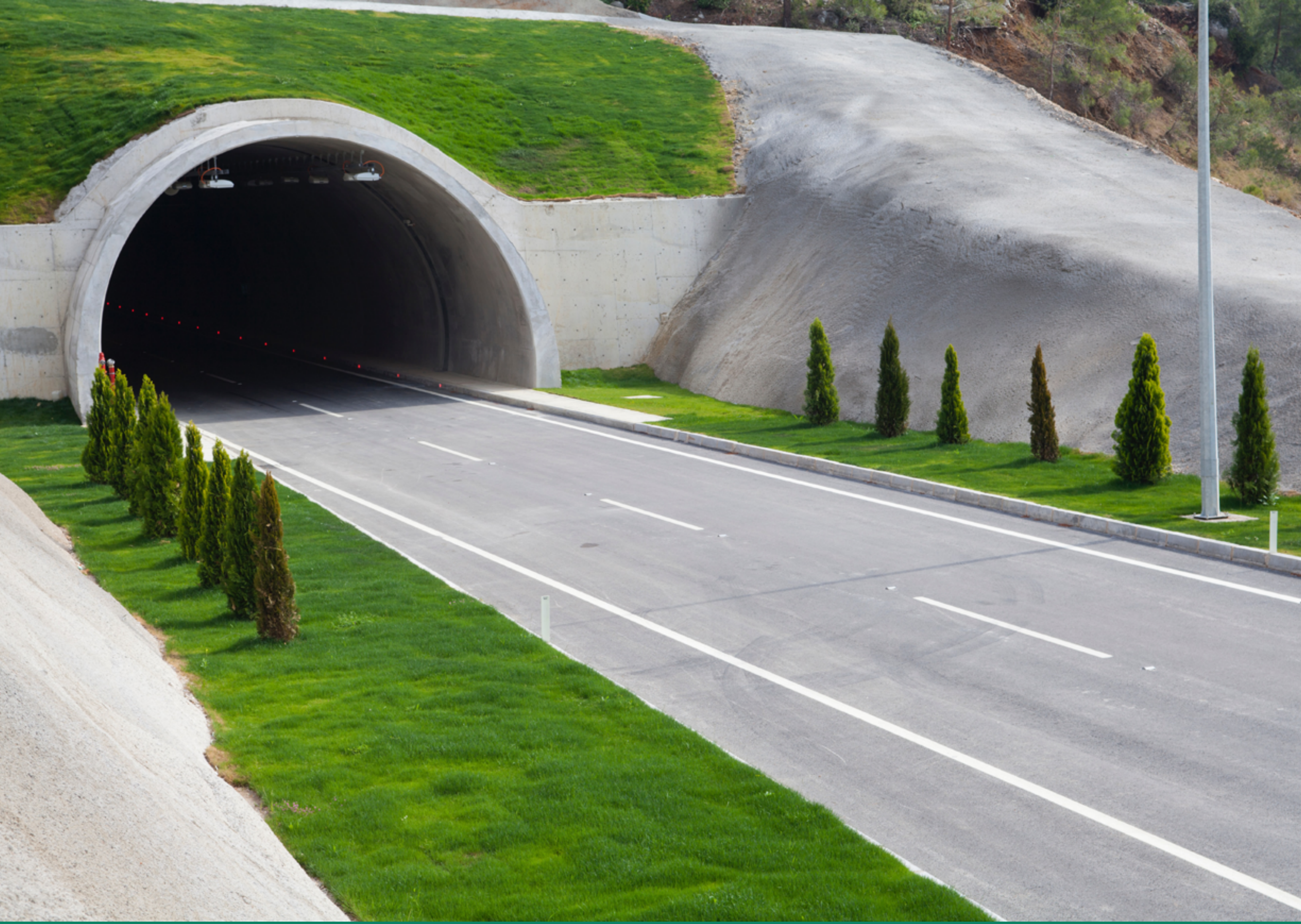

The Planning Commissioner Handbook

Chapter 8

Infrastructure Planning

INSTITUTE FOR LOCAL GOVERNMENT℠

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Infrastructure

Infrastructure refers to the physical support services necessary for development. At the simplest level, a road, driveway or easement of some type is essential to gaining property access and allowing development on a property. Other infrastructure can include water or sewer lines in developed areas, or wells and irrigation channels in rural areas. Electrical power, telephone lines, television cable and fiber optic are also considered infrastructure. Generally, the more people expected at a site, the more infrastructure that is needed to provide services.

