

TMH 15

South African Engineering Service Contribution Manual for Municipal Road Infrastructure

**Draft Standard 1.0
July 2015**

Committee of Transport Officials

**TECHNICAL METHODS
FOR HIGHWAYS**

TMH 15

**South African Engineering
Service Contribution Manual for
Municipal Road Infrastructure**

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Complied under auspices of the:

Roads Coordinating Body (RCB)
Committee of Transport Officials (COTO)
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Synopsis:

This manual contains procedures and methods for use by municipalities to establish policies on engineering service contributions to municipal road infrastructure. The adoption of this manual by all municipalities in the country will ensure that a single, uniform set of requirements is established for Applicants regarding their responsibility towards the provision of engineering services, irrespective of where they develop in the country. The autonomy of municipalities, however, is acknowledged and each Municipality may use or amend the manual to suite its own particular circumstances.

The purpose of this manual is to define a framework for the responsibilities with regard to the provision of road infrastructure required by developments in a municipality. The scope of the manual, however, only covers the provision and installation of roads and not any of the other engineering services such as stormwater, water, sewerage and electricity.

Technical Methods for Highways:

The Technical Methods for Highways consists of a series of publications in which methods are prescribed for use on various aspects related to highway engineering. The documents are primarily aimed at ensuring the use of uniform methods throughout South Africa.

Users of the documents must ensure that the latest editions or versions of the document are used. When a document is referred to in other documents, the reference should be to the latest edition or version of the document.

Any comments on the document will be welcomed and should be forwarded to coto@nra.co.za for consideration in future revisions.

Document Versions

Working Draft (WD). When a COTO subcommittee identifies the need for the revision of existing, or the drafting of new Technical Recommendations for Highways (TRH) or Technical Methods for Highways (TMH) documents, a workgroup of experts is appointed by the COTO subcommittee to develop the document. This document is referred to as a Working Draft (WD). Successive working drafts may be generated, with the last being referred to as Working Draft Final (WDF). Working Drafts (WD) have no legal standing.

Committee Draft (CD). The Working Draft Final (WDF) document is converted to a Committee Draft (CD) and is submitted to the COTO subcommittee for consensus building and comments. Successive committee drafts may be generated during the process. When approved by the subcommittee, the document is submitted to the Roads Coordinating Body (RCB) members for further consensus building and comments. Additional committee drafts may be generated, with the last being referred to as Committee Draft Final (CDF). Committee Drafts (CD) have no legal standing.

Draft Standard (DS). The Committee Draft Final (CDF) document is converted to a Draft Standard (DS) and submitted by the Roads Coordinating Body (RCB) to COTO for approval as a draft standard. This Draft Standard is implemented in Industry for a period of two (2) years, during which written comments may be submitted to the COTO subcommittee. Draft Standards (DS) have full legal standing.

Final Standard (FS). After the two-year period, comments received are reviewed and where appropriate, incorporated by the COTO subcommittee. The document is converted to a Final Standard (FS) and submitted by the Roads Coordinating Body (RCB) to COTO for approval as a final standard. This Final Standard is implemented in industry for a period of five (5) years, after which it may again be reviewed. Final Standards (FS) have full legal standing.

Important Note

This Manual was developed during the period when applications for changes in land use rights were regulated by provincial legislation. Since the development of the manual, the Spatial Planning and Land Use Management Act, Act 16 of 2013 came into force on 1 July 2015, which included the repeal of some legislation as indicated in the Act. The legal framework provided in Chapter 2 of the manual is therefore no longer applicable and current legislation must be taken into account when the manual is applied. A new version of the manual will be made available in future to account for the changes in legislation. The legal framework provided in Chapter 2 is applicable to the period before 1 July 2015.

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Executive Summary

This manual contains guidelines that may be used by municipalities for establishing policies on engineering service contributions to municipal road infrastructure. The adoption of this manual by all municipalities in the country will ensure that a single, uniform set of requirements is established for Applicants regarding their responsibility towards the provision of engineering services, irrespective of where they develop in the country. The autonomy of municipalities, however, is acknowledged and each Municipality may use or amend the manual to suite its own particular circumstances.

The purpose of this manual is to define a framework for the responsibilities with regard to the provision of road infrastructure required by developments in a municipality. The scope of the manual only covers the provision and installation of roads and not any of the other engineering services (stormwater, water, sewerage and electricity). Contributions to such services are covered by other policies of the Municipality.

The following are a number of important elements of the manual:

- The purpose of the manual is to define responsibilities with regard to the provision of, and contributions to, road infrastructure required by developments in the Municipality. It establishes the road infrastructure for which contributions are required, the classification of internal and external services, the responsibilities of the Applicant and the Municipality respectively, the methodology of determining the contributions and the purpose for which contributions may be used.
- The scope of this manual only covers the provision and installation of municipal street and road infrastructure. Contributions to other engineering services are established in terms of other policies of the Municipality.
- The manual is established in terms of the Constitution of the Republic of South Africa as well as various other acts and ordinances.
- In terms of this manual, the person or body making an application for a development (the *Applicant*) is responsible for the provision and installation of internal roads and to contribute to the cost of external roads. Internal roads include Class 4 and 5 roads within the boundary of the development as well as those outside the boundary required for the exclusive use of the development.
- The manual is based on the fundamental principle that engineering service contributions must be equitable and fair to both new entrants and existing residents. Existing residents should not be burdened by the cost of new services necessitated by new developments but at the same time, new entrants should not be required to contribute more than their fair and equitable share to the cost of the road system.
- In terms of this manual, the full cost of improvements to external roads required to accommodate developments in the area of jurisdiction of the Municipality, must be recovered by means of engineering service contributions.

Engineering Service Contributions to Roads

- The Municipality shall, where possible and practical, allow the Applicant to make an offer to provide and install external road infrastructure, or to provide land required for road reserves, in lieu of monetary contributions. In such cases, the Applicant must, in the offer, define the exact scope of road infrastructure or land to be provided and the Municipality will decide whether or not to accept the offer. Should the offer be accepted, the scope of road infrastructure or land to be provided will be specified by agreement with the Municipality.
- Contributions to external roads received by the Municipality will first be used for payment of land provided by the Applicant for external roads and then secondly for improving external road infrastructure to the extent deemed necessary by the Municipality to accommodate the development. Remaining contributions will be transferred to the *Road Contributions Account* of the Municipality.
- The Municipality will establish a *Road Contributions Account* in its capital replacement reserve to manage and control the utilisation of engineering service contributions.
- The contributions to external roads consist of two components, namely a *basic external road contribution* and a *boundary road component*. The basic external road contribution is calculated using a formula which takes the trip generation and trip length characteristics of the development into account. The boundary road contribution is determined for roads located at or on the boundary of the development.
- Parameters for the calculation of the engineering service contributions are provided in the *South African Trip Data Manual*. The latest available version of this manual must be used for the determination of the contributions. The Municipality will also annually publish tariff rates required for the establishment of the contributions.

Definitions

Amendment Scheme means an Amendment Scheme as defined by the Town Planning and Township Ordinance (1986) or any other procedure whereby effect is given to implement a development, as defined hereunder.

Applicant means any person or entity legally empowered to apply for a development, as defined hereunder.

Application means an application for a development, as defined hereunder.

Approved Township means an Approved Township as defined in the Town Planning and Township Ordinance (1986) or any other development established in terms of any other law that will result in a development that complies with the definition of "township" as contained in the Ordinance.

Boundary Service means an engineering service at or on a boundary of a township, subject to the requirements of this manual.

Connection means the connection between two services. In the case of roads, this is the junction or intersection between different roads.

Development means any procedure whereby a township is established, a property is subdivided, a property is consolidated, the lawful land use of a property is changed in terms of a lawful procedure and a combination of one or more of the foregoing.

Engineering Services means the provision of water, electricity and sewerage (essential engineering services) and the provision and construction of streets, roads and stormwater drainage systems. This manual only covers municipal roads and streets and associated public transport facilities.

External Engineering Services means engineering services classified as such in terms of the requirements of this manual.

Internal Engineering Services means engineering services classified as such in terms of the requirements of this manual.

Municipality means the municipality responsible for the provision of municipal engineering services.

Priority Development Area is a geographic area defined and/or adopted by the Municipality where bulk services have already been installed or where provision has been made in the Integrated Development Plan for bulk services in that area or any area designated as such in terms of the statutory powers of the Municipality and where a budget has been made available for the provision of such services.

Road contribution account is a capital account (or vote) within the Capital Replacement Reserve of the Municipality that is utilised for purposes of funding engineering services as specified in this manual.

Trip Data Manual means the latest available version of the *TMH 17 South African Trip Data Manual* of COTO (2012).

1 Introduction

- 1.1 The aim of this manual is to establish responsibilities for the provision of municipal road infrastructure required by developments in the Municipality. Every development shall be provided with engineering services, including road infrastructure. Applicants are responsible for the installation and provision of internal services while they are responsible for contributing to the cost of external services.
- 1.2 The manual establishes the road infrastructure for which the contributions are required, the classification of internal and external services, the responsibilities of the Applicant and the Municipality respectively, the methodology of determining the contributions and the purpose for which the contributions may be used.
- 1.3 The scope of this manual only covers the provision and installation of municipal street and road infrastructure. Contributions to other engineering services are established in terms of other policies of the Municipality.
- 1.4 In terms of this manual, the full cost of improvements to external roads required to accommodate developments in the Municipality, must be recovered by means of engineering service contributions. No provision is therefore made in this manual for incentives, rebates or exemptions but the Municipality may establish a policy for the introduction of such incentives, rebates or exemptions.

2 Legal framework

- 2.1 The legal framework in terms of which the manual has been established is described in this section. Reference is made to the Constitution as well as various national and provincial acts and regulations.
- 2.2 *Constitution of the Republic of South Africa (Act 108 of 1996)*. The South African Constitution establishes various spheres of governments, including the local sphere that consists of municipalities for the whole of the territory of the Republic (Section 151). A municipality has the right to govern, on its own initiative, the local government affairs of its community, subject to national and provincial legislation, as provided for in the Constitution.

Section 152 of the Constitution identifies the provision of services to communities in a sustainable manner as one of the objects of local government. Municipalities must strive, within their financial and administrative capacity to achieve these objects.

Section 156 of the Constitution assigns to a municipality the executive authority to administer local government matters listed in Parts B of Schedules 4 and 5. Municipal roads are included in Part B of Schedule 5. In terms of Section 156(4), national and provincial governments must also assign to a municipality any matter listed in Parts A of Schedules 4 and 5 if that matter relates to local government, if it would most effectively be administered locally and if a

municipality has the capacity to administer it. Schedule 5 Part A includes provincial roads and traffic.

Municipal fiscal powers and functions are described in Section 229 of the Constitution, including the authority of a municipality to impose rates on property and surcharges on fees for services provided by or on behalf of the municipality.

2.3 *Local Government: Municipal Systems Act (MSA), Act 32 of 2000.* Section 4(1)(c) of the Municipal Systems Act determines that the Council of a municipality has the right to finance the affairs of the municipality by:

- a) Charging fees for services; and
- b) Imposing surcharges on fees, rates on property and, to the extent authorized by national legislation, other taxes, levies and duties.

Municipal services are defined as a service that the municipality, in terms of its powers and functions, provides or may provide to, or for the benefit of, the local community, irrespective of whether-

- a) Such service is provided, or to be provided, by the municipality through an internal mechanism or by engaging an external mechanism as contemplated in Section 76; or
- b) Fees, charges or tariffs are levied in respect of such service or not.

The local community is defined in the MSA as the residents of the municipality; the ratepayers of the municipality; any community organisation or non-governmental, private sector or labour organization or bodies which are involved in local affairs within the municipality; and visitors and other people residing outside the municipality who, because of their presence in the municipality, make use of services or facilities provided by the municipality.

A municipality is therefore in terms of the MSA empowered to impose a fee in respect of the provision of municipal road infrastructure.

Section 74 of the MSA requires that a municipal council must adopt and implement a tariff policy on the levying of fees for municipal services provided by the municipality itself or by way of service delivery agreements.

Section 75 of the MSA requires a municipal council to adopt by-laws to give effect to the implementation and enforcement of its tariff policy and, inter alia, allows differentiation between different geographical areas.

2.4 *Local Government Municipal Finance Management Act (MFMA) Act 56 of 2003.* The MFMA secures sound and sustainable management of the financial affairs of municipalities and describes the obligations of the municipality in connection with capital expenditure.

The requirements of the MFMA are therefore paramount in the procedures to collect engineering service contributions.

When an applicant provides infrastructure in lieu of contributions, the municipality should ensure that the value of the infrastructure is equal to the amount of the engineering service contributions payable.

