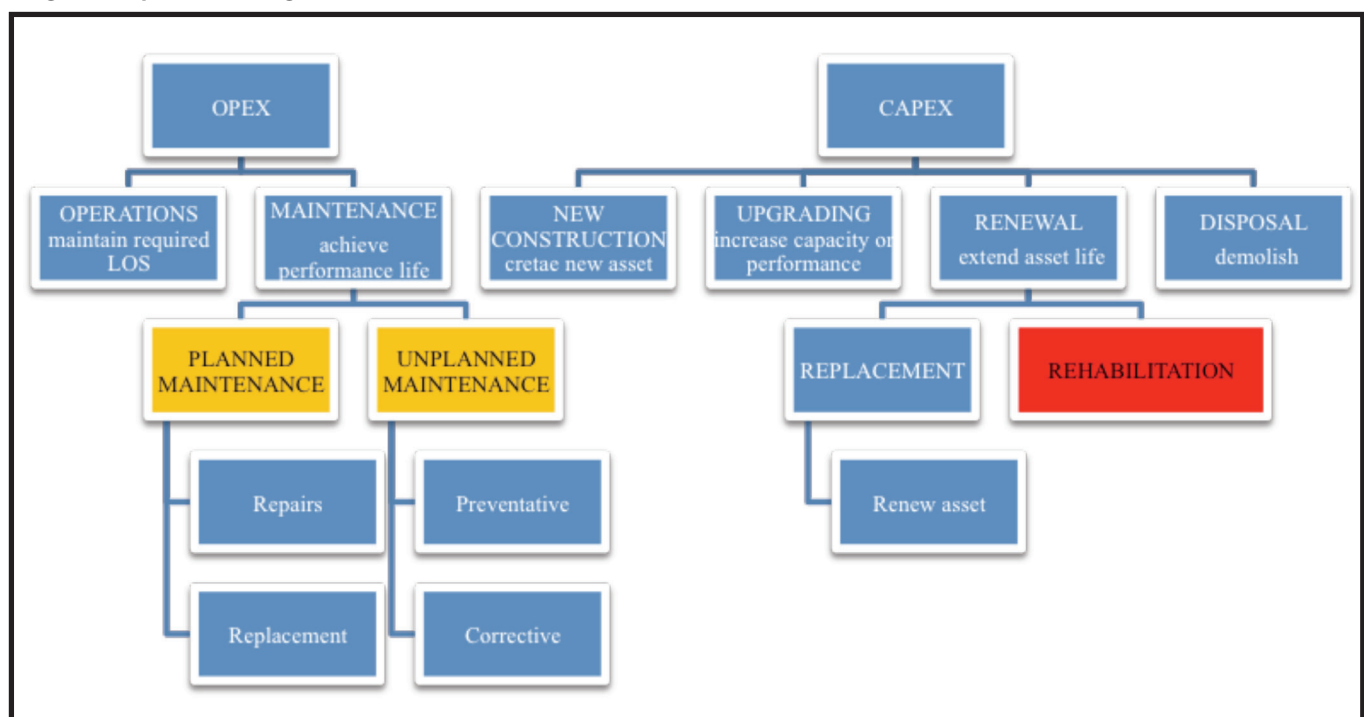


Figure 8: Expenditure categories



10. RESULTS FROM THE RRAMS PROJECT THUS FAR

There are 5 639.07km of surfaced and 37 479.59km of gravelled roads within the 10 district municipalities. The estimated Current Replacement Cost (CRC) of this asset can be conservatively set at R150 billion. It is planned that these assets will be maintained by either the provincial or municipal authorities. There is no dedicated budget to maintain these roads at present.

To put this in perspective, SANRAL presently is responsible for just over 13 000km of non-tolled surfaced roads in South Africa. Their budget for routine, periodic and special maintenance for 2011/12 was R3.2 billion. This figure does not take into account road rehabilitation and upgrading!

Surveys undertaken over the last 2 years indicate a clear lack of maintenance of municipal roads. Results of these surveys indicate that a major proportion of the surfaced roads are in a very poor and poor condition.

These detailed surveys highlight the need to carry out immediate maintenance and rehabilitation.

To delay these actions would put the entire road network at risk.

