Chapter 4.
Summary Comparison of Impacts for Alternatives

4 SUMMARY COMPARISON OF IMPACTS FOR ALTERNATIVES

Table 4.1 summarizes the potential direct and indirect impacts or consequences that the No Action Alternative and Summit's Proposed Project may have on each of the respective environmental resources considered in this EIS. ***Tables 4.2 through 4.5 provide a detailed comparison of each of the waterline, transmission line, access road, and natural gas pipeline options, respectively.***

Table 4.1. Summary of Impacts from Summit's Proposed TCEP and the No Action Alternative

Resource	Summit's Proposed Project	No Action Alternative*
Air Quality	Project Emissions during Construction Operation of worker vehicles and construction equipment and vehicles would result in criteria pollutant emissions. Land clearing and excavation, road surface construction, and cut and fill operations would generate dust (PM_{10} and $PM_{2.5}$). Impacts resulting from dust emissions would be localized and short term. Project Emissions during Operations Wet cooling towers would emit PM as drift from the evaporative cooling process. Coal delivery trains would emit a small amount of pollutants from the train exhaust and potentially during coal unloading and handling; control devices for transfer, conveyance, and loading would minimize PM emissions. For the plant itself, maximum annual emissions (tons per year), including startup, shutdown, and maintenance emissions, would be as follows: NO_2: 225 tn (204 t) per year (2 percent increase over existing sources in Ector County) CO: 1,173 tn (1,064 t) per year (4 percent increase over the same) SO_2: 251.1 tn (228 t) per year (20 percent increase over the same) PM_{10}: 380 tn (345 t) per year (6 percent increase over the same) $PM_{2.5}$: 367 tn (333 t) per year (20 percent increase over the same) H_2SO_4: 15 tn (14 t) per year Note that only those air contaminants that pertain to the TCEQ-approved air permit are addressed here. Maximum annual emissions would be above both PSD and Clean Air Act Title V Major Source thresholds (100 tn [91 t] per year) for NO_2, SO_2, CO, PM_{10}, and $PM_{2.5}$. Plant-wide emissions of HAPs would be below the individual HAP major source thresholds (10 tn [9 t] per year) as well as the total combined HAPs threshold (25 tn [23 t] per year). **Incremental contributions to NAAQS exceedances**: Operational emissions from the TCEP would not contribute to a PSD exceedance or violation of NAAQS for any criteria pollutants in the region. However, project emissions would incrementally increase the ambient air concentrations of criteria pollutants as demonstrated using dispersion modeling, ranging from an increase (over background concentrations) of up to 9 percent for PM_{10} to 200 percent for NO_2 at the points of maximum impact. **ESLs**: Maximum predicted concentrations for all identified compounds that could have a negative impact to human health were below their respective ESLs, except for Tier I short-term coal dust. However, per the TCEQ, the coal dust concentrations would meet the Tier II requirements. **Hg**: TCEP operations would produce approximately 0.02 tn (0.018 t) of Hg emissions per year.	Rural land uses, including residential development, grazing, dispersed recreation, and light commercial and industrial development, would continue in the air quality ROI. No exceedances or violations of NAAQS would occur as a result of the current land uses. Risks from HAPs in the project area would continue to be very low.