2.5 *Planning legislation.* Different statutes prescribe the process that an applicant may follow in order to achieve a change in land use. The following are some examples:

- a) *Development Facilitation Act (No 67 of 1995).* Where an application is submitted in terms of this Act, provisions of the Act related to the provision of engineering services and responsibilities for such provision, subject thereto that any conditions be either specifically authorized by a development tribunal, or alternatively, incorporated in an Engineering Services Agreement and approved by the development tribunal.
- b) *Town Planning and Townships Ordinance (No 15 of 1986).* Where an application is submitted in terms of this Ordinance, provisions of the Ordinance related to the provision of engineering services and responsibilities for such provision, including responsibilities related to contributions to engineering services.
- c) *Division of Land Ordinance, 20 of 1986, as amended by Act 36 of 1992.* Where an application is submitted in terms of this Ordinance, provisions of the Ordinance related to the responsibilities of the applicant, including responsibilities to contributions to engineering services.
- d) *Gauteng Removal of Restriction Act, No 3 of 1996.* Where an application is submitted in terms of this Act, provisions of the Act related to the responsibilities of the applicant, including responsibilities related to contributions to engineering services.

Although the above statutes are used to effect the change in land use envisaged by an applicant, they cannot be used as the basis on which engineering service contributions are charged.

2.6 *Provincial roads.* Different statutes regulate provincial roads in South Africa, including the South African Constitution.

The South African Constitution (Section 103) established the nine (9) provinces of the country. Section 104(1)(b) of the Constitution confers on the different provincial legislatures the authority to pass legislation regarding matters listed in Schedules 4 and 5 of the Constitution. In South African Constitutional law, it is accepted that executive authority follows legislative authority.

“Provincial road and traffic” has been listed in Schedule 5 Part A as a functional area of exclusive provincial legislative competence. The previous (pre-constitutional dispensation) four provinces had provincial ordinances that dealt with provincial roads. Consistent with their constitutional competencies, a number of provinces have introduced post-constitutional legislation in respect of the provision of provincial roads.

The following are examples of roads related legislation that applies within the different provinces:

- a) Gauteng Transport Infrastructure Act (Act 8 of 2001) in the Gauteng Province (Post Constitutional)
- b) Cape Provincial Roads Ordinance (No 19 of 1976) in some provinces that formed part of the erstwhile Cape Province.

- c) Free State Roads Ordinance (No 4 of 1968) – Free State Province
- d) KwaZulu Natal Provincial Roads Act (No 4 of 2001) – KwaZulu Natal (Post Constitutional)
- e) The Transvaal Roads Ordinance of 1957 – Mpumalanga and North West Provinces
- f) Northern Province Roads Agency (Pty) Ltd and Provincial Roads Act (Act 7 of 1998) – Limpopo (Post Constitutional).

In the above legislation, the responsibility to finance provincial roads is assigned to the provincial government (or the member of the Executive Council of the province responsible for transport) and no provision has been made for provinces to recover engineering service contributions as a result of land development.

Provincial roads are not deemed municipal engineering services (for which engineering service contributions are charged). Some of the provincial acts permit the relevant authorities to charge a levy or fee for an authorisation linked to the granting of access to provincial roads, installation of services on or over a provincial road, advertising along provincial roads and trading within provincial road reserves, but no provincial act empowers a provincial authority to recover engineering service contributions from applicants in respect of the additional load imposed on provincial roads pursuant to a change of land use or subdivision of land abutting onto or in close proximity to a provincial road.”

- 2.7 *National Roads.* The South African National Roads Agency Limited and National Roads Act (Act 7 of 1998) established the South African National Roads Agency Limited (SANRAL). The Act makes provision for SANRAL to manage and control the national road system and take charge of the development, maintenance and rehabilitation of national roads.

Section 25(1) of the SANRAL act assigns the power to perform a comprehensive list of functions with regard to national roads to SANRAL, including the responsibility for the financing of all those functions. Section 25(3) stipulates that the responsibility and capacity to perform those functions are entrusted to the Agency only.

Sections 26(f), 57 and 28 deal with the operation of national roads as toll roads, which creates the framework for a user-pay system for national roads.

Section 26(g) empowers SANRAL to charge a levy, fee or rent for any authorisation, approval or permission that may be granted by SANRAL in respect of, inter alia, direct access onto a national road, the construction of any structures over or below national roads, advertising on or visible from national roads and trading within national road reserves. However, no provision is made in the SANRAL Act that empowers the agency to recover engineering services contributions from applicants in respect of the additional load imposed on a national road as a result of a change in land use or subdivision of land abutting onto or in proximity of a national road.

3 Adoption of manual

3.1 This manual may be adopted by including it as part of the Tariff Policy of the Municipality in terms of the Municipal Systems Act (Act 32 of 2000). The following process is required by the Municipality to adopt the Tariff Policy:

- a) Adopt a Tariff Policy which refers to this manual as a general framework for the determination of fees. Also adopt the Council Resolutions described in the following paragraph.
- b) Pass a By-Law to give effect to the policy.
- c) Adopt a Council Resolution to determine the actual content of the tariffs.

An example of a pro-forma Council Report for adopting the Tariff Policy, By-Law and the required Council Resolutions is provided in Appendix D.

3.2 Council Resolutions must also be adopted which will allow the following:

- a) Repayment of Applicants in situations where the Municipality requires or allows Applicants to bear the cost of providing and installing external services in excess of the engineering service contribution and where the Applicants are entitled to recover such costs at some later stage as allowed for in this manual. This resolution must be adopted in terms of the Municipal Finance Management (Act 56 of 2003), Section 48(1)(c) which states that (1) A municipality may, by resolution of its council, provide security for (c) contractual obligations of the municipality undertaken in connection with capital expenditure by other persons on property, plant or equipment to be used by the municipality or such other person for the purpose of achieving the objects of local government in terms of section 152 of the Constitution.
- b) Allowing Applicants to provide and install external services and associated land (for road reserves) in lieu of monetary contributions. This allowance is necessary to avoid unnecessary delay in land development due to the Municipality not being in a position to procure the services in time for developments to occur. This allowance must be treated as an exceptional case for which provision must be made in the Supply Chain Management Policy of the Municipality in terms of the Regulation 36 (1) (a) (v) of the Municipal Supply Chain Management Regulations (General Notice 868 of the Government Gazette No 27636 of 30 May 2005).

4 Scope: Road infrastructure

4.1 Engineering services are defined as the provision of water, electricity and sewerage (the so-called essential services) as well as the provision and construction of streets, roads and stormwater drainage systems. The scope of the manual covers the provision and construction of municipal streets and roads and associated stormwater and public transport services. Contributions to other engineering services are established in terms of other policies of the Municipality.

4.2 The scope of this manual only covers engineering services that will be taken over by the Municipality. Services that will not be taken over by the Municipality or

transferred to the Municipality are considered to be private services and fall outside the scope of this manual. The applicant is fully responsible for such provision and cost of such services. Reference in this manual to *taken over by the Municipality* includes services that will be transferred to other authorities.

- 4.3 The scope of the manual excludes maintenance and operations of roads and streets. Engineering service contributions are not a suitable funding source for such services due to their once-off nature while a sustainable funding source is required for the maintenance and operation of services.
- 4.4 The scope of the manual includes public transport facilities normally provided on the road and street system such as bus stops and pedestrian sidewalks, but facilities such as modal transfer stations, ranks, termini and reserved public transport or high occupancy vehicle lanes are excluded from the manual. Promotion of public transport is a priority in terms of national priorities and funding for major public transport facilities should be obtained from programmes that have been established for such purposes.
- 4.5 The scope of this manual also only covers roads or portions of roads and streets with functions that are primarily associated with vehicular traffic and not roads that are mostly or primarily provided for other functions such as walking, cycling, trading, parking, etc. The Applicant may, however, provide such roads as part of the internal services of the development.
- 4.6 Exclusion of engineering services or other facilities from the scope of the manual means that contributions for such services or facilities may not be levied in terms of this manual. It also means that contributions that are levied in terms of this manual may not be used for the provision of such services.

5 Scope: Other authorities

- 5.1 The Municipality has the sole responsibility for the provision of all external engineering services required to serve the local community within its area of jurisdiction. Applicants are responsible to make a contribution to the municipality to fully accommodate the increased traffic loads resulting from their applications and will therefore not be held responsible for contributing to roads under the jurisdiction of other authorities such as national and provincial authorities or adjacent municipalities. These authorities, however, are not obliged to upgrade or improve roads or to provide access in order to accommodate an application.
- 5.2 While it is the responsibility of the Municipality to ensure that a municipal road network is available to serve developments, there may be situations where this is not possible or cost-effective and where it is necessary to co-operate with other authorities to provide the required road network capacity. In such cases, the Municipality will during the master planning of the road network enter into discussions with the other authorities regarding the possible impact of developments in the Municipality on the roads under their jurisdiction. The Applicant will have no responsibilities in this regard.

- 5.3 During the discussions with other authorities, the Municipality may implement the following approaches for addressing these impacts on the other authorities:
- a) National and provincial roads which have a predominant function of serving the local community of the Municipality should be transferred to the Municipality.
 - b) For national and provincial roads that do not have such a predominant function, the Municipality may utilise engineering service contributions made to the Municipality for the upgrading the roads (or request Applicants to improve the roads in lieu of monetary contributions).
 - c) The engineering service contributions made to the Municipality may also be used to improve roads under the jurisdiction of other municipalities (or request Applicants to improve the roads in lieu of monetary contributions).

6 Principles of engineering service contributions

- 6.1 Engineering service contributions are a mechanism for the funding of engineering services required as a result of a development. Contributions are therefore made for a specific purpose, namely the provision of engineering services (specifically roads in this manual) and are therefore not a general taxation that can be used for general funding purposes or the provision of other services.
- 6.2 This manual is based on the following important fundamental principles:
- a) **Legal requirements.** The basic requirement for any cost recovery mechanism is that it must be supported by legislation. The mechanism may be excellent in terms of all other requirements, but, if it is not legally supported, the method cannot be implemented. This manual complies with the legislation in terms of which it has been established.
 - b) **Fiscal efficiency.** One of the basic principles and requirements of a cost recovery system is that it should not be costly to implement. The administration cost should not be so high that a substantial proportion of the fees collected go towards covering the administration costs. Administration cost will be high when a cost recovery system is technically difficult to implement or when the system is open to evasion.
 - c) **Financial efficiency.** A financing mechanism should provide a predictable and reliable source of income that is sustainable over time. A funding method such as engineering service contributions is not suitable for funding recurring costs such as maintenance and operations.
 - d) **Economic efficiency.** Economic resources are scarce and should be used in the most efficient and sustainable way to ensure maximum benefit for communities. It is therefore important that the manual should support the development of a road network that is economically efficient and sustainable.
 - e) **Equity and fairness.** A most important principle is that the determination and utilisation of engineering service contributions should, as far as possible and practical, be equitable and fair to all involved, including

existing residents and new Applicants (unless a deliberate decision to the contrary is taken by the Municipality).

- 6.3 Amongst funding mechanisms legally and practically available to municipalities at the time this manual was developed, engineering service contributions were considered to be the method which complies with most of the above principles.

7 Principle of equity and fairness

- 7.1 Engineering service contributions are considered equitable when all developments collectively contribute to and share in the cost of engineering services and no development subsidises another. Existing residents should not subsidise new developments but neither should they derive a disproportionate benefit in terms of infrastructure provided by new Applicants.
- 7.2 The principle of equal treatment applies to initial stages of development in an area such as during township development, as well as to future developments such as amendments to the township or consent uses. In order to be equitable, therefore, contributions must be determined for a future scenario in which the development of an area has stabilised.
- 7.3 An important consequence of the above principle is that contributions will not be affected by the sequence in which developments occur. However, in terms of this manual, an Applicant may be required to pay the full cost of providing infrastructure but at some later date recover the cost from the Municipality.
- 7.4 Based on the principle of equal treatment, new developments are not responsible to contribute to the backlog in engineering services caused by previous under-recovery of costs. Backlog is not taken into account in establishing the tariffs for engineering service contributions.
- 7.5 A further requirement based on the principle of equal treatment is that contributions are unrelated to the spare capacity that has been provided by the Municipality in the past to accommodate future growth. The contribution of the Applicant can be considered as a contribution towards the costs incurred by the Municipality to provide engineering services. Contributions will therefore be payable even if spare capacity exists in the vicinity of the application.
- 7.6 An important principle of this manual is that contributions to *external roads* must, where possible, be calculated using average parameters and costs, except that differentiation may be made between different categories of road types, land use or development types, environments and geographical areas (this requirement is not applicable to *internal roads*). Traffic visiting a development does not travel on specific roads only and may use any of the roads in the network. Parameters and costs are therefore not determined for specific roads but as an average for all roads.
- 7.7 Another principle is that contributions are calculated using current parameters and costs, even in situations where contributions are made in respect of engineering services that were previously provided using different traffic parameters and/or cost rates.