Infrastructure for individual projects is handled at the staff level and is usually the first question asked concerning the development potential for a property. Most agencies have development standards that establish a basic minimum amount of infrastructure for certain types of development, and in many instances have adopted ordinances that require an extension of lines to connect to existing infrastructure. As a result, by the time the planning commission is considering a project these issues have largely been addressed.

Occasionally infrastructure must be brought from an area outside of the project boundaries and occasionally for some distance. When this occurs, there are direct impacts such as trenching, road closure, etc. associated with construction and indirect impacts such as growth inducement that the commission must consider. As this need would be part of the project itself, both the direct and indirect impacts should also be addressed in the staff report for the project and provided to the commission.

The commission will have a considerable say in where infrastructure is provided in long range planning associated with a general or a specific plan, or master planning of a large project. As a part of this process, the commission will need to consider existing and future land use. Staff will provide information regarding utilities in that area that may be available to support additional development. An example might be considering adding new housing to a downtown where water and sewer lines already exist. In some instances, there will be adequate capacity because the system may have been designed for housing in the past, in others expansion of the system may be required as part of any improvements. Without a technical engineering study, it is not possible to know what improvements will be needed.

Infrastructure Planning

Good Infrastructure Planning

Good infrastructure planning starts with the general plan and the anticipated density and intensity of development. Because we can estimate utility demand based on population and building size, dwelling units, persons per acre, type and size of commercial development are important components of long-range planning. Ideally infrastructure should be phased, meaning that you only build enough to meet your short-term needs and allow for expansion to meet long term needs. However, the individual phases may need to be larger than the project at hand to take advantage of engineering efficiencies, or practicality. For example, it is not possible to build half an overpass.

Infrastructure can also be used to help guide development into areas of the community that meet the goals of the general plan. If major infrastructure is extended into an area that currently lacks infrastructure it becomes easier for development to occur, which can attract developer interest. While in one context this could be considered growth inducing, in another it can be seen as furthering the expectations expressed in the general plan.

Infrastructure planning does not just look at new (greenfield) development potential, it is also important to evaluate the potential to intensify development that has already occurred. For example, if you are expanding housing opportunities in your downtown it is likely that that the new homes will have a greater demand on sewer and water systems than the existing commercial land use. While expanding existing infrastructure can be disruptive to daily activities, encouraging infill may have greater long-term benefits.

Capital Improvement Plans

A capital improvements plan ("CIP") is a plan for the orderly expansion and financing of infrastructure— like roads, drainage, sewers, water lines, parks, libraries and other civic amenities—to meet the needs of new and existing development. These costs are critical expenditures that can seldom be covered through a local agency's annual operating budget. Once a CIP is created, it can be used to establish a fee schedule for new development. The planning agency is required to review capital improvements for consistency with the general plan.[1] One method of ensuring consistency is to have the planning commission review and make a general plan consistency finding for the CIP prior to its adoption by the agency.

To provide a simple example, if a city's capital improvements plan calls for each neighborhood to have its own park and the estimated cost for a park in a new 2000-unit development is $100,000, the per-unit fee would be $500. Most calculations are more complex, but the idea is the same: new development should pick up its fair share of the cost of infrastructure. Remember, however, that new development cannot be asked to make up for shortcomings in existing infrastructure. For example, if an existing wastewater treatment plant needs to be replaced, the agency cannot place the entire replacement cost on new development.