Roads which are in a "Very Poor" to "Poor" state require maintenance interventions to continue performing their designed functions. The type of maintenance activities required are presented below:

Unplanned or Routine Maintenance

Routine maintenance is the fixing of certain defects so that a road can still function properly. Think of this as "reactive maintenance."

Examples:

Non pavement: Clearing side drains & culverts, vegetation control, line-marking, road signs repair, guard rail repair

Pavement: Defects caused by a combination of traffic and environmental effects, for

example, crack sealing, patching, edge repair; shoulders re-gravelling and grading.

Planned or Periodic Maintenance

Periodic maintenance focuses on treating roads prior to the appearance of distresses. These treatments prolong the life of a road.

Periodic maintenance delays future deterioration in other words "preventive maintenance".

Examples: Adding a thin surfacing to improve surface integrity, waterproofing, or skid resistance, without increasing the strength of the road.

Road Rehabilitation

Rehabilitation is for roads which require restoration rather than maintenance. Roads which are in a very poor condition require additional investigations before the type and extent of the rehabilitation can be determined. It is for this reason that the costs for roads in a very poor condition are usually not costed when doing network level maintenance needs surveys.

11. PAVED ROAD MAINTENANCE COSTS

The RRAMS Division of Revenue Bill intimates that the data generated from the RRAMS project will inform the National Treasury on the future allocation of Municipal Infrastructure Grants.

It is accepted that the level of service for a municipal road would be less than that which expected on national or strategic roads. However it is enlightening to compare the overall condition of the paved network of national roads, provincial roads and municipal roads and then extrapolate what the anticipated budgetary requirement is just to maintain the municipal road network. This comparison puts the challenge into perspective.

It must be noted that the provincial road network is also presently underfunded (estimates are put at ± 0.9 billion per annum).

No allowance has been made for the rehabilitation or special maintenance needs of the network in the following figure which has been presented for illustrative purposes.

From this scenario the annual budgetary shortfall for maintaining 6 250km of municipal roads is $\pm R1.0$ billion per annum.

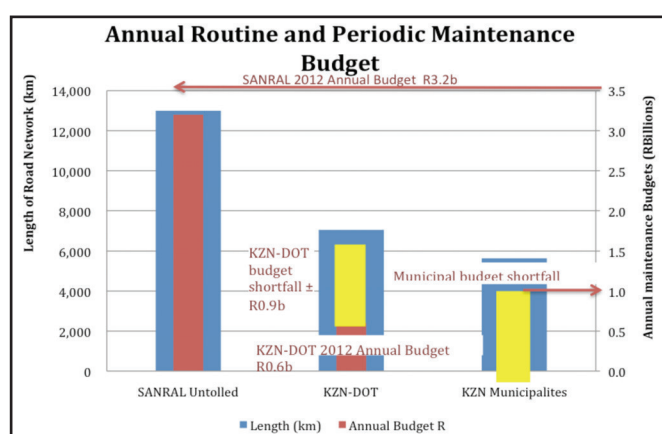


Figure 9: Extrapolated maintenance needs for municipal roads

12. UNPAVED ROADS MAINTENANCE COSTS

A large proportion of the unpaved roads in the municipalities require immediate maintenance. This maintenance varies from routine blading to more costly reshaping and regravelling.

These figures not only dwarf the paved road annual budget requirements but highlight the dire need for a rationalisation of the unpaved road network in the province. Long term plans for a sustainable road network must include the systematic upgrading of gravel roads to blacktop in order to limit the effects of gravel road building material depletion.

From this scenario the annual budgets for routine blading is $\pm R1.7$ billion and for regravelling is $\pm R1.9$ billion.

13. CONCLUSION

The work done over the last 2 years has largely quantified the challenge awaiting KwaZulu-Natal road authorities in the near future. The annual budget required to maintain the condition of the paved and unpaved roads within the municipal boundaries is in excess of R4.6 billion per annum.

If this money is not spent the percentage of roads in the "Very Poor" condition will gradually rise. In general roads in a very poor condition require rehabilitation rather than maintenance. The cost of rehabilitation is a factor of 6 times that of maintenance.

Quantifying this deterioration scenario would require the collection of additional data which is not yet available but the impact is clear:

Delaying the maintenance and rehabilitation of roads in the KwaZulu-Natal road network will cause a sharp increase in the annual cost of this annual maintenance costs over time. In other words "A stitch in time may save nine".

14. REFERENCES

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