The Department of Public Works, Engineering Division for the City and County of Denver in May of 2019 published the Small Cell Infrastructure Design Guidelines. Communications companies use small cell infrastructure to improve wireless communication in densely populated areas. To complete the construction of the infrastructure, communications companies requested the right to install poles holding small cell equipment in the public right of way of the City and County of Denver. For that reason, the Small Cell Infrastructure Design Guidelines were published and are available at the following website: [https://www.denvergov.org/content/dam/denvergov/Portals/705/documents/guidelines/PWES-016.1-Small\_Cell\_Infrastructure\_Design\_Guidelines.pdf (Links to an external site.)](https://www.denvergov.org/content/dam/denvergov/Portals/705/documents/guidelines/PWES-016.1-Small_Cell_Infrastructure_Design_Guidelines.pdf)

While the document provides standards for building small cells in the Denver city and county public right of way, it offers no quality management plan. You have been contracted to develop a quality management plan, and you will report to the Engineering Supervisor, Jon Reynolds. If Mr. Reynolds is pleased with the quality management plan your company develops, your firm will likely be hired to project manage and quality check the portion of the small cell infrastructure build impacting the public works and public safety for the City and County of Denver.

Note: While the document at the core of this assignment is an actual document published by The Department of Public Works, Engineering Division for the City and County of Denver, the quality management scenario described is fictional and only for the educational purpose of showing mastery of the course objectives set forth for this course.

In Module 3, you were asked as a first step, to familiarize yourself with the Small Cell Infrastructure Design Guidelines. Note that two contract firms were instrumental in the development of the guidelines: Clanton & Associates, Inc. and Jacobs Engineering Group. After your review of the guidelines, you were asked to provide your input to the following: (Module 3 paper attached at bottom of page for reference)

* Are the current Small Cell Infrastructure Design Guidelines (SCIDG) ones that promote high quality? If yes, how? If no, why not and what should change to promote quality? Support your position with specific references to the SCIDG or current scholarly documentation.
* What do you interpret to be meant by “quality” from the perspective of the public works personnel, communications companies deploying small cell infrastructure, the contract companies involved, and the public both now and in the future? What support do you have for your position with specific references to the SCIDG or current scholarly documentation?
* What are the drivers for change, and the barriers to change from the perspective of the public works personnel and the public? Are there competing drivers for change that may impact quality from the public’s perspective? Support your position with specific references to the SCIDG or current scholarly documentation.

In Module 8, you are asked to build upon your work from Module 3 and show additional mastery through other course modules.

Provide the following quality management plan in your final portfolio:

1. Provide an opening paragraph which describes the importance of the using this case to show your mastery of course objectives, and mapping of what is contained in your paper to prove that mastery.
2. Delineate your next section with a header, and in less than one page, describe the case of using small cell infrastructure to improve wireless communication in densely populated areas, and the role of the Department of Public Works, Engineering Division for the City and County of Denver in promoting quality.
3. Delineate your next section using headers and sub-headers with your work from Module 3. Include any updates that you wish to make as a result of learning more about quality management, and input from your instructor in Module 3 for the following:
	1. Are the current Small Cell Infrastructure Design Guidelines (SCIDG) ones that promote high quality? If yes, how? If no, why not and what should change to promote quality? Support your position with specific references to the SCIDG or current scholarly documentation.
	2. What do you interpret to be meant by “quality” from the perspective of the public works personnel, communications companies deploying small cell infrastructure, the contract companies involved, and the public both now and in the future? What support do you have for your position with specific references to the SCIDG or current scholarly documentation?
	3. What are the drivers for change, and the barriers to change from the perspective of the public works personnel and the public? Are there competing drivers for change that may impact quality from the public’s perspective? Support your position with specific references to the SCIDG or current scholarly documentation.
4. Delineate your next section with a header to discuss the operational issues that must be managed and controlled to support quality including partnering and strategic alliances if any are pertinent. How will those issues be managed and controlled in your plan? As usual, what support do you have for your position with specific references to the SCIDG or current scholarly documentation?
5. Delineate your next section with a header to discuss the human resource issues that must be managed and controlled to support quality including employee empowerment, teamwork, education and training. How will those issues be managed and controlled in your plan? As usual, what support do you have for your position with specific references to the SCIDG or current scholarly documentation?
6. Delineate your next section with a header to discuss customer satisfaction and how it will be measured. How will and when will measurement happen in your plan? As usual, what support do you have for your position with specific references to the SCIDG or current scholarly documentation?
7. Delineate your next section with a header to discuss how problems will be solved, conflicts resolved, and how decisions will be made. As usual, what support do you have for your position with specific references to the SCIDG or current scholarly documentation?
8. Delineate your next section with a header to discuss what quality tools should be used, when and how, including communications tools, process control tools, benchmarking, or other tools as you find appropriate. What support do you have for your position with specific references to the SCIDG or current scholarly documentation?
9. Finally, conclude with the final section making a recommendation to Mr. Reynolds for your plans, and why your company is in the best position to lead the quality management effort going forward through implementation.

