

City of South San Francisco Broadband Policy Options



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1. Broadband Staff Report Elements

1.1. Purpose

Broadband service – fast, reliable, high quality links to the Internet and internal networks – is a basic competitive requirement of twenty-first century economies.

Broadband is a necessity for residents and businesses. Fast, high quality, affordable broadband service supports economic development, education and equitable access to twenty-first century opportunities, and leads to a higher standard of living for all members of the community.

It is also necessary for government to operate. The availability of adequate telecommunications capacity will be a defining factor in whether or not a local agency will, for example, be able to deliver emergency services and healthcare, prepare its students for the careers of tomorrow and support the development of living wage jobs.

The City of South San Francisco owns and maintains an extensive system of streets, sidewalks and other infrastructure in the public right of way. Any time construction work involving an excavation is done, the life expectancy of the paving is significantly reduced. Construction work also adds to traffic congestion and can present safety issues. It is in the City's interest to provide incentives for collaborative projects in the right of way, in order to reduce the impact of construction work on City streets and sidewalks over the long term.

1.2. Authority

The City of South San Francisco, like other California cities, has no direct role in regulating public utilities. The City does have limited control over encroachment and land use permitting for utility projects, particularly in the public right of way and for major construction projects. The City has a responsibility to implement policies that preserve the City's investment in streets and other infrastructure, minimize disruption to traffic and pedestrian access, and encourage infrastructure development, including broadband and other telecommunications infrastructure.

The City maintains transportation infrastructure, including streets, bridges and sidewalks, and other physical infrastructure within the City limits. It must keep this infrastructure in good repair, improve it when necessary, and ensure that residents can enjoy its unimpeded use.

The City has authority to issue discretionary permits for certain types of construction projects and other developments. That discretion includes the authority to establish and collect fees to mitigate the impact of projects on City services and infrastructure, and establish development standards.

The City also maintains a citywide broadband network that supports all aspects of municipal operations and governance, connects South San Francisco residents to City services, and supports civic engagement. It requires constant upgrading to meet the ever increasing demand for broadband-enabled data and services. The City has a responsibility to proactively develop this network, and overall broadband resources and infrastructure, in order to support a growing population and economy.

1.3. “Dig Once” Policies

To properly maintain its telecommunications resources in a cost effective manner, prudently manage its infrastructure investments, and maximize opportunities for residents, staff recommends the establishment and implementation of several policies, and the enactment of a Broadband Impact Mitigation fee ordinance. Collectively, these policies and ordinance would constitute the City’s “Dig Once” policy, which is intended to achieve three objectives:

- Allow the City to maximize the availability of broadband service to residents and businesses by encouraging the systematic development of telecommunications infrastructure by private companies and public agencies, including the City.
- Ensure that the City’s internal information technology network is capable of supporting the growing demand for City services now and in the future, in a cost effective manner.
- Extend the life of City streets and other civil infrastructure, and reduce the cost of ongoing maintenance by encouraging cooperation between utility companies, public agencies and City departments.

The proposed measures include:

- 1.3.1. Open Trench Notification Policy. The Public Works Department will develop a procedure for notifying interested parties when excavations are planned in the public right of way, or when the City performs street improvement work, and facilitate proactive colocation of utility facilities when appropriate. Enhanced remediation standards will be established for any work done in a location where open trench notification has been offered, for the following five years.
- 1.3.2. Shadow Conduit Policy. In accordance with the City’s Broadband Master Plan, the Information Technology Department will receive, evaluate and respond to open trench notifications, and advise the Economic and Community Development Department as it administers the Broadband Impact Mitigation Policy and Broadband Impact Fee Ordinance.
- 1.3.3. Broadband Impact Mitigation Policy. The Economic and Community Development Department will manage the determination, negotiation and collection of Broadband Impact fees, and determine permit conditions regarding any related in-kind contributions.
- 1.3.4. Broadband Impact Fee Ordinance. The ordinance establishes a fee that will be collected from project developers and used to offset the corresponding increase in demand for City information technology network support resulting from the additional burden on City services.
- 1.3.5. Telecommunications Capital Improvement Account. Any broadband impact fees collected will be deposited in this account, and used to fund qualifying capital

improvements, including conduit and other facilities installed in response to the Open Trench Notification Policy.

1.4. Responsibilities

The Public Works Department is responsible for encroachment and other ministerial permits related to work in the public right of way. It will be responsible for establishing and managing the Open Trench Policy and associated enhanced remediation standards.

The Planning Division of the Economic and Community Development Department is responsible for new development and design reviews, and for use and other discretionary permits related to compliance with the City's development standards. It will be responsible for administering the Broadband Impact Mitigation Policy and the Broadband Impact Fee Ordinance.