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Resource	Summit's Proposed Project	No Action Alternative*
	GHGs: Annual noncaptured CO_2 emissions from TCEP operations would be approximately 300,000 tn (272,155 t) per year. **Proximity to Class I area**: PSD Class I visibility impairment analysis was not required for TCEP because the site would be greater than 62 mi (100 km) away from the nearest Class I area. Local Plume Visibility, Shadowing, Fogging, and Water Deposition The project is designed to use air cooling for the power block and mechanical draft wet cooling towers for the chemical processes. No plumes or fogging would result from the use of the dry cooling tower. Water droplets carried with the water vapor plume from the cooling tower (drift) would have the same chemical composition as the water entering and circulating through the tower. Circulating water could contain anti-corrosion, anti-scaling, anti-fouling, and biocidal additives that could create emissions of volatile organic compounds, PM, and toxic compounds in low concentrations. The drift would not cause excessive pitting or corrosion of metal on nearby structures or equipment because of the relatively small amount of water released and the low concentrations of anti-corrosion additives. Similarly, the treatment additives would not cause noticeable adverse impacts on local biota because of the very small amounts released. Potential deposition of solids would occur because the TCEP would use process water, which may contain dissolved and suspended solids. Effects from vapor plumes and deposition would be most pronounced within 300 ft (91 m) of the vapor source and would decrease rapidly with distance from the source. The drift rate and associated deposition of solids would be reduced with drift eliminators; losses would be limited to less than 0.01 percent of the circulation rate. The TCEP would also comply with Texas Administrative Code visibility and opacity requirements to minimize visible NO_x and PM in stack emissions. Odor Two odorous compounds that are regulated by the TCEQ would be emitted from the TCEP in small quantities: H_2S and NH_3. The wind may carry small volumes and may create a nuisance for residents within 1.0 mi (1.6 km) of the polygen plant.	
Climate	Severe Weather **Construction**: Severe temperature or weather conditions could cause a delay in some aspects of construction as well as in materials deliveries. Impacts, if any, would be minimal and temporary because the region's climate is relatively mild and severe climatic conditions would not adversely impact the TCEP. Weather events such as severe thunderstorms, flooding, and/or tornados could also delay construction. If an extreme drought occurs during construction, increased use of water trucks would be required for fugitive dust control and support of other construction activities. Workers would also be required to wear protective dust masks. **Operations**: It is unlikely that weather extremes, such as very high or very low temperatures or snowfall, would affect operations. It is also unlikely that flooding would affect operations because the polygen plant site would be outside the 100-year floodplain. Relatively frequent tornados in the region do pose a low potential for both direct and indirect impacts to operations. Severe or extreme drought conditions could occur over the planned life of the project and cause increased ambient air concentrations of PM_{10} and $PM_{2.5}$. Wet cooling towers could cause local shadowing and under certain meteorological conditions could cause local ground-level fogging or icing. Such localized	Existing climate and meteorological conditions in the project area would continue. This area historically experiences a wide spectrum of weather phenomena, including cold and hot days, high winds, heavy rainfall events, thunderstorms, localized floods, and tornadoes.

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Resource	Summit's Proposed Project	No Action Alternative*
	occurrences would be infrequent, usually lasting only a few hours. **Technology options:** Among the cooling tower options for the chemical process part of the plant, wet cooling towers could cause shadowing and under certain weather conditions could cause ground-level local fogging and icing. ***Among the waste*** disposal options, solar evaporation ponds could cause ground-level fogging under certain weather conditions.	
Soils, Geology, and Mineral Resources	<u>Soils</u> Potential impacts to soils would be site-specific and primarily occur during construction and would include erosion or compaction, contamination in the event of hazardous material spills, and composition changes due to the introduction of fill material. Spills of hazardous materials would be minimized through the use of controls and measures. Following construction, and as disturbed areas are revegetated, soil impacts would be negligible. **Technology options:** Among the cooling tower options, there could be a slight deposition of salt on surface soils from drift from the wet cooling tower. ***Among the waste*** disposal options, there would be a potential for local soil contamination at the solar evaporation pond site***s*** if the pond liner were to leak. <u>Geology</u> **Polygen plant site**: No impacts to or from geologic features would occur. **Linear facilities**: No impacts to or from geologic features would occur. **Technology options:** Of the ***waste*** disposal options, deep well injection could pose a slight risk of induced seismic events as a result of increased fluid pressures in the injection reservoirs. Therefore, careful monitoring and control of the fluid pressures in geologic reservoirs would be required to reduce the likelihood of these events. Injected brine and displaced native fluids could migrate from the target strata into other adjoining strata; however, there would be a very low risk of noticeable harm because the water in all of these deeper strata is highly saline. **EOR sequestration site (or sites)**: EOR-related seismic events could occur, but careful monitoring and control of the fluid pressures in geologic reservoirs greatly reduces the likelihood of these events. No other impacts to or from geologic features would occur. <u>Mineral Resources</u> **Polygen plant site**: No impacts to or from mineral resources would occur. **Linear facilities**: Minor obstructions to mineral resources access along the linear facilities could occur during construction and operational phases of the project. No impacts to or from mineral resources would occur. **Technology options**: Of the ***waste*** disposal options, deep well injection of brine could displace hydrocarbons; however, there would be a very low risk of noticeable harm because the target strata and surrounding strata have been explored for hydrocarbons and found not to have economical deposits in the vicinity of the plant site. Brine water would be injected into formations that are not known to be oil-bearing. **EOR sequestration site (or sites)**: CO_2 from the TCEP would be used by the ongoing EOR industry in the Permian Basin. This use of CO_2 is a well-developed and documented industrial process that would serve as final sequestration for the captured CO_2 from the TCEP. Operation of the polygen plant site would benefit the recovery of oil and gas in the portions of the Permian Basin that would receive CO_2 from the TCEP. Concentrations and pH of dissolved mineral matter could change	Soil and geological resources would remain unchanged, mineral development would continue, and EOR would continue throughout the Permian Basin using natural sources of CO_2.