**Submission**:

* Write a paper addressing the case of The Department of Public Works, Engineering Division for the City and County of Denver regarding the Small Cell Infrastructure Design Guidelines and quality management. Paper should be 8-10 pages in length, not including the required title and references pages and any appendix if required.
* Support the paper with a minimum of six current (published in the most recent five years) scholarly sources.
* Format the paper according to the APA.
* Be clear, concise, and focused.

**Tip:** Cases may be addressed in 6 steps:

1. Read the assignment and questions provided to get an idea of the important course concepts to be covered. There is plenty of material in a case that may be immaterial to the course learning objectives. (For example, a case may have significant information on utility pole design issues, but the assignment questions relate to quality management. In that case, do not spend time on utility pole design unless relevant to quality management. Use your time searching the case, researching and reporting on quality management.)
2. Read and take notes on the entire case. Read every figure and table to thoroughly understand them.
3. Determine who are the key players; what are the key issues; what is the problem to be solved?
4. Do the research and analyze any data. Find current academic information on those topics.
5. Make your decisions relative to the important course concepts, and document the defense of your position by melding the scholarly research and examples from the case. Remember, no opinions; only facts.
6. Finalize paper by checking all assignment questions are fully answered.

**Module 3 paper for reference**

**Small Cell Infrastructure Design Guidelines**

According to Clanton and Associates, Inc. and Jacobs Engineering Group (2019), small cell infrastructure design involves the creation and placement of small wireless cell antennas, which offers cellular and data to complement mobile networks within a small area. Numerous wireless service providers and wireless infrastructure companies, including Clanton & Associates and Jacobs Engineering Group, were contacted to assist in the development of the guidelines to follow in the design. Small cell infrastructure design guidelines (SCIDG) focus on requirements and specifications that must be met by those installing small cell towers within the right of way (ROW). Therefore, any small cell, which is not installed at the public ROW, is opposed to the provisions of the SCIDG (Butters, 2018). Small cell design guidelines provide that any network provider needs to consider the boundaries of the existing poles and the adjacent neighborhoods in the proposed locations of the small cell before submitting their applications to the municipal or city of development.

The SCIDG permits four types of small cell installation within the city: small cell should be attached to the utility poles and lines, on existing wooden streetlights, installing of new freestanding, and removal and replacement of old streetlights. The guideline provides that permission from the company owning the old poles should be given prior to the installation of small cell infrastructure equipment. Also, all installation should be made in a way it does not obstruct the usual pedestrian or automobile. In the four types of small cell installation, it is required that the mechanical strength of the existing pole or new poles should of standard value before mounting the communication equipment. All small cell carter equipment should be in-housed and attached to the pole. Certification on safety levels of radiation by a non-ionization radiation electromagnetic radiation report (NIER) should be endorsed by qualified personnel to the city before the installation of small cells.