The Information Technology Department is the City's expert resource for evaluating, developing, planning, implementing and managing broadband and other telecommunications services, infrastructure and assets. It is responsible for implementing the Broadband Master Plan and Shadow Conduit Policy, and will:

- 1.4.1. Coordinate the City's response to open trench notifications with the Public Works Departments and advise the Planning Division on management of the Broadband Mitigation Impact Policy;
- 1.4.2. Develop and manage the City's telecommunications services, infrastructure and assets in accordance with the Broadband Master Plan;
- 1.4.3. Represent the City's interests with other agencies, companies and organizations when telecommunications issues or assets are involved.

2. Open Trench Notification Policy

2.1. Policy Summary

The Public Works Department will develop and implement a procedure to notify interested parties when permit applications for excavations in the public right of way (ROW) are received or public works projects involving excavations or similar work in the ROW are tendered. This procedure will be triggered when a proposed or planned project meets certain criteria. Following notification, interested parties may coordinate colocation of facilities in the excavation with the project lead (the applicant or the Public Works Department, as appropriate). Following completion of the project, any excavations in the affected area in the subsequent five years may be subject to enhanced remediation requirements, as determined by the Public Works Department.

2.2. Notification Trigger

When an encroachment permit application is received, or specifications for a public works project are approved for public distribution by the Public Works Director, the project plan will be reviewed to determine if the following criteria are met:

- 2.2.1. The project involves utility infrastructure construction, road construction or resurfacing, or other work that will result in an excavation that could reasonably include, or prepare for, the installation of broadband conduit.
- 2.2.2. It spans 900 feet or three city blocks within the ROW, or involves terrain that is difficult or expensive to traverse (e.g. a bridge), or is an element of a larger project that will require installation or upgrading of utility infrastructure.

When a proposed project meets the above criteria, the Open Trench Notification process is triggered and notification will proceed.

2.3. Notification Process

The Public Works Department will maintain a list of email address of parties that have a history of installing utility infrastructure in the ROW, or have the potential for doing so in the future, or have other interests involving utility or transportation infrastructure. The initial list will be based on existing information regarding such parties, to the best of the Department's knowledge. A summary of the Open Trench Notification Policy and contact information for parties wishing to be added or deleted from the list will be posted on the Department's website. The Department will add or delete parties from the list upon request or based on independently acquired information. The list will also include staff designated by the City's Information Technology Department.

Upon establishment of the initial list, the Department will send a copy of this policy and instructions for participating in the Open Trench Notification process to the list.

Thereafter, whenever the process is triggered, the Department will send a copy of the relevant public document(s) and instructions for participating in the process to the list.

2.4. Open Trench Participation

Per the instructions for participation, third parties, including ITD, will have 30 days to inform the Department of their interest in colocating facilities in the project area. If no competent responses are received in that period, the Open Trench Notification process will be deemed complete.

If received, competent responses will be forwarded to the applicant upon receipt by the Department. It is the responsibility of the applicant/project lead and respondents to negotiate the scope and terms of colocation work in good faith. If a respondent believes that the applicant/project lead is not negotiating in good faith, then a protest detailing the dispute may be submitted to the Department.

The Department will review the status of a notification no less than 30 days after the final response was forwarded to the applicant/project lead or after being informed by the parties that agreement has been reached, whichever is soonest. If agreement has been reached, then the parties will amend or submit permit applications as necessary, and the notification process will be deemed complete. If no agreement has been reached and no protest has been submitted, then the notification process will also be deemed complete.

When a protest is submitted, the Department will determine if the information provided by the protestor is, on the balance, sufficient to demonstrate that further negotiation is appropriate. If it is, then the parties may be allowed an additional 30 days to reach an agreement. Subsequent 30 day periods may be allowed by the Department if subsequent protests are submitted and determined to be sufficient. If the Department determines that a protest is not sufficient to demonstrate the need for further negotiation, then the notification process will be deemed complete.

2.5. Completion of Notification Process

If the Open Trench Notification process is triggered by an application, then the application cannot be approved until the process is complete.

If the process is complete and the application, as may be amended, is approved and the permitted work commences, then any subsequent excavation work in the project area will be subject to enhanced remediation requirements for five years following the completion or abandonment of the work.

2.6. Enhanced Remediation Requirements

The Public Works Director is responsible for 1. determining the time, place and manner of utility work conducted in the ROW and 2. building and maintaining streets and other public facilities in the ROW. This responsibility include determining reasonable and necessary standards for mitigating damage or degradations to public facilities as a result of any such work.

Consistent with this responsibility, the Public Works Director will establish standards and/or processes that ensure that excavations performed in an area where an Open Trench Notification Process has been completed will include all work necessary to restore the area to its original condition prior to the excavation. These standards and process may be general in nature, or specific to an excavation.

2.7. Waivers

At the discretion of the Public Works Director, this Open Trench Notification policy may be waived or varied, in whole or in part, in the event of an emergency or urgent conditions that require immediate action, or for other good cause relating to the public welfare.