Master plans are often prepared for important infrastructure. These plans are based on the general plan and reflect the anticipated development potential within the service area covered by the plan. Often the staff report or analysis for the project will reference whether the project is consistent with the water, wastewater or storm drainage master plan. In some cases, payment of fees is all that is needed for the project to be considered consistent, and in others the project will actually construct some of the improvements called for in the master plan. As the improvements and fees are based on development potential, projects that are less than the expected potential can have an impact on the overall plan because the agency may receive less in the way of fees which can affect funding of other plan components.

1 Government Code Section 65103(c)

Wet Utilities

Water

Developers refer to infrastructure as utilities and divide them into wet and dry utilities. Wet utilities include water, sewer and storm drainage. Water service can be provided by a public agency or by a private water company or in some instances by the landowner themselves through either a private well or collection of wells. The placement of water lines is regulated by an agency's design standards and by the physical constraints of the site. Because water lines operate under pressure, steep slopes and valleys are not as critical an issue to new water lines.

It is important to note that most water services are sized (meaning the diameter of the pipes and the design of the system) not for the actual use of the building but to meet fire flow which is a much higher demand. Water providers prepare an Urban Water Management Plan (UWMP) that assumes development consistent with a general plan, shows the service area and source of all water.[2] Usually, a project that is consistent with the general plan and the UWMP is sufficient to determine there is adequate water for that project. Note that the update periods of the UWMP and different than those of the general plan therefore as part of the development review process the agency confers with the water provider early in the development review process to ensure adequate water resources. For large projects, Water Code Section 10910 requires preparation of a Water Supply Assessment (WSA) as part of the environmental documentation for the project. The WSA must demonstrate that water is available to meet the needs of the project during multiple drought years.

For rural projects, or projects that are on some form of groundwater well, providing service can be more complicated. The reason for this is the Sustainable Groundwater Management Act[3] that establishes regional planning to prevent overdraft of groundwater. Overdraft is when more water is extracted from the ground than can be replenished. Other planning considerations for groundwater wells include water quality, gallons per minute, emergency generator(s) as backup and possible interaction with other groundwater wells. Well placement, abandonment and construction are usually overseen by the local health department who maintain standards for groundwater wells.

In California, water is a valuable and scarce resource. The wise and efficient use, and ultimately reuse of water, is an essential part of the long range and current planning process. After years of multiple droughts, our fragile water collection and distribution system is mandating that decisions on development include a discussion of water usage. Depending on location and water resources, efficient use of water may require the elimination of lawns in some areas, and the extension of reclaimed water into others.

Sewer

Sewer or sanitary sewer is arguably one of the most important aspects of development as careful consideration is needed to avoid contamination and health impacts. Agencies that provide sewer service create master plans that rely on development potential established by the general plan. These master plans often form the basis of impact fees charged for development to connect to the system. The sewer master plans typically have a collection and a treatment system component.

2 Water Code Section 10631

3 Water Code Section 10720

Collection System

Sewer lines are placed underground, and ideally designed to use gravity to move liquid and solids toward a wastewater treatment plant. Because of the mix of liquid and solids, the slope of the sewer line is important. If the slope of the line is too steep the liquid will flow faster than the solids which can lead to the solids blocking the pipe. If the slope of the line is too shallow the flow will collect and can stagnate causing odor and blockage problems. If topography does not allow the use of gravity, the agency may require a form of pump known as a lift station to lift the sewer up and into a gravity system. In some instances, the pump can force sewage into a pressurized sewer line which is known as a forced main. While lift stations and forced mains are essential in some communities, engineers try to avoid them because they require power and have moving parts which require regular maintenance. Because of the potential for blockage, and to relieve hydraulic pressure, lines are connected using a series of manholes. A manhole (or maintenance hole) is usually a concrete column that leads to the sewer line. The sewer line is open at the bottom of a manhole to allow inspection and to remove blockage.