8 Responsibilities for the provision of engineering services

- 8.1 The respective responsibilities of the Municipality and Applicants for the provision of engineering services are as follows:
- a) The Applicant is responsible for the installation and provision of internal engineering services. This includes the provision of land required to accommodate such services.
 - b) The Municipality is responsible for the installation and provision of external services (including the expropriation of land required by such services). The Applicant, however, will contribute to the cost incurred by the Municipality to install and provide external engineering services, including the land required to accommodate such services.
- 8.2 Engineering services are classified as internal or external in accordance with the requirements of this manual.
- 8.3 For the determination of engineering service contributions, no differentiation is made between township establishment and other applications. An Applicant for other types of application will only be responsible for the required increase in external services resulting from the application.
- 8.4 Where an application is made for a development outside the Priority Development Area of the Municipality (so-called leapfrog developments), the Municipality may require the Applicant to bear the total cost of providing the connecting services or alternatively provide and install the external services on behalf of the Municipality. In such cases, the Applicant will be entitled to recover a share of the cost for the services when other Applicants at some future date will make use of such services, provided that there was prior agreement with the Municipality. The scope of the services as well as the conditions of repayment by the Municipality must be defined in the Engineering Services Agreement.
- 8.5 In terms of this manual, where the cost of providing or improving external road infrastructure required to serve the development, other than that required for leapfrog developments, exceeds the external engineering service contribution of the Applicant, the Municipality may budget and make funds available for providing such services.
- Where funds have not been made available, the Applicant may offer to make additional contributions available or alternatively provide and install the external road infrastructure on behalf of the Municipality. If such offer is accepted by the Municipality, the Applicant will be entitled to recover a share of the cost for the services when other Applicants at some future date will make use of such services. The scope of services as well as the conditions of repayment by the Municipality must be defined in the Engineering Services Agreement.
- The Municipality may, however, refuse any application on the grounds that the cost of providing external road infrastructure is, in its opinion, excessive or unaffordable.
- 8.6 The Municipality may request the Applicant to provide and install additional services in addition to those required in terms of this manual (including the increase in size of internal services to accommodate other developments). The

Applicant may deduct the cost of such services from the external engineering contribution provided that sufficient funds are available after addressing other obligations of the Applicant. If such funds are not available, the Applicant may agree to provide such services provided that the Municipality agrees to refund the additional cost.

Where the Municipality agrees to refund the Applicant for providing and installing external engineering services, the scope of the services as well as the conditions of repayment by the Municipality must be defined in the Engineering Services Agreement.

- 8.7 The Municipality will, where possible and practical, allow the Applicant to make an offer to provide and install external road infrastructure, or to provide land required for road reserves, in lieu of monetary contributions to such services, either partially or fully. In such cases, the Applicant must, in the offer, define the exact scope of road infrastructure that will be provided and installed or land that will be provided. The cost of the services (land as well as infrastructure) must be determined based on the average cost rates published by the Municipality, but adjusted for price escalation and for specific conditions.

The Municipality will decide on whether or not to accept the offer, provided that such acceptance will not be unreasonably withheld. Should the offer be accepted by the Municipality, the scope of road infrastructure will be defined in the Engineering Services Agreement. All improvements to road infrastructure will be in accordance with the specifications of and subject to the approval of the Municipality.

- 8.8 A Municipality may determine that an internal service will not be required in the near future, in which case the Applicant will make a cash contribution in lieu of providing and installing the service. In such cases, the cost of the internal services will be determined based on the average cost rates published by the Municipality (adjusted for price escalation and for specific conditions). The contribution will be added to the engineering service contributions to external roads and may be used for the provision or upgrading of external roads. The Municipality then becomes responsible for providing the internal service at some future date.

9 Utilisation of external engineering service contributions

- 9.1 In terms of this manual, the external engineering service contribution is made towards the costs incurred or which will be incurred by the Municipality to provide external engineering services. This manual therefore only covers contributions that will specifically be used for providing engineering services and not for other purposes. The contributions charged in terms of this manual will therefore only be utilised for the purpose of providing road infrastructure.

- 9.2 Contributions must, where possible and practical, be used to provide the services required to serve the specific development for which the application is made (where such infrastructure has not yet been provided or is lacking). Contributions made by an Applicant will therefore be used in the following order of priority:
- a) Firstly, for the cost of spatial and road master planning undertaken by the Applicant on behalf of the Municipality where such planning is inadequate. More information on such planning is provided below.
 - b) Secondly, for the payment of land provided for external services by the Applicant.
 - c) Thirdly, for the cost to increase the size or capacity of internal services that are required to serve other developments provided by the Applicant when such increase is required by the Municipality.
 - d) Fourthly, for the cost to the Applicant as agreed with the Municipality to improve the external services required by the particular development where such services have insufficient capacity to accommodate the development (including leapfrog developments). Contributions may also be used to address improvements to external services that are indicated in a Traffic Impact Assessment of the development.
- 9.3 Remaining contributions will be paid in cash to the Municipality and must be transferred to the *Road Contributions Account* which will be utilised for purposes as prescribed in this manual.
- 9.4 The above utilisation of contributions makes provision for situations where there is a lack of spatial and transportation master planning in an area. In such situations, the Municipality may allow the Applicant to make an offer to undertake the planning on behalf of the Municipality.

The Applicant will submit a study proposal and the Municipality will decide on whether or not to accept the proposal. Should the proposal be accepted by the Municipality, the Applicant may subtract the cost of the master planning from the engineering service contribution.

10 Road Contributions Account

- 10.1 The need for external engineering services shall be taken into consideration in the Integrated Development Plan of the Municipality. The Municipality must consider, approve and budget for road construction projects in its annual or adjustments budget.
- 10.2 All monetary contributions made towards roads in terms of this manual will be transferred to the *Road Contributions Account* within the Capital Replacement Reserve of the Municipality.
- 10.3 The Municipality may define geographic regions (or areas) for the purpose of road contributions and create separate *Road Contributions Accounts* for each region. Funds from these accounts may then only be used for road improvements in the specific regions.

- 10.4 The contributions will be ring-fenced in the account and may only be utilised for the purpose of providing road infrastructure. The funds will be utilised in the following order of priority:
- a) Firstly, where contributions were received for specific roads (such as boundary roads), for the improvement or provision of such roads when such improvements are required.
 - b) Secondly, to make payments to Applicants who previously paid the cost of external services in situations that are defined as leapfrog developments, when contributions that are received from an Applicant who makes use of such services are transferred to the account. Such payment will be made in accordance with the Engineering Services Agreement of the previous Applicant.
 - c) Thirdly, to pay the cost of increasing the size of internal engineering services to accommodate other developments when the Applicant is required by the Municipality to do so.
 - d) Fourthly, to pay additional costs in situations where the cost of providing or improving external road infrastructure required as a result of a development exceeds the engineering service contribution of an Applicant. The payment will be made in accordance with the Engineering Services Agreement.
 - e) Fifthly, for the planning, design and construction of new road infrastructure or improvement of existing infrastructure.
- 10.5 The Municipality may adopt a budget-related policy identifying additional sources of revenue for the *Road Contributions Account* including the following:
- a) Additional voluntary annual contributions by the Municipality and other parties; and
 - b) The allocation of interest earned on cash investments of the Road Contributions Account.

11 Road design standards and classification

- 11.1 Roads and streets comprise all elements normally associated with a road or street, including earthworks, foundation courses, wearing courses, kerbing, bridges, culverts, stormwater drainage, kerb inlets, auxiliary lanes, junctions intersections, public transport stops, pedestrian walkways, finishing of the street reserve, road markings and signs, traffic signals, guard rails, safety devices, street lighting and everything necessary to allow vehicles and pedestrians to move safely, effectively and conveniently. The provision of road infrastructure services also includes the land that is required for road reserves.
- 11.2 In order to establish the responsibilities for and contributions to road infrastructure, roads must be classified by the Municipality into Functional Classes as defined in the *TRH26 South African Road Classification and Access Management Manual* of COTO (2012). The Municipality will prepare a road network master plan showing these road classes.

- 11.3 The required design standards for roads will be prescribed by the Municipality. In terms of this manual, roads will be provided to the following nominal standards:

Nominal design standards (internal and external roads)		
Road Class	Road reserve width	Paved carriageway width (excluding shoulders or kerbs)
1	62m	9.0m
2	48m	9.0m
3	32m	9.0m
4	20m	9.0m
5	16m	7.0m (8.0m for bus routes)
Stop or yield controlled intersections		

- 11.4 Any widening of roads or the provision of other forms of intersection control above the nominal standards will be determined by means of engineering studies.

12 Internal road infrastructure

- 12.1 The Applicant is fully responsible for the provision and installation of internal roads, including the design, provision, installation, construction and commissioning of all components of such services. It also includes the road reserves required to accommodate the services, and such land must be provided to the Municipality at no cost.
- 12.2 Internal roads are defined as the following:
- a) All Class 4 and 5 roads and streets located within the boundary of the development; but excluding any widening that may be required by the Municipality to accommodate other developments. Widening of roads required for the purpose of the development itself is classified as an internal service (including any upgrading of roads on the initiative of the Applicant that is not required to increase the capacity of the road network).
 - b) All Class 4 and 5 roads and streets at, on or outside of the boundary of the development that are required for the exclusive use of the development (now and in perpetuity).
 - c) Only roads that will be taken over by the Municipality are classified as engineering services.
- 12.3 Connections (junctions or intersections) between internal and external services are defined as external services up to the continuous road reserve boundary (i.e. excluding splays) of the external service. The external engineering service contribution provides for connections, but only up to the road reserve boundary of the external service. Any additional work required on or along the internal service as a result of the application at the connection is defined as internal..
- 12.4 For township establishments, any reference to the boundaries of the development will be taken to mean the boundaries of the township. The boundaries of

developments other than township establishments, are taken as those of the development and not of the original township.

- 12.5 In addition to internal roads, the Applicant is also responsible for the provision and installation of all roads (e.g. private roads) that will NOT be taken over by the Municipality. This includes the connections with these roads, including erf or property accesses, even if such connections will be taken over by the Municipality.

13 External road infrastructure

- 13.1 The Municipality is responsible for the provision of external engineering services, including external services located within the boundaries of the application. This includes the compensation for land required to accommodate such services. The Applicant is responsible to contribute to the cost of the external engineering services.
- 13.2 All municipal road infrastructure NOT classified as internal services are classified as external services.
- 13.3 The Applicant must make an engineering service contribution to external road infrastructure in accordance with the following formula:

$$\text{Total contribution} = C_A + C_B$$

Where:

- C_A = Basic external road contribution
 C_B = Boundary road contribution

- 13.4 The basic external road contribution is calculated by means of the following formula:

$$C_A = (C_{AQ} - C'_{AQ}) + (C_{AH} - C'_{AH})$$

Where:

- C_A = Basic external road contribution
 C_{AQ} = Capacity component for total development (total rights)
 C'_{AQ} = Capacity component for the existing land use rights
 C_{AH} = Strength component for total development (total rights)
 C'_{AH} = Strength component for existing land use rights

- 13.5 Any reduction in contributions (negative C_A) shall only be taken into consideration to the extent that the Municipality can recover the cost of such services.
- 13.6 The principles according to which external engineering service contributions are determined are described in the following sections, with details provided in Appendix A. The method for calculating the contributions is described in Appendix B.

14 Basic external road contribution: Capacity component

14.1 The capacity component of the basic external road contribution provides for the road space required to serve traffic visiting a development. This space is broadly determined by first calculating the “amount of travel” by multiplying the trip generation of the development with half the average of trip lengths on the external road network between the development and previous or next developments visited during trips. Only half of the trip lengths are taken into account since the development at the other end of the trip would contribute to the cost of the other half of the trip length. Travel on certain roads is excluded from the trip lengths. The amount of travel is then divided by the typical service flow rate of a Class 3 road to determine the length of road required to serve the traffic demand. This length of road is then multiplied by an average unit cost rate to determine the capacity component of the basic external road contribution.

14.2 The capacity component C_{AQ} of the basic external road contribution is calculated by means of the following formula (a similar formula is used for calculating C'_{AQ}):

$$C_{AQ} = \text{Sum of } C_{AQD} \text{ for different land uses (D)}$$

In which:

$$C_{AQD} = A_D \cdot T_D \cdot (L_D / 2) \cdot R_Q$$

With:

$$T_D = F_{QD} \cdot AADT_D$$

Where:

- C_{AQ} = Capacity component for total development
- C_{AQD} = Capacity component for a particular land use
- A_D = Size of the land use rights in appropriate size units
- T_D = Impact trip rate (trips per hour per size unit)
- F_{QD} = Traffic factor to convert AADT to an impact trip rate
- $AADT_D$ = AADT trip generation rate (trips per day per size unit)
- $L_D/2$ = Half average trip length (km) on external roads only
- R_Q = Cost rate per veh-km/hour for the capacity component

14.3 The size of a land use right A_D is determined in terms of prescribed size units. The size applies to the approved land use rights and not exercised land use.

14.4 The cost rate R_Q for the capacity component is a rate per veh-km/hour. The rate is determined using formulae provided in Appendix A.

14.5 $AADT_D$ is the Annual Average Daily Trip generation rate (per size unit), the estimated total in- and outbound traffic generated by one size unit of the development over one year divided by the number of days in a year.

14.6 The traffic factor F_{QD} converts the $AADT_D$ to an equivalent impact hourly trip rate T_D for the development. Peak hour traffic demand is the basis for the design of the road network, particularly the higher order roads. The factor, however, also provides for the utilisation of available road space by developments that generate traffic outside the peak hours. All developments therefore contribute to the cost of

road space in relation to their total use of roads. The factor is determined using formulae provided in Appendix A.