3. Shadow Conduit Policy

3.1. Summary

The Information Technology Department maintains and implements a Broadband Master Plan that identifies the City's current information technology (IT) networking needs, and evaluates how those needs will increase over time due to technological advances, economic and demographic changes and the evolution of City finances and services. The Department manages a heterogeneous network that includes both leased and City-owned facilities. To support the necessary expansion of this network, the Department will evaluate opportunities to install telecommunications facilities, including conduit, that arise from the City's Open Trench Notification and Broadband Impact Mitigation policies. When such opportunities are cost effective and consistent with the Broadband Master Plan, the Department will work with the responsible department to design, install and, in cooperation with the Public Works Department, manage the facilities.

3.2. Scope

It is anticipated that implementation of this policy will primarily involve the installation of conduit and appurtenant facilities. However, circumstances may arise where installation of other types of facilities, including but not limited to fiber optic cable, is appropriate. If so, the design, construction and management of such facilities will be consistent with this policy to the extent feasible. Necessary exceptions may be made as circumstances warrant.

3.3. Conduit Specifications

The Department will evaluate standards developed in other jurisdictions and, in consultation with the Public Works Department, adopt specifications for conduit and appurtenant facilities, such as pull boxes, that may be installed pursuant to the Shadow Conduit policy.

3.4. Open Trench Notifications

The Information Technology Director will designate staff to receive notifications of pending excavations and other broadband-related work from the Public Works Department and encroachment permit applicants, per the Open Trench Notification policy. Department staff will determine whether:

- 3.4.1. The colocation of city-owned conduit in a given project is consistent with the Broadband Master Plan, or will support the achievement of other City objectives.
- 3.4.2. The incremental installation cost is reasonable.
- 3.4.3. The cost of maintaining the conduit over time is proportionate to its value to the City.
- 3.4.4. Sufficient funds are available within existing budgets, or can be obtained from other sources.

- 3.4.5. When considered in relation to overall City goals and priorities, the colocation makes sense.

If these conditions are present, the Information Technology Director will submit a response to the Open Trench Notification, attempt to negotiate an acceptable agreement with the applicant/project lead and, if successful, coordinate the design and construction of the colocation project with the Public Works Department.

3.5. Broadband Impact Mitigation Projects

The Planning Division of the Economic and Community Development Department administers the Broadband Impact Mitigation policy, and will provide the Director with information regarding proposed projects from time to time. The Director will evaluate this information using the same criteria and process developed for responding to open trench notifications.

Additionally, the Director may determine that installation of facilities other than conduit is necessary. For example, a project might require an immediate connection to the City's IT network. In that case, it might be appropriate to add fiber optic cable and offsite connections to the project. There may be circumstances where the City colocates facilities in a project or performs other work at its own expense.

If the Director decides that installation of conduit or other facilities in a project is appropriate, the design and value of the facilities based on incremental cost will be determined in consultation with the Public Works Department, and provided to the Planning Division. Otherwise, the Director will inform the Planning Division that such work is not necessary.

3.6. Operations and Maintenance

The Department will work with the Public Works Department, other public agencies and private companies with an interest in City-owned communications assets to, over time, develop a matrix of responsibilities for operating and maintaining those assets. This matrix will delineate ownership and usage rights, and designate maintenance, repair and operational responsibilities, including underground service locating and marking.

3.7. GIS Logging

The Department will maintain a geodatabase of communications assets located within or connecting to the City, including but not limited to:

- City owned conduit and appurtenant facilities.
- Fiber optic cable.
- Towers and tower sites.
- Communications facilities and services belonging to third parties that are used by the City.

- Real estate, poles and other City-owned assets leased to third parties for telecommunications purposes.
- Third party network data provided to the City in conjunction with such leases or permitting processes, or as may become available through other means, including but not limited to a future electronic plans submission program, or as collected by other agencies or provided by telecommunications companies.

Upon reasonable request, City departments will provide such information to the Department in a timely manner. This geodatabase will be available to all City departments in a manner consistent with City information security policy.

4. Broadband Impact Mitigation Policy

4.1. Summary

The Planning Division of the Economic and Community Development Department is responsible for new development and design reviews, for use and other discretionary permits related to compliance with the City's development standards, and for implementation of impact fee ordinances. The Division determines which fees are applicable to a given project, including Broadband Impact Mitigation fees, and the amount owed. The Division also determines 1. if substitution of in-kind facilities is appropriate and 2. the value of such facilities.

4.2. Project Identification

The Broadband Impact Mitigation fee applies to "all residential and nonresidential development projects". The fee is calculated on the basis of 1. the extent of project's frontage on the public right of way, and 2. the distance from the public right of way to the center of the building.

The Division may waive the fee when the distances involved are de minimis, or when the cost of administering the fee is otherwise disproportionate to the amount to be collected.

4.3. Procedure

Unless otherwise stated in this policy, the Division will administer Broadband Impact Mitigation fee requirements in the same way it administers similar project fees and conditions.

When the Division determines that the fee applies to a project, it will provide a copy of the project application or project summary, as appropriate, to the Information Technology Director. The IT Director will review the information and determine if and how the proposed work corresponds to the City's Broadband Master Plan, and, pursuant to the Information Technology Department's Shadow Conduit policy, determine whether construction of in-kind telecommunications facilities is appropriate as full or partial substitute for a cash fee.