**Are the current Small Cell Infrastructure Design Guidelines (SCIDG) ones that promote high quality?**

Yes, small cell infrastructure design has increased the quality of wireless services. This is due to the increased interconnection between networks, which has eased access to the broadband internet. The fact that the installation of small cell facilities has eliminated data traffic which has been occurring in traditional cell towers (Macro calls) (Clanton & Associates, Inc. and Jacobs Engineering Group, 2019). The conception of small cell facilities which cover a small area in corporation with mobile phones and other wireless devices has increased the demand for high-speed wireless data, and hence qualitative communication is boosted. The introduction of small cell infrastructure has increased the data demand which has benefited the current 4G voice speed by strengthening its coverage. Network providers are increasing aspiring to shift to a 5G data speed network to further improve the communication quality (Clanton & Associates, Inc. and Jacobs Engineering Group, 2019).

**What do you interpret to be meant by “quality” from the perspective of the public works personnel, communications companies deploying small cell infrastructure, the contract companies involved, and the public both now and in the future?**

According to Axelrod (2019), the Federal Communications Commission (FCC) in the U.S intermediated between the local government and the broadband network providers in abolishing out of date local regulations, which hindered growth in telecommunication field especially the small cell infrastructure - This was given priority after the realization of the increased dependence on mobile data. It was realized that if macro-cells cause data traffic, a backhaul volume of data will be required. The FCC regulates the local government from imposing strict requirements on small wireless telecommunications. One of the mandates stated its intention to write-off regulatory obstacles which slowed down the implementation of 5G networks. In his article, small cell antennas providers should be given quick approvals to set up small cell installation sites in urban centers. Generally, small cell infrastructure should be exempted from additional permitting requirements if they are installed in existing structures. In his argument, governments should promote the installation of small cell infrastructure by drawing a lesser fee structure and permit taxes for installation. The advantage of small cell installation is that it requires small equipment that transmits signals and data within a smaller range. This makes it useful in populated areas like in a city. Small cell infrastructure is accelerating the introduction of a 5G network which is transmitted micro-waves leading to transmission of numerous data over less time. In the past, public works were rarely involved in telecom because the towers of macro-cells were not placed in the ROW. Emerging of small cells in the cities has posed another problem to the public works; lack of expertise in their officials has made them rethink their plans. A law has been endorsed to enforce learning to its officials on small cell infrastructure.

According to Wright (2019), wireless service companies have been pivotal in the development of smart cities, and internet of things (IoT) through the introduction of small cell antennas, which substitute the cell towers and the fact that small cell have bolstered the lightning 5G network which has improved the lives of the residents and economic value of the community can exchange commodities easily which using the available fast network.

**What are the drivers for change, and the barriers to change from the perspective of the public works personnel and the public?**

To improve the quality of the small cells, public works have to adjust the restrictions to the level that will enable the integration of small cell technologies as well as removing taxes and lowering costs of implementing the network by forming third party deployments (Markets, 2020). Also, availing virtualized and ultra-reliable software will enable the realization of local communications networks as a critical driver to bolster the quality of small cells network. Adoption of the fast 5G network technologies will heighten the economic scale of the community is also essential in this study (Markets, 2020). Small cells can link the government and commercial organizations through the creation of a broadband network. The focus has to be put on population densification to reduce the cost of distributing the network. The network providers have advanced to becoming enablers of an informal system in addition to providing network within buildings, hence making its application more useful as it can reach places where large tower networks cannot reach.

**Conclusion**

The small cells have shown a complexity in the design and the process of operating it. This problem calls for trained personnel, which can be rarely found in the public works team. Consequently, these drivers for change if well inducted in the small cell system, quality of the small cell infrastructure will increase significantly (Axelrod, 2020).

References

Clanton & Associates, Inc. and Jacobs Engineering Group. (2019). Small Cell Infrastructure Design Guidelines.Retrieved from <https://www.denvergov.org/content/dam/denvergov/Portals/705/documents/guidelines/PWES-016.1-Small_Cell_Infrastructure_Design_Guidelines.pdf>

Axelrod, J. (2020). *Small cells, big uncertainties*. [online] American City and County. Available at: https://www.americancityandcounty.com/2019/07/10/small-cells-big-uncertainties/

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