- 14.7 The parameters required for the calculation of the capacity component are provided in the latest available version of the *South African Trip Data Manual*. The Municipality will annually publish the cost rates required for the calculation.
- 14.8 The parameters provided in the Trip Data Manual refer to specific land uses and not the zoning of the land. The definition of certain zoning classifications may include a wide range of land uses which have a trip generation rate or length exceeding the trip generation of the zoning description. The calculations are therefore based on land uses and not zoning descriptions.

15 Basic external road contribution: Strength component

- 15.1 The strength component of the basic external road contribution provides for strengthening roads to accommodate heavy vehicles. The strengthening required is determined on the basis of the number of heavy vehicles expected to visit the development over the design life of the road. The trip length is taken as the average of half the trip lengths on the external road network between a development and previous or next developments on a trip.
- 15.2 The strength component C_{AH} of the basic external road contribution is calculated by means of the following formula (a similar formula is used for the calculation of C'_{AH}):

$$C_{AH} = \text{Sum of } C_{AHD} \text{ for different land uses (D)}$$

In which:

$$C_{AHD} = A_D \cdot AADT_D \cdot P_{HD} \cdot E_{HD} \cdot (L_D / 2) \cdot R_H$$

Where:

- C_{AH} = Strength component for total development
- C_{AHD} = Strength component for a particular land use
- A_D = Size of the land use right in appropriate size units
- P_{HD} = Proportion of heavy vehicles (of $AADT_D$)
- E_{HD} = Average number of E80 axles per heavy vehicle
- $AADT_D$ = AADT trip generation rate (trips per day per size unit)
- $L_D/2$ = Half average trip length (km)
- R_H = Cost rate per E80-km/day for the strength component

- 15.3 The cost rate R_H for the strength component is determined using formulae provided in Appendix A. The trip length for heavy vehicles may also be different from the trip lengths used to determine the capacity component.
- 15.4 The parameters required for the calculation of the strength component are provided in the latest available version of the *South African Trip Data Manual*. The Municipality will annually publish the cost rates required for the calculation.

16 Boundary road contribution

- 16.1 In addition to the basic external road contributions (capacity and strength components), an additional contribution must also be made to the cost of Class 4 and 5 roads located at or on the boundaries of the development (and which are not required for the exclusive use of the development). No such contribution will be made to Class 1 to 3 boundary roads (the cost of such roads is recovered by basic external road contributions).
- 16.2 The boundary road contribution must be made irrespective of whether the development actually requires direct access to the boundary road or not. These roads are available to provide access and the development may require such access in future.
- 16.3 The contribution is made for existing as well as planned boundary roads. This means the Applicant may be contributing to the cost of boundary roads which do not exist at the time of application and which will only be provided in future.
- 16.4 The boundary road contribution is only required once and only with township establishment.
- 16.5 The boundary road contribution is calculated by means of the following formula:

$$C_B = \text{Sum of } P_B \cdot K_B \cdot L_B \text{ for boundary road segments B}$$

Where:

- C_B = Total boundary road contribution
- P_B = A factor which is either 0.5 or 1.0
- K_B = Cost of one kilometre of boundary road to *nominal* standards
- L_B = Length of the boundary road segment (km)

- 16.6 The value of the factor P_B is 1.0, but is reduced to 0.5 where the boundary road is flanked by another developed or developable property that can obtain access to the road.
- 16.7 The length L_B is measured along the centreline of the boundary road segment. At intersections between internal roads, the length is measured up to the intersection of the two centrelines. The overlapping of road space as a result of this method of measurement is used to account for the widening of roads at junctions. At intersections with external roads, the length is measured up to the continuous road reserve boundary (i.e. excluding splays) of the external road.
- 16.8 The cost of a Boundary Service is determined using average cost rates for a particular class of road (adjusted for price escalation). The average cost rate will be used, even if the actual cost of particular boundary road is lower or higher than the average cost.
- 16.9 The average cost rates for boundary roads are determined for roads designed to *nominal* standards as defined in this manual. Where widening of a boundary road is required to accommodate traffic, such widening will be covered by the basic component of the external engineering contribution and the boundary service contribution will not be increased to cover the cost of the widening.

17 Connections

- 17.1 In terms of this manual, connections between internal and external services are classified as an external service up to the continuous road reserve boundary (i.e. excluding splays) of the external service. Connections to roads that will not be taken over by the Municipality are the responsibility of the Applicant.
- 17.2 On roads, a connection may be provided as an at-grade junction or intersection in accordance with the standards of the responsible road authority. The cost of providing such connection includes all elements of the intersection within the road reserve of the external road, including but not limited to the following:
- a) Additional land required along external roads to accommodate the intersection, over and above the normal road works.
 - b) All work required to widen roadways within the road reserve of the external roads at the connection.
 - c) Public transport facilities required within the road reserve of the external road network as a direct result of the connection.
 - d) Traffic control devices and road traffic signs within the road reserve of the external roads.
 - e) Additional street lighting required for the connection along the external road network.
- 17.3 Any work or improvements required along the internal road to provide the connection are classified as internal, including additional land that may be required along the internal road, work required to widen the internal road, public transport facilities, road traffic signs as well as street lighting required along the internal road.
- 17.4 Interchanges are mostly provided between major roads classified as external services and would not normally be provided on roads classified as internal. Where such an interchange is required, the Applicant will enter into an agreement with the Municipality regarding the provision of such interchange.

18 Trip generation rate

- 18.1 The daily trip generation rates used in the contribution formulae are the same as those used in Traffic Impact Assessments. These trip rates take modal split and the use of public transport into account.
- 18.2 The trip generation rates are measured in units of trip ends, with either an origin or a destination within the development. It is the sum of in- and outbound traffic to or from a development.
- 18.3 The trip generation rate used for the determination of the capacity component of the engineering service contributions may, when agreed with the Municipality, be adjusted for mixed-use developments, developments in low-vehicle ownership areas and transit orientated developments by means of the following formula:

$$\text{Reduction factor} = (1 - P_{\text{Mixed}}) \cdot (1 - P_{\text{LowVeh}}) \cdot (1 - P_{\text{Transit}})$$

Where:

P_{Mixed} = Proportion reduction for mixed-used development

P_{LowVeh} = Proportion reduction for low-vehicle ownership areas

$P_{Transit}$ = Proportion reduction for transit orientated developments

The trip generation rate is reduced by multiplying the standard trip rate with the above reduction factor.

- 18.4 The above reduction is NOT applied to the strength component of the engineering service contributions.
- 18.5 The reduction accounts for travel by modes of transport other than private vehicles. The mixed-use reduction accounts for walking trips between land-uses located within a reasonable walking distance of each other. The reduction for low-vehicle ownership areas accounts for the greater use of public transport and non-motorised forms of transport in such areas. Provision is also made for very low vehicle ownership areas in which most trips are made by means of public transport. The reduction for transit orientated developments provides for reduced need for vehicular travel as a result of high density land use in such developments, as well as the increased use of public transport.
- 18.6 The reduction for mixed-use development will only be allowed when there are other complimentary land-uses within a reasonable walking distance from the proposed development. Furthermore, the reduction in the number of trips may not exceed the total available mixed-use trips at the other land uses, determined as follows:

$$\text{Total mixed-use trips at other land uses} = \sum P_{Mixed} \cdot \text{Trips}$$

Where:

P_{Mixed} = Mixed-use proportion for other developments

Trips = Trips generated by other developments after deduction for low vehicle ownership and transit orientated developments.

Where the Applicant wishes to apply the mixed-use reduction factor, the Applicant must provide information on the land-uses to which the walking trips will be made and the mixed-use trip generation of such land uses, calculated with the formula above. The mixed-use reduction may not exceed the total mixed-use trip generation of these land uses.

- 18.7 No deductions will be made from the trip rate for pass-by or diverted traffic. The reason for this is that all developments must share equitably in the cost of the road infrastructure required by all traffic visiting the development. This implies that developments that rely significantly on pass-by traffic also make an equitable contribution to the cost of road infrastructure.
- 18.8 No deductions will also be made for "internal" trips where such trips are made on internal roads. This manual already provides for a reduction of the trip length for travel on such roads and no additional reduction in the trip generation rate can be allowed.
- 18.9 Where the land-use rights applied for allow for an optional range of land-use types, the land-use type resulting in the highest engineering service contribution

shall be selected to determine the contribution (worst-case scenario). Should the Applicant not intend to develop the land uses that result in the higher contribution, such uses should be excluded from the application, or alternatively the maximum extent of certain land uses may be curtailed.

- 18.10 The Municipality will NOT allow the use of trip rates observed at a particular development for determining the development contribution. The reason for this is that the current rate observed at a development may not necessarily be representative of the future trip generation rate at the development since the development may change, expand or improve in future. Statistically sound methods must be used to establish representative trip rates for different land uses.

19 Trip length

- 19.1 The incorporation of trip length in the cost contribution formula makes provision that some types of developments may generate traffic over longer travel distances than others. Large regional developments, for example, attract traffic from larger areas and travel distances are therefore longer.
- 19.2 The trip length L_D for a particular land-use is determined as the distance travelled between a development and the previous or next developments visited during trips, excluding travel on the following roads:
- a) Travel on roads other than those under the jurisdiction of the Municipality.
 - b) Travel on Class 4 and 5 roads. These roads are either provided by the Applicant or have previously been provided by other Applicants as internal or boundary roads. However, widening of boundary and external Class 4 and 5 roads is recovered from the external engineering contribution, and a portion of the trip length on such widened roads must therefore be included in the trip length. This portion is taken as 50% of the trip length on these widened roads.
- 19.3 The trip length L_D for the capacity component of the contribution is primarily related to private passenger car travel, whereas L_D for the strength component of the contribution applies exclusively to heavy vehicles used for the transport of goods that typically takes place over longer distances. Different values for L_D may thus apply to the calculation of the two components of the contribution.
- 19.4 The trip length used for the determination of the engineering service contribution is determined by means of the following formula:

$$(L_D / 2) = F_T \cdot [(1 - P_N) \cdot (L_T / 2) - L_{45}]$$

Where:

- $L_D/2$ = Half adjusted average trip length (km)
- $L_T/2$ = Half total average trip length from origin to destination
- F_T = Adjustment for size of the Municipality
- P_N = Proportion travel on roads not under jurisdiction of Municipality
- L_{45} = Length of travel on Municipal Class 4/5 roads

- 19.5 The adjustment factor F_T is used to account for the impact of the total size of the urbanised or developed area in which the development is located. In smaller urbanised areas, trip lengths can be expected to be shorter compared to large areas. The adjustment is made by means of the following formula:

$$F_T = 1 - F_{LA} \cdot e^{-A \cdot F_{LB}}$$

Where:

- F_T = Adjustment for size of the urbanised area
- A = Total size of the urbanised area (km²)
- F_{LA}, F_{LB} = Parameters of the formula

The Municipality will determine the total size of the urbanised area (A) for use in the above formula. Where a Municipality consists of two or more separate urbanised areas and where travel between the areas is limited, the Municipality may determine different adjustment factors for the different areas.

- 19.6 Half the average trip length is used to determine contributions. However, the in- and outbound trip lengths are not added together but are measured as separate *trips* in determining the trip length.
- 19.7 Trip lengths are measured in regions or areas in which developments have stabilised and no further amendments or re-development are likely. Trip lengths measured in developing areas would not be representative of future travel and may result in an inequitable cost recovery.

20 Cost rates

- 20.1 The cost rates of the capacity component of municipal roads include all components of such roads, such as the following:
- a) The cost of land.
 - b) Earthworks (fills and cuts).
 - c) Pavement, including auxiliary lanes at junctions (excluding strength component required by heavy vehicles).
 - d) Kerbs.
 - e) Sidewalks.
 - f) Guard rails and other safety devices.
 - g) Stormwater drainage, including culverts and bridges.
 - h) Public transport stops directly associated with the road network and located within the road reserve (excluding modal transfer facilities, ranks, holding areas and termini).
 - i) Grade-separated intersections and interchanges.
 - j) Traffic signals, road signs and markings.
 - k) Street lighting.
 - l) Landscaping to the extent reasonably required for road provision. Landscaping aimed at purposes such as city beautification is not an engineering service and can thus not be included.
 - m) Preliminary and general items.
 - n) Professional fees (planning, design and supervision).

- 20.2 The cost of boundary roads includes all components of providing such roads to *nominal* standards, such as the following:
- a) The cost of land.
 - b) Earthworks (fills and cuts).
 - c) Pavement (including strength component required by heavy vehicles).
 - d) Kerbs.
 - e) Sidewalks.
 - f) Guard rails and other safety devices.
 - g) Stormwater drainage, including culverts and bridges.
 - h) Public transport stops directly associated with the road network and located within the road reserve (excluding modal transfer facilities, ranks, holding areas and termini).
 - i) Priority controlled intersections.
 - j) Road signs and markings.
 - k) Street lighting.
 - l) Landscaping (see note above).
 - m) Preliminary and general items.
 - n) Professional fees (planning, design and supervision), including the cost of master planning.