If such construction is appropriate, the IT Director will, in consultation with the Public Works Department, develop specifications for the work and determine its value on an incremental cost basis. The specifications and value determination, or a determination that in-kind facilities are not appropriate, will be provided to the Division, which will assume all further responsibility for developing and implementing the specific conditions and/or fees which will be required of the project applicant.

4.4. In-kind Facilities

Any facilities thus constructed and conveyed to the City will be managed pursuant to the Shadow Conduit policy.

4.5. Use of Fees

Broadband Impact fees collected by the Division will be deposited in the Telecommunications Capital Improvement Account, and may be used to fund construction of broadband or telecommunications facilities necessary to support City operations. These facilities may include facilities constructed pursuant to the Shadow Conduit Policy.

5. Broadband Impact Fee Ordinance - Draft Text

5.1. Summary

New developments and major remodelling projects increase demand for City services and for utility services, including telecommunications. To support the consequent and necessary growth of City services and to relieve the additional burden on the City's ageing utility infrastructure, [municipal code section] establishes a schedule of Broadband Impact Mitigation fees to be collected and used to offset these costs. It also allows applicants for specified permits to install and convey to the City telecommunications facilities, including conduit and appurtenances. The value of these in-kind facilities may be deducted from any Broadband Impact Mitigation fees owed.

5.2. Purpose

The City Council finds and determines that in order to provide sufficient funding to achieve the City's goal of maintaining broadband infrastructure levels and providing adequate improvements in City services to residents, employees, and visitors of the city, in accordance with the standards established in the general plan, the Broadband Master Plan, and other applicable plans and regulations, development projects identified in [section] below shall pay a Broadband Impact Fee as outlined in this chapter, in order to mitigate the impacts of these development projects on telecommunications infrastructure in the city.

The specific purpose of the Broadband Impact Fee is to mitigate the impact of development projects by collecting sufficient funds to pay for the telecommunications infrastructure improvements in the City that are listed in the Broadband Master Plan.

5.3. Broadband Impact Fee findings

(a) Broadband Impact Fee. The City Council finds and determines that:

(1) There is a reasonable relationship between the Broadband Impact Fee and the type of development projects to which the fee is imposed because the development projects that are subject to the fee outlined in this chapter will generate additional demand on City services, which must, in turn, be supported by the City information technology network, which relies on telecommunications facilities which are owned by the City and leased from third parties. The telecommunications improvements built with the proceeds of this fee will address and mitigate the additional impacts created by these development projects.

(2) There is a reasonable relationship between the need for the additional telecommunications improvements and the type of development projects subject to the fee outlined in this chapter because these development projects will attract additional residents, visitors, and employees to the city that will place a greater demand on City services which are supported by the City information technology network. The telecommunications improvements constructed with the proceeds of this fee will serve those new residents, visitors and employees.

(3) There is a reasonable relationship between the amount of the fee and the cost of providing the telecommunications improvements attributable to the types of development upon which the fee is imposed because, pursuant to [section] below, the fee is calculated by determining the cost of constructing telecommunications facilities, including conduit, fiber optic cable and appurtenances along the public right of way adjacent to and connecting laterally to the development, and interconnecting to existing telecommunications facilities.

5.4. Relation of telecommunications infrastructure improvements to health and welfare

The City Council finds and determines that the public interest, convenience, health, welfare, and safety require that adequate telecommunications facilities are available to City services to residents, visitors, and employees of the city.

5.5. Broadband Impact Fee established – payment

(a) The Broadband Impact Fee is hereby established, pursuant to California Government Code Sections 66000 et seq.

(b) Payment of the Broadband Impact Fee shall be imposed as a condition of development for every type of development project specified in [section].

(c) The Broadband Impact Fee shall be charged to and paid by each development subject to the fees upon the date of final inspection or issuance of the certificate of occupancy for the development, whichever is earlier. However, if the fees are to reimburse the city for expenditures previously made, or if the city determines that the fees will be collected for telecommunications improvements for which an account has been established and funds appropriated, and for which the city has adopted a proposed construction schedule prior to issuance of the building permit for such development projects, then the fee or fees shall be charged and paid upon issuance of the building permit for such development. However, with respect to a residential development proposed by a nonprofit housing developer in which at least forty-nine percent of the total units are reserved for occupancy by lower income households, as defined in Health and Safety Code Section 50079.5 at an affordable rent, as defined in Health and Safety Code Section 50053, the payment procedures described in Government Code Section 66007(b)(2)(A)-(B) shall apply.

(d) The City may, at its discretion, accept as full or partial payment of the Broadband Impact Fee the conveyance of ownership in-kind telecommunications facilities as described in this section. The nature and value of such facilities will be determined by the City, prior to the issuance of the building permit for the development. The City will use the incremental construction cost of such facilities as the basis for determining value.

5.6. Application of Broadband Impact Fee

All residential and nonresidential development projects shall be required to pay the Broadband Impact Fee established pursuant to this chapter.