Treatment System

Once the sewage reaches the wastewater treatment plant it is treated in accordance with state and federal requirements. Some wastewater treatment plants treat sewage at a level that allows reuse of the water. Reused water can be pressurized like potable water but is delivered in a purple pipe. The pipes are purple to avoid cross connection with potable water lines that are white. Purple pipe water is often used for irrigation of landscaping and can also be used for some industrial purposes.

If a wastewater treatment plant does not create reusable water it must discharge the water either onto land or into a receiving water body. The quality of water discharged from the wastewater treatment plant is regulated by the state Regional Water Quality Control Board and is in a published permit that can be reviewed by the public.

Onsite Systems

In areas where there is no sanitary sewer system, on-site systems may be used. Because of the potential public health hazard, the design of on-site systems is usually monitored by the health department. The most commonly known on-site system is called a septic tank. A septic tank consists of a concrete box that has multiple chambers that capture liquids and solids from the structure(s). Bacteria forms in the tank that breaks down the solids and the excess liquid drains into a leach field. A leach field is a collection of perforated pipes that are underground and allow the liquids to drain into the soil where more bacteria in the soil further treat the water. Septic tanks are dependent upon soil types, depth to ground water, and the types of use, all of which are regulated by the health department. Septic tanks also require regular maintenance and rely upon the owner to have knowledge of the system limitations.

There are several different ways of treating wastewater on-site and each has benefits and constraints. Engineers will select the system best suited for the project, soil conditions and regulatory environment. These decisions seldom rise to the level of the planning commission as they are highly technical in nature and heavily regulated for public health and safety.

Drainage

Land can create impervious surfaces which are surfaces that repel stormwater and keep it from soaking into the ground. Stormwater runoff can be channelized by topography into creeks and rivers, and by development through buildings, roads, curbs and channels. Flowing water is powerful and erosive and unless kept in check it can create damage and hazards far in excess to the size of a given storm. The process of planning for storms is called stormwater planning and often occurs at a regional and local level.

All land can be placed in a defined watershed. A watershed is an area with a ‘top’ and a ‘slope’ toward a receiving water body or drainage. Development within the watershed changes the natural drainage by placing buildings, roads and other improvements in the path of stormwater. While collecting stormwater in pipes and channels concentrates its potentially damaging effects, a collection system can protect communities from flooding, aid in groundwater recharge and in some cases allow reuse of the water. Toward the top of the watershed the storm drainage system may consist of curbs along paths or roadways that direct drainage away from improvements. As the amount of impervious area increases, the stormwater is directed to drop inlets (DI) which is usually a form of grate in the curb line of a roadway that leads to a pipe. A series of pipes and channels direct the stormwater flow to the receiving waterbody. Generally, stormwater system pipelines and channels are larger at the bottom of the watershed the closer they are to the receiving water body.

As with sewer, the discharge of stormwater into a receiving water body is regulated by the Regional Water Quality Control Board (RWQC). The RWQC requires development to prepare a Stormwater Pollution Prevention Plan (SWPPP) as part of the National Pollutant Discharge Elimination System Permit (NPDES) that every agency has, or operates under (some agencies operate under a larger agency permit). The quality of the stormwater runoff is monitored and if it exceeds standards active measures are required to improve the quality. A component of the stormwater system can include onsite detention or retention basins, along with pervious landscaping or recharge areas to keep as much of the stormwater on the project site as possible.

Dry Utilities

Electricity

While California is moving toward individual buildings providing their own power, for the foreseeable future there will still be a need to connect to the larger power grid. Power lines range in size from very large to very small and have different design and setback requirements based on their size. For example, it may not make fiscal sense to underground some power lines because of their size, while others are usually required to be undergrounded for aesthetic reasons. Often an older community has a mix of above ground services to buildings and underground services.