The cost rate for boundary roads is determined for Class 4 and 5 roads provided to *nominal* standards and does not include the cost of any widening required of such roads.

- 20.3 The above components are those that are normally associated with a well-planned and designed road network. Costs resulting from inadequate infrastructure planning or insufficient reservation of land for infrastructure provision are not taken into account. These costs could have been prevented if adequate planning was in place or land was adequately reserved for infrastructure provision before development occurred in an area. The following cost items are therefore not taken into account in the establishment of unit cost rates:
- a) Relocation of engineering services.
 - b) Demolition of buildings and other structures.
 - c) Excessive measures required to accommodate traffic.

21 Land values

- 21.1 The cost rate of external roads includes the cost of the land required for the road reserve and such cost is therefore included in the engineering service contribution made by an Applicant.
- 21.2 The cost of land is taken as the average cost of land in an area at the time when a new township is established (adjusted for price escalation). Typically, the cost would be that of farm land with development potential.
- 21.3 The Municipality will establish geographic areas in which land values are relatively homogeneous. The land value for a particular application will thus depend on the geographic area in which the proposed development is located.

- 21.4 Where an Applicant offers to make land available for an external road, the Applicant must be compensated for the value of such land.

22 Parameters for contributions

- 22.1 The Municipality will establish parameters for the calculation of engineering service contributions for use in the Municipality. Where such parameters have not been established, the parameters provided in the *South African Trip Data Manual* will be used. The latest available version of this manual must be used for the determination of the contributions.
- 22.2 The Municipality may establish parameters for the Municipality as a whole, or it may differentiate between different geographical areas of the Municipality.
- 22.3 All newly established parameters or revisions to parameters must be approved by the Municipality. Such revisions will be applicable from the date on which such parameters are approved by the Municipality.
- 22.4 Unit cost rates used for establishing engineering service contributions will be revised at time intervals not exceeding five years. The rates will be determined for a specific base date. Such revisions must be approved by the Municipality.
- 22.5 After approval of unit cost rates by the Municipality, the rates will be escalated annually in accordance with price indices published by Statistics South Africa using formulae provided in Appendix A. The adjusted cost rates will be approved by the Municipality and published annually. Published rates will be applicable until the next rate schedule has been approved and published by the Municipality.
- 22.6 The annual review of the cost rates will form part of the contents of the annual budget of the Municipality.

23 Engineering Services Agreement

- 23.1 An Engineering Services Agreement between the Applicant and the Municipality will be drawn up for all developments (township establishment and amendment schemes). The agreement will stipulate the conditions and requirements for the provision or improvement of engineering services.
- 23.2 The agreement will, in addition to any other conditions and requirements of the Municipality, specify the following:
- a) The amount of engineering service contributions to be made with regard to the application, together with conditions regarding the payment of such contributions.
 - b) Should the Municipality allow payment of contributions in instalments the Municipality will impose conditions for such payment with regard to security of payment and interest payable.
 - c) The amount of any additional costs paid by the Applicant and which will be recovered from the Municipality, together with conditions regarding such cost recovery.

- d) Where an Applicant will provide land in lieu of the monetary contributions, the detailed definition of land that will be provided. The agreement must include security for the provision of the land to the satisfaction of the Municipality.
- e) Where an Applicant will provide and install external engineering infrastructure in lieu of monetary contributions, the detailed scope of the work together with any conditions imposed by the Municipality with regard to such work. The agreement must include security for the provision of the infrastructure to the satisfaction of the Municipality. Such security must provide for escalation in the cost of providing and installing the road infrastructure. The time of completion of the work will also be specified in the agreement.

24 References and bibliography

COTO, 2012, South African Trip Data Manual, TMH 17, Committee of Transport Officials, Pretoria.

COTO, 2012, South African Road Classification and Access Management Manual, TRH26, Committee of Transport Officials, Pretoria.

De Vries, J, 2004, A Methodology for Establishing Developer Contributions to the Provision of Road Infrastructure in Urban Areas. M.Eng Thesis, University of Pretoria.

Appendix A

Formulae for the Calculation of External Engineering Service Contributions

A.1 Introduction

- 1.1 The principles according to which external engineering service contributions are calculated are described in the main text of the manual. More details are provided in this appendix on the calculation of the contributions and the formulae used in the calculation.

A.2 External road infrastructure

- 2.1 The total engineering service contribution to external roads is calculated using the following formula:

$$\text{Total contribution} = C_A + C_B$$

Where:

$$\begin{aligned} C_A &= \text{Basic external road contribution} \\ C_B &= \text{Boundary road contribution} \end{aligned}$$

- 2.2 The basic external road contribution is calculated by means of the following formula:

$$C_A = (C_{AQ} - C'_{AQ}) + (C_{AH} - C'_{AH})$$

Where:

$$\begin{aligned} C_A &= \text{Basic external road contribution} \\ C_{AQ} &= \text{Capacity component for total development (approved rights)} \\ C'_{AQ} &= \text{Capacity component for the existing land use rights} \\ C_{AH} &= \text{Strength component for total development (approved rights)} \\ C'_{AH} &= \text{Strength component for existing land use rights} \end{aligned}$$

- 2.3 The method according to which the boundary road contribution is calculated has been described in the main document and is not repeated in this appendix.

A.3 Basic external road contribution: Capacity component

- 3.1 The capacity component C_{AQ} of the basic external road contribution is calculated by means of the following formula (a similar formula is used for calculating C'_{AQ}):

$$C_{AQ} = \text{Sum of } C_{AQD} \text{ for different land uses (D)}$$

In which:

$$C_{AQD} = A_D \cdot T_D \cdot (L_D / 2) \cdot R_Q$$

With:

$$T_D = F_{QD} \cdot AADT_D$$

Where:

- C_{AQ} = Capacity component for total development
- C_{AQD} = Capacity component for a particular land use
- A_D = Size of the land use rights in appropriate size units
- T_D = Impact trip generate rate (trips per hour per size unit)
- F_{QD} = Traffic factor to convert AADT to an impact trip rate
- $AADT_D$ = AADT trip generation rate (trips per day per size unit)
- $L_D/2$ = Half average trip length (km)
- R_Q = Cost rate per veh-km/hour for the capacity component

- 3.2 $AADT_D$ is the Annual Average Daily Trip generation rate (per size unit), the estimated total in- and outbound traffic generated by one size unit of the development over one year divided by the number of days in a year.
- 3.3 The traffic factor F_{QD} converts the $AADT_D$ to an equivalent impact hourly trip rate for the development. Peak hour traffic demand is the basis for the design of the road network, particularly the higher order roads. The factor, however, also provides for the utilisation of available road space by developments that generate traffic outside the peak hours. All developments therefore contribute to the cost of road space in relation to their use of roads. The factor is determined using formulae provided in this appendix.

A.4 Basic external road contribution: Strength component

- 4.1 The strength component C_{AH} of the basic external road contribution is calculated by means of the following formula (a similar formula is used for the calculation of C'_{AH}):

$$C_{AH} = \text{Sum of } C_{AHD} \text{ for different land uses (D)}$$

In which:

$$C_{AHD} = A_D \cdot AADT_D \cdot P_{HD} \cdot E_{HD} \cdot (L_D / 2) \cdot R_H$$

Where:

- C_{AH} = Strength component for total development
- C_{AHD} = Strength component for a particular land use
- A_D = Size of the land use right in appropriate size units
- P_{HD} = Proportion of heavy vehicles (of $AADT_D$)
- E_{HD} = Average number of E80 axles per heavy vehicle
- $AADT_D$ = AADT trip generation rate (trips per day per size unit)
- $L_D/2$ = Half average trip length (km)
- R_H = Cost rate per E80-km/day for the strength component

- 4.2 The trip length for heavy vehicle trips (strength component) may be different from the trip length for the capacity component.

A.5 Unit cost rate: Capacity component

- 5.1 The unit cost rate for the capacity component is determined for a typical major road carrying an estimated service flow rate. This approach has the advantage that the cost rate can be determined without estimating the total cost of the entire road network or the total amount of travel on the network. The unit cost rate is established by means of the following formula:

$$R_Q = K_Q / Q_T$$

Where:

- R_Q = Unit cost rate per veh-km/hr
 K_Q = Cost of one km of a typical major municipal road
 Q_T = Service flow rate of a major road (veh per hour)

- 5.2 The service flow rate required in the above formula is determined by means of the following formula:

$$Q_T = \frac{N_L \cdot Q_L}{2 \cdot F_{D1}}$$

Where:

- Q_T = Service flow rate of the road (veh per hour)
 N_L = Number of lanes on the road (e.g. 4 for a 4-lane road)
 Q_L = Service flow rate per lane (veh per hour per lane)
 F_{D1}, F_{D2} = Background traffic directional split $F_{D1}:F_{D2}$ with $F_{D1} > F_{D2}$

- 5.3 Using the background directional traffic split implies that developments are charged on the basis of the directional split for which roads are designed. This is an average or typical split for all developments which does not take the directional characteristics of specific developments into account. It is not possible to determine such characteristics for individual developments and the formula is therefore based on the average split. Even if a development has a 50:50 traffic split at the entrance to the development, it does not imply that the same split would be maintained on the road network since outgoing traffic would not follow the exact same route as incoming traffic (particularly if there are more than one destination on a trip).

A.6 Unit cost rate: Strength component

- 6.1 The cost of the strength component of municipal roads provides for the strengthening of roads to accommodate the E80 axle loads of heavy vehicles. This cost rate includes provisional and general items, professional fees and value added tax (VAT).

6.2 The cost rate for the strength component is determined as follows:

$$R_H = \frac{365 \cdot Y_H \cdot P_E}{2 \cdot E_H} \cdot K_H$$

Where:

- R_H = Unit cost rate for the strength component per E80-km
- Y_H = Structural design life for road pavements (typically 20 years)
- P_E = Percentage of all heavy vehicles using the slow lane
- E_H = Design number of E80 axle loads per design lane
- K_H = Additional cost to strengthen one kilometre of road

The factor 2 in the above formula provides for the two directions of travel.

6.3 The cost contribution is based on the cost per road kilometre rather than lane kilometre. This is to account for the practice that is normally followed to construct all lanes of multilane roads for the required pavement strength although heavy vehicles tend to use the slow lane. Provision is however made for the lane distribution of heavy vehicles by means of the factor P_E .

A.7 Cost escalation

7.1 Unit cost rates for determining engineering service contributions will be adjusted to account for price escalation. The rates will be published annually by the municipality.

7.2 Escalation factors will be determined separately for the construction and land components of the cost rates, using the following formulae:

$$I_K = 1 - X_{PK} + X_{PK} \cdot \left(X_{PL} \cdot \frac{I_{PCt}}{I_{PCo}} + X_{PM} \cdot \frac{I_{PMt}}{I_{PMo}} + X_{PF} \cdot \frac{I_{PFt}}{I_{PFo}} + X_{PP} \cdot \frac{I_{PPt}}{I_{PPo}} \right)$$

$$I_L = \frac{I_{PCt}}{I_{PCo}}$$

In which:

- I_K = Escalation factor for construction component
- I_L = Escalation factor for land component
- X_{PK} = Proportion of Construction cost subject to escalation
- X_{PL} = Proportional value for Labour cost
- X_{PM} = Proportional value for Materials (Civil engineering industry)
- X_{PF} = Proportional value for Fuel
- X_{PP} = Proportional value for Civil engineering plant
- I_{PC} = Consumer Price Index (Historical metropolitan and other urban)
- I_{PP} = Production Price Index for Civil engineering plant
- I_{PM} = Production Price Index for Materials (Civil engineering industry)
- I_{PF} = Production Price Index for Fuel (Diesel oil)

The suffix "o" denotes the basic indices applicable to the base date for which the base unit cost rate was determined.

The suffix "t" denotes the date at the start of the year for which the cost rates are published. If indices are not available for this date, the latest available indices will be used.

A.8 Method for determining traffic factor F_{QD}

- 8.1 The traffic factor F_{QD} is used to convert $AADT_D$ to an equivalent hourly trip rate T_D which accounts for differences between the peak times of individual developments and the peak hour for which the road network is designed. The peak times of some developments may correspond with the design peak hour, but there are many developments for which the peak times do not coincide with the peak hour on the road network.
- 8.2 Using the peak trip generations of individual developments irrespective of the design hour would lead to an over-recovering of the cost of providing the road network. This problem can be addressed by using the trips generated during the design peak hour (background traffic peak), but this approach would lead to some developments making large contributions while others would make relatively low contributions. These developments would therefore be using road infrastructure that has been provided by other developments without making an equitable contribution to the cost of the infrastructure.
- 8.3 An equitable approach requires that each trip generated by a development must make some contribution to the cost of the road network, irrespective of the hour in which the trip is made. On the other hand, however, trips that are made outside the design hour cannot be expected to make the same contribution as trips during the design hour.
- 8.4 The above implies that the factor F_{QD} cannot be determined for one specific hour but should consider all hours over which trips may be generated. The factor is therefore determined as the sum of factors F_{QDH} determined for each travel hour:

$$F_{QD} = \sum_{H=1}^{168} F_{QDH}$$

- 8.5 The summation should preferably have been made for all 8760 hours of the year, but traffic data are not generally available for such long periods. The formula therefore shows that only 168 hours are taken into account. These 168 hours are measured over the seven days of a so-called "normal" week. A normal week is one in which no so-called abnormal events occur, such as school and public holidays. This approach will be adequate for most types of development, but there could be developments for which a longer period could be required.