5.7. Calculation of the Broadband Impact Fee

- (a) In calculating the Broadband Impact Fee pursuant to subsection (b), the city will use the cost of \$80.00 (eighty dollars) per linear foot, as adjusted annually pursuant to subsection d.
- (b) Broadband Impact Fee Formula. The Broadband Impact Fee formula shall be calculated by multiplying the sum of the distances in feet of 1. the public right of way adjacent to the development and 2. from the center of the public right of way nearest to the center of the building to the center of the building, by the cost per linear foot.
- (c) Administrative Fee. The City may collect a reasonable administrative fee to cover the cost of administering the program described in this chapter, as determined by the finance director and approved by resolution of the City Council.
- (d) Annual Adjustment. Fees paid pursuant to this section may be adjusted annually in accordance with the Engineering New Record Construction Cost Index (CCI) for the San Francisco area. Such annual adjustment shall be approved by resolution of the city council.

5.8. Use of Broadband Impact Fee

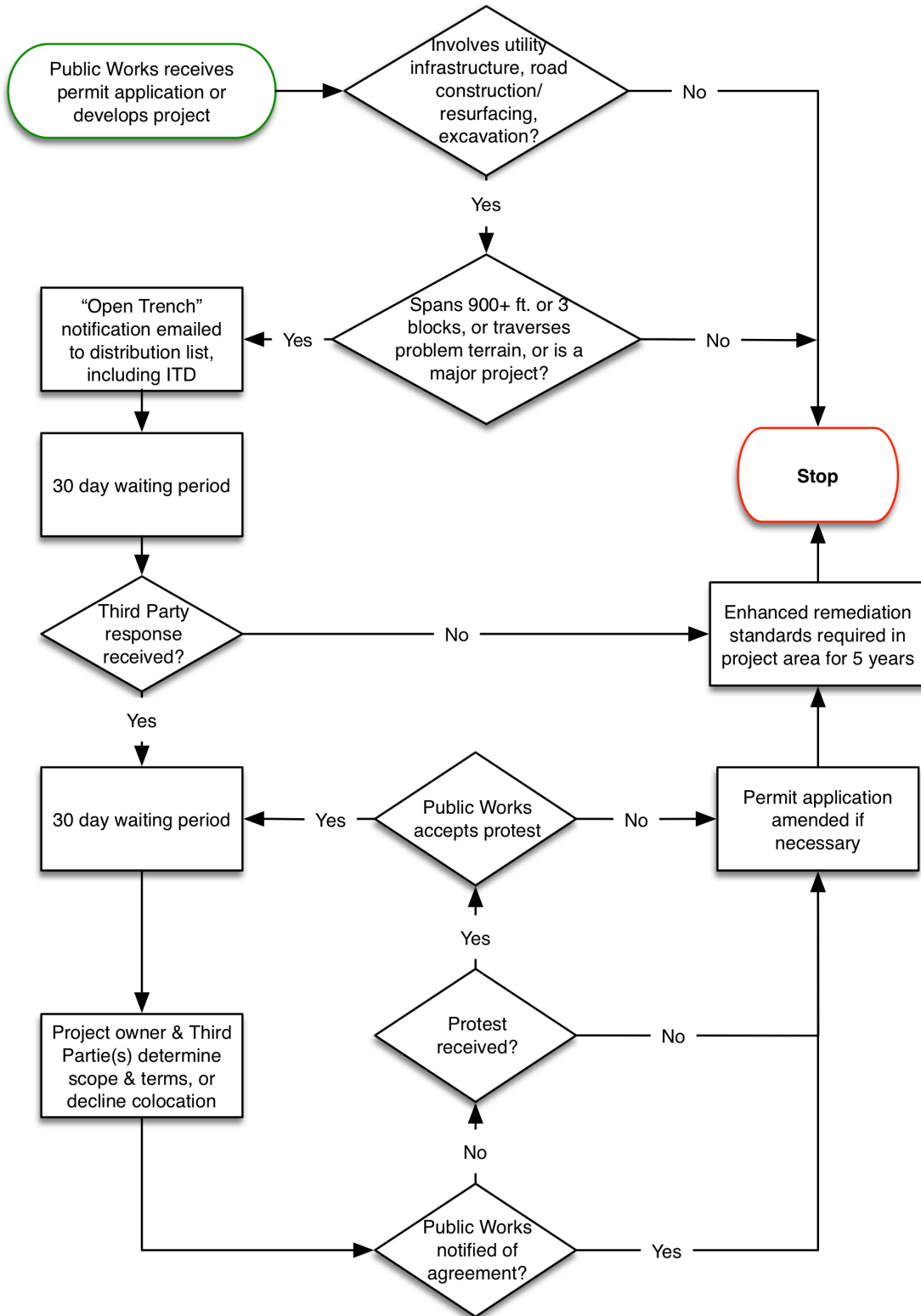
The Broadband Impact Fee funds shall be deposited in the Telecommunications Capital Improvement Account established for this purpose, and only be used for the purposes outlined in this chapter.