Each community has different standards for the extension of power; however, this usually is not a development issue that the Commission has to address. Often there can be a disagreement between the developer and the agency on the size of line that must be undergrounded because generally the larger the line the more expensive it is to underground. A similar disagreement can occur if power poles need to be relocated for a road or intersection improvement. This is usually a fiscal argument rather than a planning issue and will likely be decided at the council or board level. Note that some general plans have policies that require undergrounding, and the commission may be asked to consider whether the condition of approval is consistent with the general plan. The other requirements for electrical connection are found in the California Building Code (CBC), and cannot be changed by commission action.

Electric and Magnetic Fields from Power Lines

The concern over electric and magnetic fields from power lines is a frequent topic at commission meetings. Unfortunately, the science is not conclusive, which makes discussing the issue difficult. The following text is taken from the Environmental Protection Agency (EPA) website on the issue. "Electromagnetic radiation (EMR) consists of waves of electric and magnetic energy moving together through space. An example of electromagnetic radiation is visible light. Electromagnetic radiation can range from low to high frequency, which is measured in hertz, and can range from low to high energy, which is measured in electron volts. Wavelength, another term associated with electromagnetic radiation, is the distance from the peak of one wave to the next.

There are two general kinds of electromagnetic radiation: ionizing radiation and non-ionizing radiation. Ionizing radiation is powerful enough to knock electrons out of their orbit around an atom. This process is called ionization and can be damaging to a body's cells. Non-ionizing radiation has enough energy to move atoms in a molecule around and cause them to vibrate, which makes the atom heat up, but not enough to remove the electrons from the atoms.

Electromagnetic Fields (EMF)

Electromagnetic fields associated with electricity are a type of low frequency, non-ionizing radiation, and they can come from both natural and man-made sources. For example, lightning during a thunderstorm creates electromagnetic radiation because it creates a current between the sky and the ground. Surrounding that current is an electromagnetic field. One example is the Earth's magnetic field. We are always in the Earth's magnetic field, which is generated at the Earth's core. This magnetic field makes compasses work and is also used by pigeons and fish to navigate.

Electromagnetic Radiation (EMR)

EMR associated with power lines is a type of low frequency non-ionizing radiation. Electric fields are produced by electric charges, and magnetic fields are produced by the flow of electrical current through wires or electrical devices. Because of this, low frequency EMR is found near electrical sources such as power lines. As current moves through a power line, it creates a magnetic field called an electromagnetic field. The strength of the EMF is proportional to the amount of electrical current passing through the power line and decreases as you move farther away. Because of this property, the exposure to an electromagnetic field you would receive from a power line decreases with distance."[4]

Increasing distance, usually in the form of a setback, easement, roadway, parking lot or other design feature that only provides for occasional or temporary exposure to the power line(s) is the primary method of addressing health concerns over EMF and EMR.[5]

Gas

Some communities have access to natural gas in pipes that are underground. Natural gas is provided by one of the utility companies, often in conjunction with electricity, and metered into the individual property. In areas where natural gas is not available, gas may be provided through individual propane tanks that are stored on the property being served, or occasionally on one property that serves several others that are close by. These tanks must be placed carefully as they need to be filled regularly by truck and should be protected from snow accumulation and accidental damage. The tanks can also be considered unsightly by some so screening of some type is usually required. The use of gas in development is regulated by the California Building Code, and in some instances by an agency climate action plan that may have strict regulations regarding the use of natural gas.

Communication Infrastructure

Other utilities include cable television, telephone lines, fiber optic cable delivering broadband internet, and even wireless systems that can transmit within and outside of a development providing service to an area. Most of these are provided underground and included in trenches that are separate from the wet utilities as mixing dry and wet utilities is not permitted by regulation. Like power and water, these utilities are often provided by private companies or districts in collaboration with the community as part of a franchise agreement or other public-private agreement to provide service.

4 https://www.epa.gov/radtown/electric-and-magnetic-fields-power-lines

5 https://www.cpuc.ca.gov/General.aspx?id=2181