8.6 For the determination of the hourly factor FQDH used in the above formula, the following traffic volumes are required for each of the 168 hours of the week:

- a) Background traffic volume on the major road system (T_{BH})
- b) Trip generation for a particular type of development (T_{DH})

8.7 The methodology consists of two main steps. In the first main step, the background traffic is used to determine the road space which must be contributed to by a vehicle travelling in a particular hour of the week. In the second main step, this road space is multiplied by the trip generation of the development to provide the total road space contribution for the development.

8.8 The road space contribution required by a vehicle travelling in a particular hour of the week is determined as follows:

- a) The background hourly traffic volumes are sorted from small to large. The following notation is now used to indicate the sorted hours:

$H(i)$ = Hour which has the i^{th} highest count.

An index of $i = 1$ indicates that hour $H(1)$ has the smallest volume while an index $i = 168$ indicates that hour $H(168)$ has the highest volume.

The notation $T_{BH(i)}$ is used to indicate the background traffic in the i^{th} highest hour.

- b) The highest background traffic volume during hour 168 determines the total road space (capacity component) that is required to accommodate the background traffic on a particular road. This road space can be determined by means of the following formula:

$$\frac{T_{BH(168)}}{Q_T}$$

In which Q_T is the service flow rate of the road.

- c) The above road space is required to accommodate the traffic demand during the highest hour. Traffic travelling in the i^{th} highest hour, however, only requires the following road space:

$$\frac{T_{BH(i)}}{Q_T}$$

- d) For the 1st highest hour (the lowest volume), the road space required to accommodate a flow of $T_{BH(1)}$ is shared by traffic travelling during all 168 hours of the week, or a total of $168 \cdot T_{BH(1)}$ vehicles. The road space to which one vehicle in this hour must contribute to is therefore determined as follows:

$$\frac{F_{QBH(1)}}{Q_T} = \frac{T_{BH(1)} / Q_T}{168 \cdot T_{BH(1)}} = \frac{1}{168 \cdot Q_T}$$

In which $F_{QBH(1)}$ is a factor used in subsequent calculations.

- e) For the 2nd highest hour, the required road space is shared by $167 \cdot T_{BH(2)}$ vehicles. However, of these vehicles, a total of $167 \cdot T_{BH(1)}$ is already

making a contribution as calculated for the 1st highest hour above. The contribution by these vehicles are as follows:

$$167 \cdot T_{BH(1)} \cdot F_{QBH(1)} / Q_T$$

- f) The remaining $167 \cdot (T_{BH(2)} - T_{BH(1)})$ vehicles are responsible for contributing to the additional $(T_{BH(2)} - T_{BH(1)})/Q_T$ road space required to accommodate the 2nd highest hour traffic. The total contribution required by all vehicles travelling in the 167 hours is therefore:

$$(T_{BH(2)} - T_{BH(1)}) / Q_T + 167 \cdot T_{BH(1)} \cdot F_{QBH(1)} / Q_T$$

- g) The average contribution shared by each of the $167 \cdot T_{BH(2)}$ vehicles is therefore (per vehicle):

$$\begin{aligned} \frac{F_{QBH(2)}}{Q_T} &= \frac{(T_{BH(2)} - T_{BH(1)}) / Q_T + 167 \cdot T_{BH(1)} \cdot F_{QBH(1)} / Q_T}{167 \cdot T_{BH(2)}} \\ &= \frac{(T_{BH(2)} - T_{BH(1)}) / 167 + T_{BH(1)} \cdot F_{QBH(1)}}{T_{BH(2)} \cdot Q_T} \end{aligned}$$

- h) The above formula can be generalised as follows for ith highest hour:

$$\frac{F_{QBH(i)}}{Q_T} = \frac{(T_{BH(i)} - T_{BH(i-1)}) / (169 - i) + T_{BH(i-1)} \cdot F_{QBH(i-1)}}{T_{BH(i)} \cdot Q_T}$$

- i) However, it is more convenient to write the formula as follows:

$$\frac{F_{QBH(i)}}{Q_T} = \frac{(P_{BH(i)} - P_{BH(i-1)}) / (169 - i) + P_{BH(i-1)} \cdot F_{QBH(i-1)}}{P_{BH(i)} \cdot Q_T}$$

In which $P_{BH(i)}$ is the proportion of annual average daily background traffic $AADT_B$ travelling in hour i:

$$P_{BH(i)} = \frac{T_{BH(i)}}{AADT_B}$$

- 8.9 In the second step of the derivation, the formula for $F_{QBH(i)}/Q_T$ given above is used to determine the total contribution required for a particular development. The steps are as follows:

- a) The notation $T_{DH(i)}$ is used to indicate the trip generation of the development in the ith highest hour. Note that this reference to the highest hour refers to that of the background traffic and not to the trip generation.
- b) During hour i, the traffic $T_{DH(i)}$ generated by the development is responsible for providing the following road space:

$$T_{DH(i)} \cdot F_{QBH(i)} / Q_T$$

- c) The required hourly traffic factor $F_{QDH(i)}$ for the ith highest hour can now be determined from the following equation:

$$\frac{F_{QDH(i)} \cdot AADT_D}{Q_T} = T_{DH(i)} \cdot F_{QBH(i)} / Q_T$$

Which can be simplified to:

$$F_{QDH(i)} = P_{DH(i)} \cdot F_{QBH(i)}$$

In which $P_{BH(i)}$ is the proportion of annual average daily development traffic $AADT_D$ travelling in hour i , determined as follows:

$$P_{DH(i)} = \frac{T_{DH(i)}}{AADT_D}$$

d) The traffic factor F_{QD} can now be determined as:

$$F_{QD} = \sum_{H=1}^{168} F_{QDH} = \sum_i^{168} P_{DH(i)} \cdot F_{QBH(i)}$$

With:

$$F_{QBH(i)} = \frac{(P_{BH(i)} - P_{BH(i-1)}) / (169 - i) + P_{BH(i-1)} \cdot F_{QBH(i-1)}}{P_{BH(i)}}$$

8.10 The above derivation does not take the impact of heavy vehicles on capacity into account. In urban areas, the impact is normally relatively small and can usually be ignored. In situations where the impact is significant, the above formulae can be modified by converting all flows to equivalent passenger car units.

8.11 An example of the calculations required to determine the factor F_{QD} is shown in the following table. The example only shows the calculations for 10 of the 168 hours, but the table can easily be extended to include all 168 hours.

Hour Index i	i th Highest hour ($H(i)$)	Background traffic flow pattern ($P_{BH(i)}$)	Development traffic flow pattern ($P_{DH(i)}$)	Factor $F_{QBH(i)}$	Factor $F_{DQH(i)}$
159	66	11.050%	11.932%	2.991%	0.357%
160	114	11.216%	12.171%	3.111%	0.379%
161	18	11.267%	12.595%	3.154%	0.397%
162	90	11.284%	12.675%	3.171%	0.402%
163	42	11.576%	12.993%	3.511%	0.456%
164	33	11.596%	12.065%	3.540%	0.427%
165	105	11.665%	12.197%	3.666%	0.447%
166	9	11.880%	12.197%	4.204%	0.513%
167	81	11.886%	12.595%	4.227%	0.532%
168	57	12.075%	12.728%	5.721%	0.728%
$F_{QD} = \text{Sum of } F_{DQH(i)}$					11.771%

A.9 Trip generation traffic patterns

9.1 The method described in the previous section requires data on weekly traffic patterns for background and development traffic. Such data are readily available for the background traffic but not for all development traffic. Where such data are not available, the methodology described in this section must be used.

9.2 Differentiation is made between two main classes of land-uses:

- a) Land-uses with peak hours that correspond with the background AM and PM peak hours.
- b) Land-uses with peak hours during other hours of the week (e.g. Saturdays, Sundays or during the evenings).

9.3 For land-uses with peak hours that correspond with the background AM and PM peak hours, the traffic factor F_{QD} is determined as:

$$F_{QD} = \text{Max}\left[\frac{T_{DAM}}{AADT_D}, \frac{T_{DPM}}{AADT_D}\right]$$

In which:

- T_{DAM} = AM Peak hour trip generation rate
- T_{DPM} = PM Peak hour trip generation rate
- $AADT_D$ = Annual average daily traffic for the land-use

9.4 For land-uses with peak hours that do not correspond with the background AM and PM peak hours, the traffic factor F_{QD} is determined as:

$$F_{QD} = \text{Max}\left[\frac{T_{AM}}{AADT_D}, \frac{T_{PM}}{AADT_D}, F_{XD}\right]$$

In which:

- T_{DAM} = AM Peak hour trip generation rate
- T_{DPM} = PM Peak hour trip generation rate
- $AADT_D$ = Annual average daily traffic for the land-use
- F_{XD} = Traffic factor derived for an assumed weekly flow pattern

9.5 For the derivation of the traffic factor F_{XD} , the following trip generation pattern is assumed:

- a) AM Peak period. The morning peak is assumed to occur over a period of one hour (a total of five hours in the week).
- b) PM Peak period. The afternoon peak is assumed to occur over a period of two hours (a total of ten hours in a week).
- c) During night periods between 21:00 in the evening to 06:00 in the morning, zero flows are assumed (for $7 \times 9 = 63$ hours per week).
- d) During the remaining 90 hours of the week ($168 - 5 - 10 - 63$) the traffic flow is assumed to be uniformly distributed.

- 9.6 Using this assumed trip generation pattern, it is possible to develop the following formula for the factor F_{XD} :

$$F_{XD} = A + B \cdot \frac{T_{DAM}}{AATD_D} + C \cdot \frac{T_{DPM}}{AATD_D}$$

In which A, B and C are factors that depend on the background traffic pattern. For a typical urban background traffic pattern, the factors are:

$$A = 0.082$$

$$B = 0.155$$

$$C = 0.150$$

Appendix B

Overview of the Methodology for Calculating Engineering Service Contributions

The following provides a short overview of the methodology for calculating engineering service contributions to municipal road infrastructure. The methodology is explained by means of an illustrated example.

Step 1: Prepare Map

The first step is to prepare a map of all roads in and around the proposed development, as shown for the example given in Figure 1. All roads must be shown and marked as follows:

- a) Existing and planned municipal, provincial and national roads.
- b) Roads that will be provided by the Applicant and which will be taken over by the Municipality.
- c) Connections (intersections) between roads that will be taken over by the Municipality.

Roads that are not taken over by the Municipality (e.g. private roads) are the responsibility of the Applicant and are not covered by this manual. The Applicant is also responsible for the connections with such roads, including erf or property accesses, even if such connections will be taken over by the Municipality.

The above map can only be prepared if the required master road planning showing the classification of roads is in place. Such planning must be completed before engineering service contributions can be determined.

Step 2: Identify Internal Roads

The second step is to identify and mark all internal roads on the map, as shown in Figure 2. The following roads are defined as internal:

- a) All Class 4 and 5 roads and streets located within the boundary of the development; but excluding any widening that may be required by the Municipality to accommodate other developments. Widening of roads required for the purpose of the development itself is classified as an internal service.
- b) All Class 4 and 5 roads and streets located at, on or outside of the boundary of the development that are required for the exclusive use of the development (now and in perpetuity), but which will be taken over by the Municipality.

Connections (junctions or intersections) between internal and external services are classified as external up to the continuous road reserve boundary (i.e. excluding splays) of the external services. Work or improvements required on or along the internal service at the connection is regarded as an internal service.

The Applicant is responsible for the provision and installation of internal services.