Appendix A - Process Flowcharts

City of South San Francisco Dig Once Policy Flowchart 1.2 – DRAFT

Open Trench Notification Policy

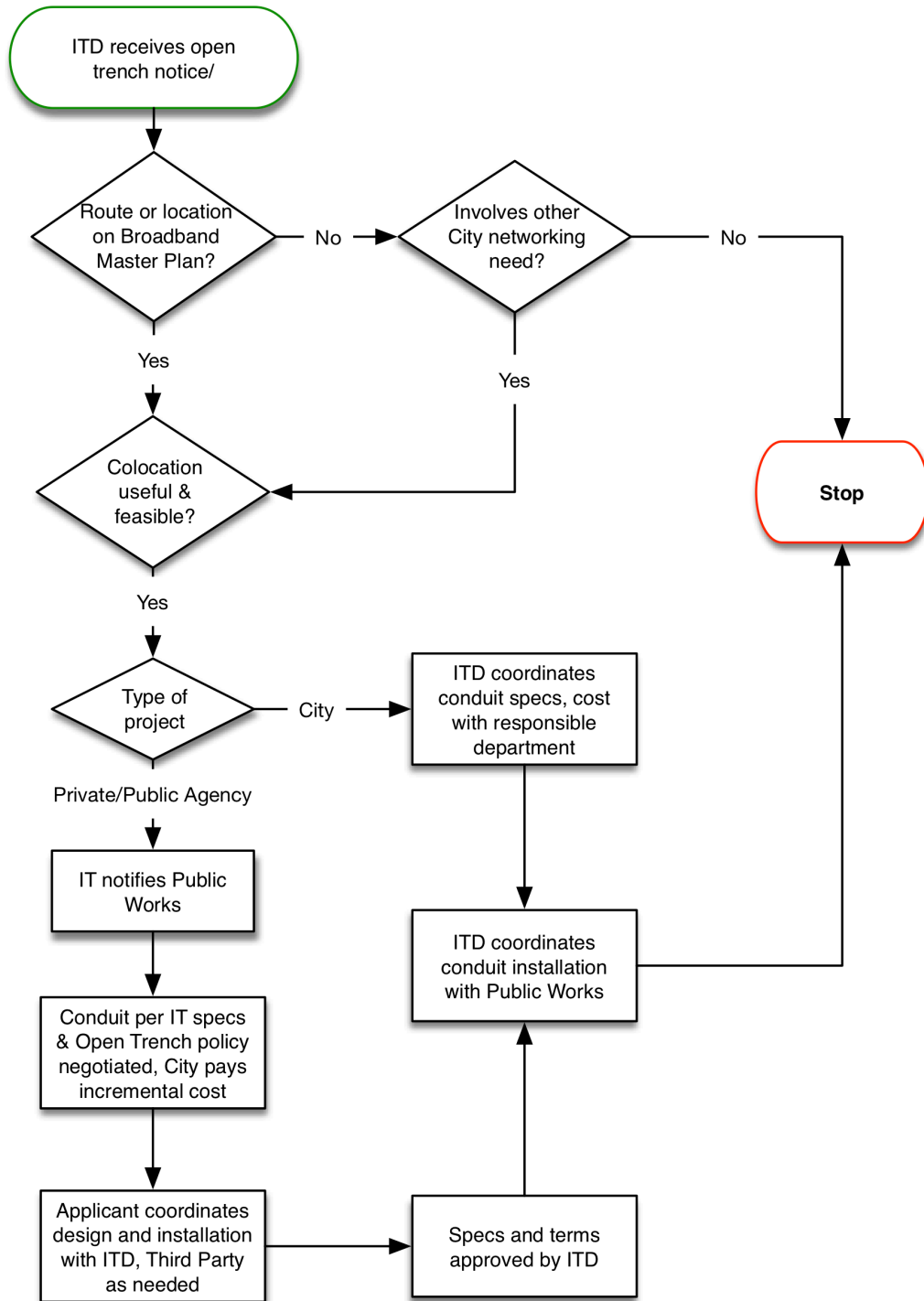
Owner: Public Works



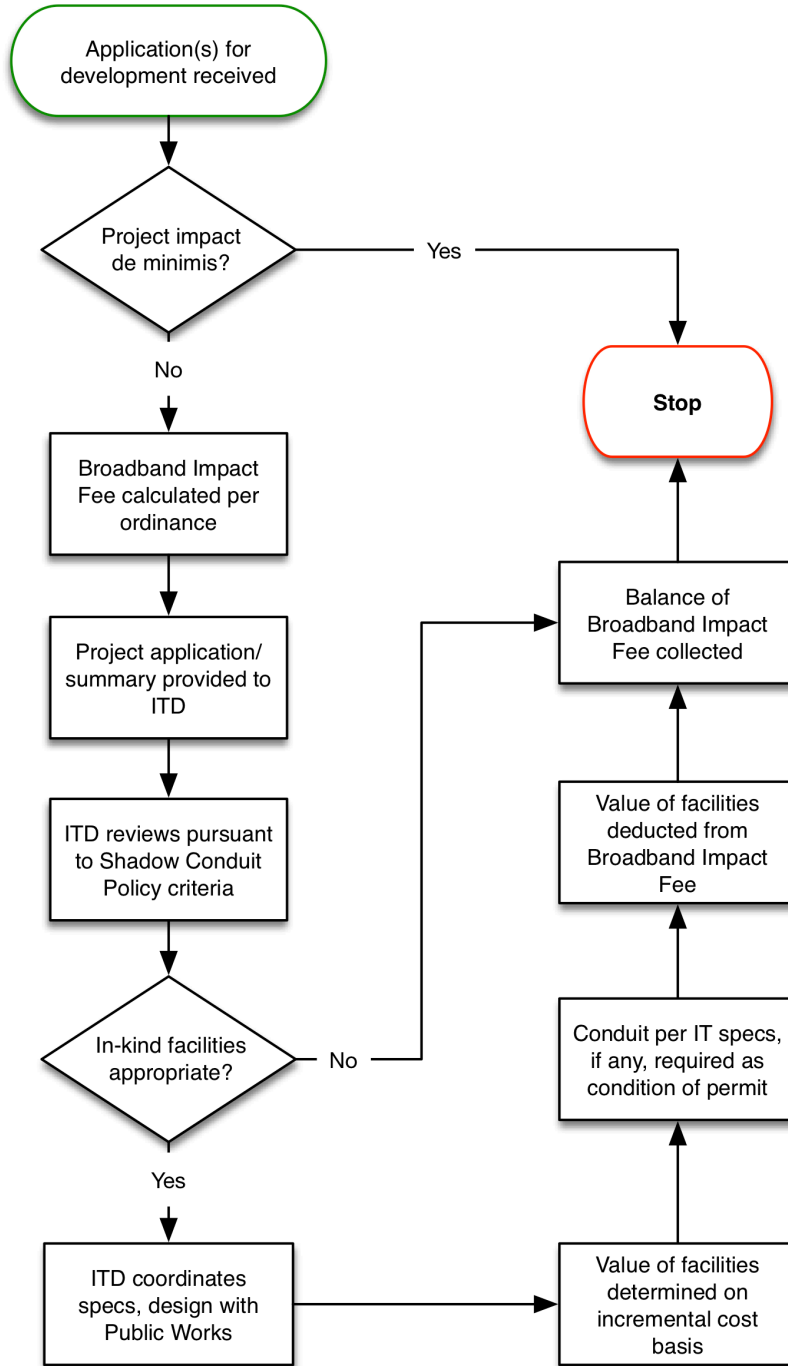
City of South San Francisco Dig Once Policy Flowchart 1.2 – DRAFT

Shadow Conduit Policy

Owner: Information Technology Department



City of South San Francisco Dig Once Policy Flowchart 1.2 – DRAFT
Broadband Impact Mitigation Policy
Owner: Planning Division



Appendix B - MBEP/CCBC Conduit Shadow Conduit Specifications

The Monterey Bay Economic Partnership and the Central Coast Broadband Consortium held a technical expert group meeting on 16 August 2016 and, after two rounds of reviewing drafts, reached consensus on an initial version of standards for installation of conduit on a prospective basis in public works projects. Items include:

1. General considerations.

The City and County of San Francisco's Department of Technology Order No. 1 – Requirements Implementing San Francisco's "Dig Once" Ordinance (draft version 8) and the accompanying report prepared by Columbia Telecommunications Corporation are good general references to use when interpreting these standards or when considering specific design or policy questions.

These specifications are guidelines that generally assume that empty conduit is being installed. If conduit is being installed to support a specific user, purpose or fiber project, then those considerations will drive design decisions and feasibility determinations.

2. Conduit installation.

Conduit size:

- 2-inch conduit is sufficient for multiple high capacity fiber cables using current technology (432 strands or more), and can be subdivided using inner-duct that would allow multiple service providers to share a single conduit.
- 4-inch conduit has even more capacity but, due to its larger size, can present design problems, for example when connecting to vaults. This size of conduit was standard when telecommunications systems depended on thick bundles of copper cables, but is not necessary for most modern fiber applications. However, 4-inch conduit should be considered for installation on bridges, railroad crossings and in other circumstances where future changes would be particularly difficult or impossible.
- Smaller conduit, e.g. 1.25-inch, is useful when it is not possible to install 2-inch conduit or when many, separate conduits are installed. It may be preferred when conduits are expected to be used by a single service provider, rather than shared among many over time, or when it meets the needs of an anticipated project or service provider.

The size and number of conduits installed depends on the particulars needs of any given project, and the number of likely or confirmed participants. For example, installation of a bank of four 2-inch conduits provides sufficient flexibility to accommodate a range of needs, and is a better option than installing two 4-inch conduits. However, because of the ability to subdivide it, installing two 2-inch conduits would not necessarily be less useful than two 4-inch conduits. As a starting point, installation of a bank of four 2-inch conduits can be considered as a reasonable standard when construction is done

on a prospective basis on a main street, while a single conduit capable of supporting multiple inner-ducts might be sufficient for a smaller or more peripheral street.