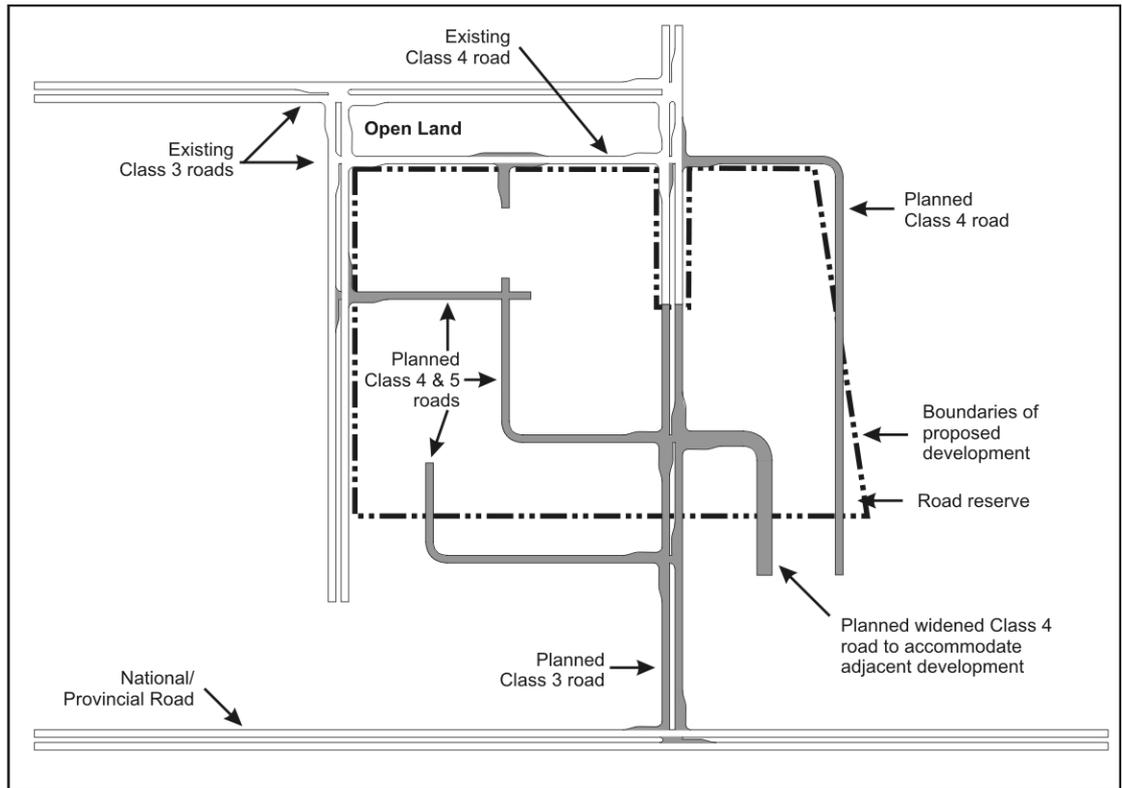


Figure 1: Example road network

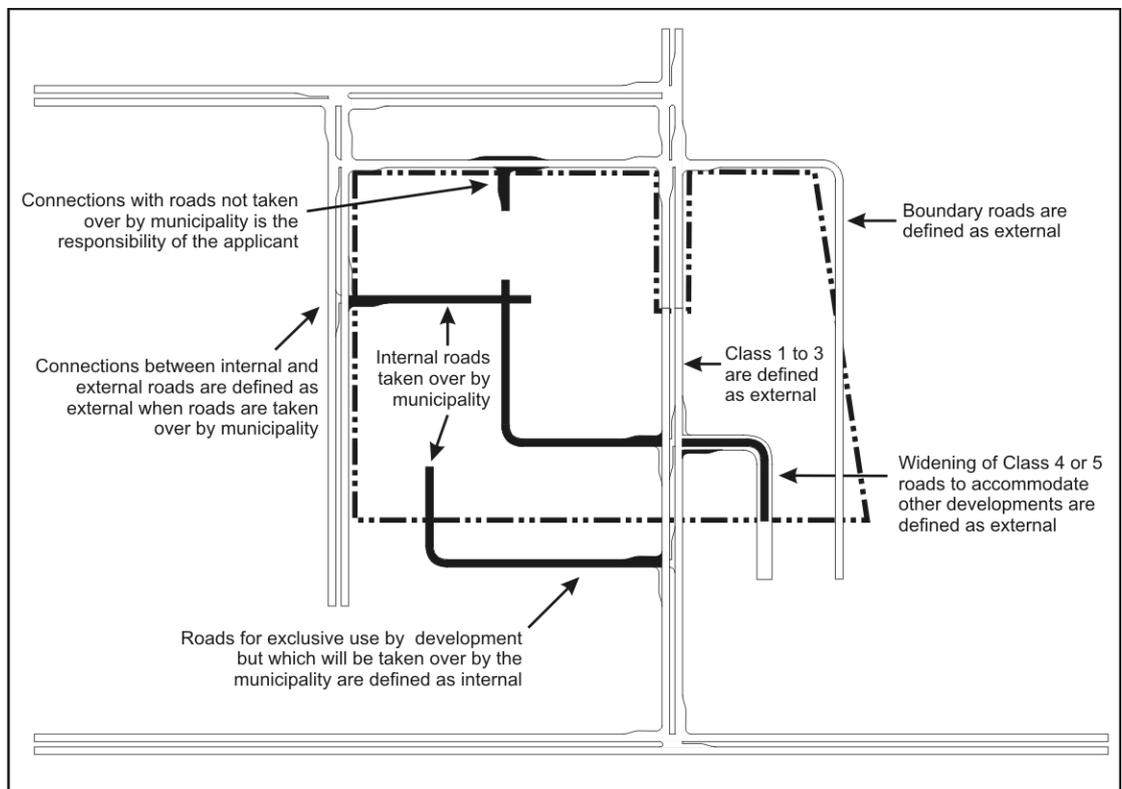


Figure 2: Identification of internal roads

Step 3: Identify Boundary Roads

The third step is to identify boundary roads. This step is ONLY required with township establishment; otherwise NO boundary roads need to be identified (and no boundary road contributions are required).

Boundary roads are Class 4 and 5 roads which are located at or on the boundary of the development (excluding roads required for the exclusive use of the development). There are two types of boundary roads that must be identified and shown on the map:

- a) 100% Share boundary roads – Boundary roads that are flanked only by the development under consideration.
- b) 50% Share boundary roads – Boundary roads that are flanked by two developed or developable properties.

All such roads are identified, irrespective of whether the development requires access to such roads or not. Once identified, these roads are marked on the map, as shown in Figure 3.

The Applicant is responsible for a boundary road contribution to these roads. In order to calculate these contributions, the lengths of boundary roads must be measured and shown on the map.

If the road has to be widened as a result of the development only, the additional cost will be added to the boundary road contribution of the applicant. If the widening is required by developments on both sides of the road, 50% of the additional cost will be added to the boundary road contribution of the applicant. If the widening of the boundary road is required by the Municipality to accommodate other developments, such widening will be classified as an external engineering service.

Step 4: Calculate engineering service contributions to roads

The engineering service contributions to roads are calculated as the sum of the following two components:

- a) Basic external road contribution

The basic external road contribution is determined for the external road network. The contribution is calculated on the basis of the number of vehicle-kilometres per hour (capacity component) as well as the number of heavy vehicle E80 axle-kilometres per day (strength component) generated by the development on the external road network. The contribution is calculated by multiplying these quantities by a cost rate or tariff. The trip generation is determined as follows:

- i) Total trip generation after approval of the development
- ii) Less trip generation for existing land-use rights

The trip length used in the calculation of the basic external road contribution is based on the travel on the external road network of the Municipality.

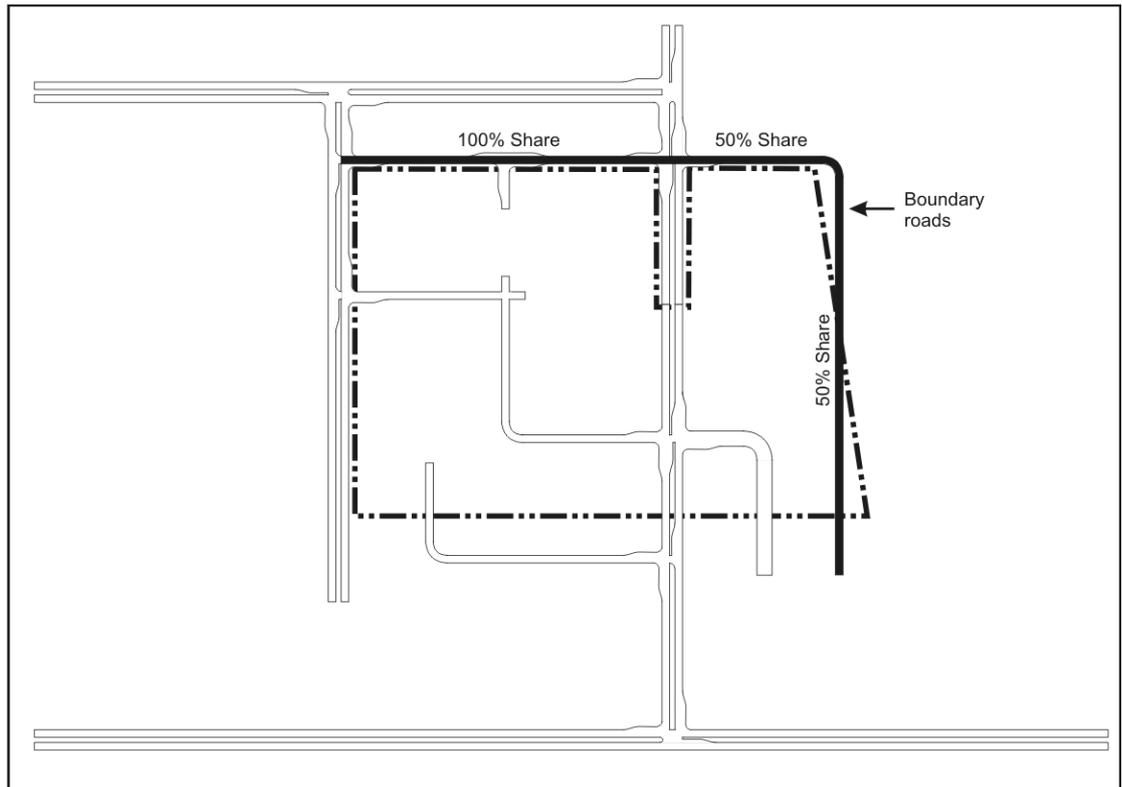


Figure 3: Boundary roads

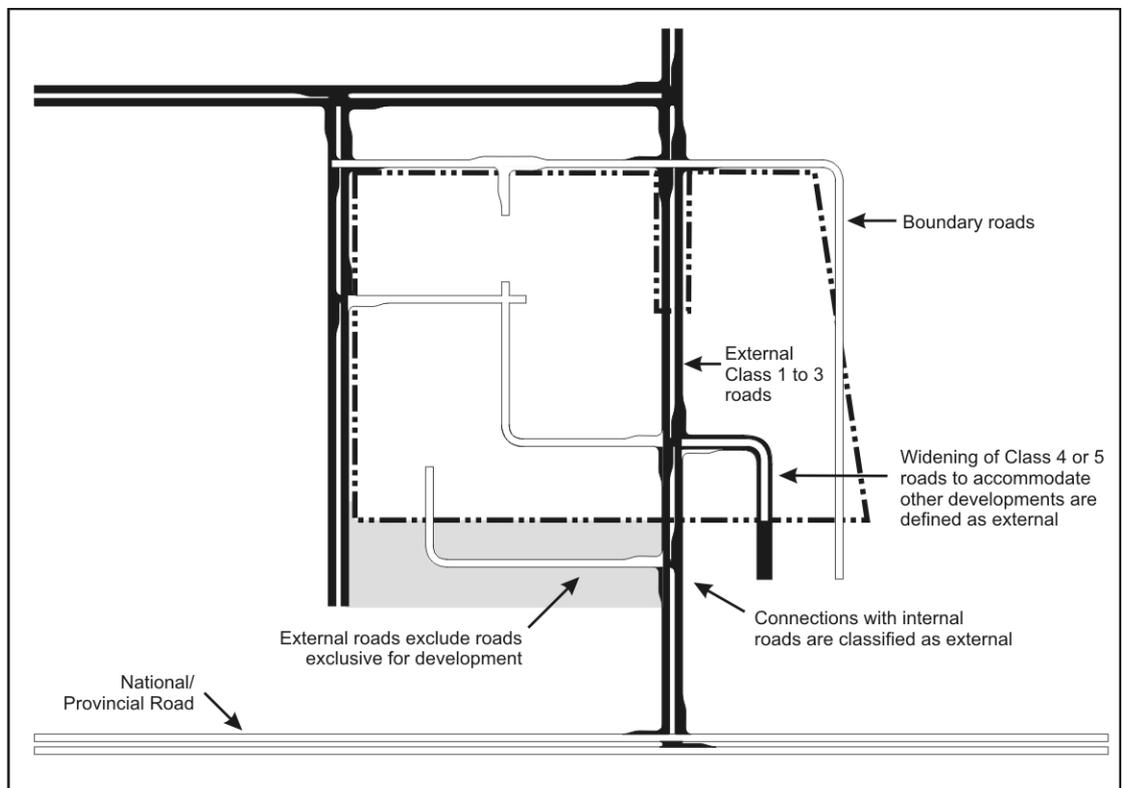


Figure 4: External road network (excluding boundary roads)

b) Boundary road contribution

The boundary road contribution is calculated using the following formula:

$$\text{Contribution} = \% \text{ Share} \times \text{Length} \times \text{Cost per kilometre}$$

The cost of a Boundary Service is determined using average cost rates for a particular class of road designed to nominal standards as defined in this manual (adjusted for price escalation). The average cost rate will be used, even if the actual cost of particular boundary road is lower or higher than the average cost.

Step 5: Identification of required external road improvements

External road improvements required by a development may be established by means of a Traffic Impact Assessment.

The Municipality shall allow the Applicant, where possible and practical, to make an offer to provide and install external road infrastructure in lieu of monetary contributions, either partially or fully. In such cases, the Applicant must, in the offer, define the exact scope of the road infrastructure that will be provided and installed. The Municipality will decide on whether or not to accept the offer. Should the offer be accepted, the scope of road infrastructure will be specified in the engineering services agreement.