An additional factor to consider is whether future conduit installation would be particularly problematic, as with railroad right of ways, or even impossible, which is often the case with bridges. In these circumstances, installation of more and/or bigger conduit than would normally be the case is advisable.

Conduit may be located in either streets or sidewalks, however installation in sidewalks is typically easier and less expensive. Traffic control is a much smaller issue, there are usually fewer existing underground utilities, and vault lids do not need to be traffic rated. Contractors are responsible for locating gravity feed lines, and this responsibility should be spelled out in the bid documents and/or the jurisdiction's standards.

Sweeping conduit bends should be used to allow cable to be pulled without exceeding pull-tension thresholds when placing high-count fiber cables (e.g. 864-count). Unsupported conduit bends should have a minimum bend radius of 48-inches, and bends utilizing manufactured elbows should have a minimum radius of 36-inches (45-degree elbow maximum). However, when necessary, modern fiber optic cables are capable of supporting bends of up to 90-degrees.

A number of factors should be considered in determining if the addition of conduit to a host project is feasible. These factors include:

- Length of the conduit section that would be installed. There is no absolute, minimum useful length for conduit sections. However, very short or isolated sections might not be cost effective to use, unless installed as part of a larger plan.
- Proximity to current or planning public facilities and community anchor locations, and economic development needs and plans.
- Presence of other city or county-owned communications infrastructure, or other open access communications facilities or services.
- Whether physical constraints (bridges, freeway underpasses, underground utility districts) would make it unlikely that there are cost-effective alternatives in the vicinity if needed in the future.
- Whether any partners or customers or other users can or will make immediate use of it.
- The cost of alternative routes, such as placement on utility poles, if needed in the future.
- Budgetary constraints, or added costs that render the host project infeasible.
- Time constraints, particularly the possibility of delaying installation of critical infrastructure.
- Risk of interfering with operation or maintenance of host project facilities.

Installing detector wire/warning tape 3 inches to 6 inches above the conduit is a common standard, but circumstances can vary widely and this question should be addressed on a case by case, engineering design basis. Pull ropes should be included as a standard design element. Pull ropes with built-in detector wire are available and, depending on the circumstances, could perform adequately.

Choice of material depends on circumstances, however HDPE and PVC are commonly used materials.

Backfill type and materials, and other remediation/construction measures should be determined by the standard specifications used by the jurisdiction concerned.

When conduit is installed on a generic, “open trench” basis, a minimum standard is to install conduit the entire length of the trench, with sweeps installed to a future access point and with both ends capped and buried for future use. Where possible, vaults or hand holes should be placed at either end, and any lateral conduit that is installed should likewise terminate at an access point.

3. Vault installation.

The base size for a vault is 24-inches by 36-inches (Number 6 vault). A vault this size can accommodate two 2-inch conduits, with some room for splicing, assuming that it is not being used for lateral/customer service purposes. It is an ample size for splicing cables smaller than 432 strands. A 30-inch by 48-inch vault would be generally capable of supporting more splice points and/or larger cables, including those used for lateral/customer service purposes. The minimum size for a vault is 18-inches by 25-inches (Number 5 vault), although its usefulness could be limited. For example, it might not have sufficient room for slack loops or a large number of splices.

Standard municipal security specifications should be followed, however bolted-down lids are considered a normal security measure. Labels on lids should include the name of the relevant jurisdiction.

The base assumption for vault design is that shared vaults will only accommodate through-splices and connections of main fiber cables, and will not be used for lateral connections, customer aggregation or other service taps or drops. When planning vault locations, sufficient space should be allowed for future installation of third party vaults which can be used for service connection purposes. When possible, designs should assume that at least one additional vault of a similar size will be installed next to every planned vault.

Where possible, conduit should enter vaults on an end wall, parallel to the direction of the conduit run, rather than on a side wall or perpendicular to the direction of the conduit run. Vaults should be placed deep enough to allow conduit to enter horizontally, as it is preferable to avoid upward conduit sweeps. 36-inches is a benchmark for minimum depth.

Installation of grounding rods is preferred.

Electronic markers (EM) are an effective method of marking and locating vaults.

Spacing of vaults depends on circumstances and needs. As a general guide in urban and suburban areas, 600-feet is a benchmark for maximum spacing and 300-feet is a common standard when the need to support lateral connections is anticipated. In rural areas, spacing can be greater. 2,500-feet is a benchmark distance for long haul (i.e. no lateral connections anticipated) conduit and can support “blown-in” installation techniques. However, it may be more efficient to install longer segments of 3,500 feet to 4,000 feet in a longer project, such as a highway project, or in rural areas.

Prospective installation of vaults is not always necessary or even desirable if there is uncertainty about the eventual use of the conduit or if the additional cost of vaults would make the project infeasible. In many cases, it is not possible to anticipate the future needs of service providers.