Appendix C

Calculation of Engineering Service Contributions

C.1 Introduction

Engineering service contributions may be calculated by means of the form provided in this appendix. The parameters required for the calculation are provided in the *South African Trip Data Manual*. The Municipality will also annually publish costing rates required for the determining the contributions.

The Municipality may also make a spreadsheet available for the calculation of the contributions. This spreadsheet will contain all the parameters required for the calculations together with the costing rates that apply for a particular year. The Municipality will in such case also annually make an updated spreadsheet available to account for inflation and other adjustments.

C.2 Required information and calculation of contributions

The following information must be provided on the form or in the spreadsheet:

Section 1. The following particulars of the Applicant and the development must be entered in Section 1 of the form:

- a) Particulars of the Applicant and the development.
- b) Municipal Reference Number.
- c) Date on which contribution becomes payable.
- d) Municipal region. Different cost rates apply to different regions of the Municipality and care must be taken in selecting the appropriate region.
- e) Indicate with H, L or V whether the development is located in a high, low or very low vehicle ownership area. The Municipality will indicate whether a particular development qualifies for this relaxation.
- f) Indicate with N or T whether the development is located adjacent of a transit node or corridor. The Municipality will indicate whether a particular transit node or corridor qualifies for this relaxation.

Sections 2 and 3. The following information must be provided for the previously approved (Section 2) as well as the newly approved land use (Section 3). The newly approved land use also includes previously approved land uses that are retained.

- a) Land-use code and description.
- b) Size units in which the size of the land-use is measured.
- c) Size of the land use in the required size units.
- d) The following traffic generation data must be obtained from tables provided in the Trip Data Manual:
 - i) Trip generation rate $AADT_D$
 - ii) Hourly equivalent trip rate (Calculated as $F_{QD} \cdot AADT_D$)

- iii) Percentage mixed-use trip *reduction* for land use
 - iv) Percentage trip rate *reduction* for low-vehicle ownership areas
 - v) Percentage trip rate *reduction* for locations adjacent to a transit node or public transport corridor
 - vi) Percentage heavy vehicles P_{HD}
 - vii) Number of E80 axles per heavy vehicle E_{HD} .
- e) The following trip length data must also be obtained from tables provided in the Trip Data Manual:
- i) Urban area size adjustment factor F_T
 - ii) Half trip length $L_D/2$ (this may be different for the capacity and strength components).
- f) The potential compatible mixed-use trips per hour for a particular land use. Must be motivated by Applicant and agreed to by the Municipality.

The remainder of the items are calculated by means of the following formulae:

- a) The applied mixed-use trip reduction (T_{Mixed}) is determined as the smallest of the following:
- i) Potential compatible mixed-use trips per hour
 - ii) Mixed-use reduction calculated using the following formula:

$$A_D \cdot Hour_D \cdot P_{Mixed} \cdot (1 - P_{LowVeh}) \cdot (1 - P_{Transit})$$

- b) The trip generation per hour is calculated using the following formula:

$$A_D \cdot Hour_D \cdot (1 - P_{LowVeh}) \cdot (1 - P_{Transit}) - P_{MultiUse} - T_{Mixed}$$

- c) The heavy vehicle generation per day is calculated as follows:

$$A_D \cdot AADT_D \cdot P_{HD}$$

- d) The Veh-km/hr is calculated using the following formula:

$$\text{Trip generation} \times \text{Half trip length} \times F_T$$

- e) The E80-km/day is calculated using the following formula:

$$E_{HD} \times \text{HV Trips} \times \text{Half trip length} \times F_T$$

The symbols used in the above formulae have the following meaning:

- A_D = Size of development
- $AADT_D$ = Daily trip generation rate (trips per day)
- $Hour_D$ = Hourly trip generation rate (trips per hour)
- F_{QD} = Traffic factor
- P_{LowVeh} = Percentage trip rate reduction for low-vehicle ownership areas
- $P_{Transit}$ = Percentage trip rate reduction for transit node or corridor
- P_{Mixed} = Percentage trip rate reduction for mixed-use developments
- T_{Mixed} = Hourly trip reduction for mixed-use developments
- P_{HD} = Percentage heavy vehicles
- E_{HD} = Number of E80 axles per heavy vehicle
- $L_D/2$ = Half trip length (km)
- F_T = Adjustment factor for the size of the urbanised area

Section 4a. The basic engineering service contribution is determined as follows:

- a) The Veh-km and E80-km traffic generation is determined by subtracting the generation of the previously approved land-uses from the total newly approved land-uses. These values may be either negative or positive.
- b) The cost rates are obtained from costing rates for Class 3 and higher order roads that will be published annually by the Municipality.
- c) The traffic generation is then multiplied with the cost rates and added together to provide the total basic engineering service contribution.
- d) If the total basic engineering service contribution is negative, it is made zero (no credit is provided to the Applicant for previous contributions unless the cost can be recovered by the Municipality).

Section 4b. For township establishment only, the boundary road contribution is calculated as follows:

- a) The lengths (in km) of Class 4 and 5 boundary roads are determined for the 50% and 100% share categories.
- b) The cost rates for Class 4 and 5 boundary roads are obtained from costing rates published annually by the Municipality (land value and construction cost components). The rates appropriate to a specific municipal region must be selected.
- c) The boundary road contribution is then determined by multiplying the cost rate with the road length and either 50% or 100% as appropriate.
- d) The total boundary contribution is then determined.

Finally, the total external engineering service contribution for roads is determined as follows:

- a) The sum of the basic and boundary road contributions is determined.
- b) Value added tax is added.
- c) The total contribution is then determined.

Logo	Municipality Name	External Engineering Service Contributions - Roads
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1. APPLICANT AND DEVELOPMENT PARTICULARS

Applicant name:		Mun Ref No:	
Applicant postal address:		Date (dd/mm/yy)	
Development physical address:		Region No/Name	
Development description:		Low Vehicle Ownership Area (N/LV)	Public Transp (N/T)

2. PREVIOUSLY APPROVED LAND USE, BEFORE APPLICATION

No	Code	Land Use	Development size		Trip Rate		Mixed-use trips		% Trip Rate Reductions			%Heavy	E80 Axles	Size Adj	Half Trip	Calculated Trips		Calculated	
			Units	Size A _D	AADT _D	Hour _D	Potential	Trips	Mix-Use	Low-Veh	Transit	P _{hd}	E _{HD} /HV	Factor F _T	Len L _D /2	Trips/Hr	HV/Day	Veh-km/hr	E80-km/day
1																			
2																			
3																			
4																			
5																			
6																			
7																			
8																			
9																			
10																			

Total previously approved, before application

3. TOTAL APPROVED LAND USE, AFTER APPLICATION																			
No	Code	Land Use	Development size		Trip Rate		Mixed-use trips		% Trip Rate Reductions			%Heavy	E80 Axles	Size Adj	Half Trip	Calculated Trips		Calculated	
			Units	Size A _D	AA _{DT} _D	Hour _D	Potential	Trips	Mix-Use	Low-Veh	Transit	P _{hd}	E _{HD} /HV	Factor F _T	Len L _D /2	Trips/Hr	HV/Day	Veh-km/hr	E80-km/day
1																			
2																			
3																			
4																			
5																			
6																			
7																			
8																			
9																			
10																			
Total previously approved, before application																			

4. ENGINEERING SERVICE CONTRIBUTIONS TO ROADS											
4a. Basic external road contribution							Unit Cost Rates per Km			Veh-km/hr	E80-km/day
Traffic generation (Total approved — Previously approved)							Land	Capacity	Strength		
Subtotals — Basic external road contributions											
Total basic external road contribution (Zero if calculated negatively), VAT Excluded											
4b. Boundary road contribution (Township establishment only)							Boundary roads (km)		Land Value	Construction	Boundary Rd
							100% Share	50% Share	Per km	Cost/km	Contribution
Class 4 Boundary roads											
Class 5 Boundary roads											
Total boundary road contribution											
Total engineering service contribution to roads, VAT Excluded											
Value added tax (VAT)											14%
Total engineering service contribution to external roads, VAT Included											

Appendix D

Pro-Forma Council Report

Tariff Policy and By-Laws for Engineering Service Contributions to Road Infrastructure

1 Purpose

The purpose of this Council Report is to obtain approval for and adopting a proposed Tariff Policy and By-Laws for the levying of Engineering Service Contributions to Road Infrastructure in the <Municipality Name>. Such adoption is regulated by the Municipal Systems Act (Act 32 of 2000).

2 Background

Engineering Service Contributions are a mechanism for the funding of the engineering services required by new developments. Such contributions are payable when application is made for a change in land use such as when a new township is established or when land is rezoned. The contributions are utilised for the provision of services, including road infrastructure, required to serve a development.

The levying of Engineering Service Contributions is considered to be the most equitable form of funding of engineering services required by developments. Existing residents have already contributed to the cost of existing services and cannot be expected to contribute to or subsidise the cost of additional services required by new developments. The new developments are fully responsible for contributing to the cost of services required to accommodate the increase in traffic loading resulting from a change in land use.

2 Tariff Policy for Engineering Service Contributions to Road Infrastructure

In South Africa, a document named the “South African Engineering Service Contribution Manual for Municipal Road Infrastructure” (TMH 15, Committee of Transport Officials, Version 1.0, 2012) is available that can be adopted as a tariff policy for the purpose of levying of Engineering Service Contributions to Road Infrastructure. A copy of this document is attached to this Council Report.

It is therefore proposed that this manual be adopted as the Tariff Policy for the <Municipality Name>, but subject to the following provisions:

- The term “Municipality” in the manual is deemed to refer to the <Municipality Name>
- The current version (Version 1.0, April 2012) is adopted as the Tariff Policy. Later versions will only apply when specifically adopted by the Municipal Council.

3 Additional resolutions

In addition to the Tariff Policy, the manual also requires that the Council adopts the following two specific resolutions:

3.1 Repayment of Applicants

The purpose of this resolution is to allow repayment of the Applicant by the Municipality for costs incurred in situations where an Applicant must bear the cost of providing and installation of external services in excess of their required engineering service contributions and where the Applicant is entitled to recover such costs at some later stage as allowed for by the policy. Such repayment will be in accordance to an agreement between the Applicant and the Municipality.

Such repayment will be made in terms of the Municipal Finance Management Act (Act 56 of 2003), Section 48(1)(c) which states that (1) A municipality may, by resolution of its council, provide security for (c) contractual obligations of the municipality undertaken in connection with capital expenditure by other persons on property, plant or equipment to be used by the municipality or such other person for the purpose of achieving the objects of local government in terms of section 152 of the Constitution.

3.2 Construction and land provision in lieu of monetary contributions

The purpose of the resolution is to allow Applicants to provide land (for road reserves) and install external services in lieu of monetary contributions. This allowance is necessary to avoid unnecessary delay in land development due to the Municipality not being in a position to procure the services in time for development to occur.

This allowance is treated as an exceptional case for which provision is made in the Supply Chain Management Policy of the Municipality in terms of the Regulation 36 (1) (a) (v) of the Municipal Supply Chain Management Regulations (General Notice 868 of the Government Gazette No 27636 of 30 May 2005).

4 Tariff By-Law for Engineering Service Contributions to Road Infrastructure

The Municipal Systems Act (Act 32 of 2000) also requires that the Council adopt a By-law to give effect to the implementation and enforcement of its tariff policy. The following By-law is proposed for the purpose of enacting the tariff policy for engineering service contributions to road infrastructure:

In terms of Section 75 of the Local Government: Municipal Systems Act (Act 32 of 2000), the Council of the <Municipality Name> enacts the following:

- (1) *The municipality shall adopt, implement and enforce a Tariff Policy for the Levying of Engineering Service Contributions to Road Infrastructure.*
- (2) *The municipality shall annually approve the tariff charges that will apply. The tariff charges may be approved as part of the annual budget of the municipality.*

This By-Law may be cited as the <Municipality Name> Tariff By-Law for Engineering Service Contributions to Road Infrastructure. The By-law comes into operation upon publication in the Provincial Gazette.

5 Community Participation

A community participation process was followed and written presentations were received from various community members. These presentations are attached to this Council Report.

The presentations have been considered but cannot be supported since it would undermine the Council's ability to fund the road infrastructure required to serve new developments.

6 Comments of the Chief Financial Officers

Members of this Department were part of the team that investigated the proposed policy and the policy as well as the By-law is supported. The Finance Department will provide assistance with the implementation of the policy.

7 Comments of the Head: Legal and Secretarial Division

Members of this Division were part of the team that investigated the proposed policy and the policy as well as the By-law is supported. The Legal and Secretarial Division Department will provide assistance with the implementation of the policy.

8 Annexures

A: South African Engineering Service Contribution Manual for Municipal Road Infrastructure (TMH 15, Committee of Transport Officials, Version 1.0, 2012)

B: Comments submitted by the community

9 Recommendation

That it be recommended to the Council:

That the tariff policy and Bylaw for levying contributions for the provision of engineering services for road infrastructure be approved.

The specific tariffs charges will be approved as part of the annual budget of the municipality.