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	and potentially hinder access as a result of injected CO_2; however, negligible impacts would occur if suitable drilling practices, well casing materials, and well casing cements are used on wells that penetrate through the CO_2 floods to reach deep petroleum resources.	
Ground Water Resources	Ground Water Quantity **Polygen plant site**: Impervious areas at the plant site would have negligible impacts to aquifer recharge. The TCEP could affect two ground water aquifers**:** one supplying brackish water for Oxy Permian and the other proposed to supply the FSH main waterline with slightly brackish water. If either of these water supply options is chosen, the TCEP would have a small effect on the total water supply in the region and would represent a small fraction (0.7 percent) of the total water demand in the region (based on the *2011 State Water Plan: Summary of Region F* [TWDB 2010c]). The ***c***ity of Midland ***WWTP's*** land application of waste water, as a means of waste disposal, may be reduced or terminated altogether if WL1 ***or WL5*** are chosen. **Linear facilities**: Minor impacts to ground water quantity could occur as a result of impervious areas associated with access roads. **Technology options:** Among the cooling tower options, wet cooling towers would have a higher water demand than dry cooling towers. Of the ***waste disposal options,*** the ***mechanical crystallizer*** and filter press option may minimize the plant's demand for water. Ground Water Quality **Polygen plant site**: No impacts during construction would occur, and risks of long-term impacts during operations are limited. Given the good geologic information and uniformity of strata, there would be a low potential for contamination of overlying aquifers by an injection well constructed and operated to RRC and TCEQ standards. **Linear facilities**: No temporary or permanent long-term impacts to ground water quality would occur from the construction or operation of the linear facility options. **Technology options:** ***One of the waste disposal options, mechanical crystallizer and filter press system, presents a small possibility that salt from the concentrated solids, which would be transported to landfills, could eventually leach into the ground water.*** Furthermore, there would be a potential for local, shallow ground water contamination at the solar evaporation pond sites should a liner leak. ***D****eep* well injection ***would have a*** remote possibility for injected brine to displace native fluids to shallow aquifers or for injected brine to migrate into shallow aquifers. **Sequestration sites**: There would be a risk for potential ground water quality impacts associated with 1) the limited potential for upward migration of CO_2, or 2) displaced native fluids through improperly abandoned deep wells or through natural fractures and faults in the rock. However, this risk would be low due to the relatively low-pressure drives associated with EOR activities, the monitoring requirements for oil and gas injection wells, and the types of geologic formations found in the Permian Basin.	Existing activities, such as oil and gas production and land development, would continue in the region with a continuation of the existing trend of impacts. EOR activities would continue on a regional scale, with CO_2 for EOR from natural geological sources rather than from industrial sources.

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Resource	Summit's Proposed Project	No Action Alternative*
Surface Water Resources	Wetlands, Waterways, Water Bodies, and Surface Water Quality **Polygen plant site**: No surface water resources are present at the proposed polygen plant site, and ***therefore,*** no impacts to surface waters would occur. **Linear facilities**: ***Five*** w***ater bodies*** are present within the proposed WL1**,** WL3***, and WL5*** corridors, with a combined area of ***4.68 ac (1.89 ha).*** Construction activities are likely to result in short-term impacts such as increased turbidity, sedimentation, streambed disturbance, and streambank vegetation removal. After construction is complete, no long-term impacts would occur ***from most of the linear facilities. If WL1 or WL5 is chosen, the resulting increase in effluent discharge from the GCA outfall 1) would not contribute significantly to anticipated future flooding events in downstream low-lying areas, and 2) would have a minor contribution to the already existing salt loading occurring in Monahans Draw.*** **Technology options:** ***One of the waste disposal options (mechanical crystallizer and filter press system) presents a remote possibility that salt from the concentrated solids, which would be transported to landfills, could eventually leach into the ground water.*** ***Flooding Impacts: The average 0.75-million-gal (2.8-million-L) increase in discharge to Monahans Draw would represent a 27 percent increase over the current average discharge from the GCA outfall and would have negligible impacts to the conditions along Monahans Draw during dry periods. Neither the average per day increase in GCA's effluent discharge, nor the infrequent (if ever) full release would represent a significant impact to flood flow volume, flood elevations, or flooding frequency in the low-elevation downstream areas of Monahans Draw, because they would contribute 0.04 and 0.3 percent of the total flood flow during a two-year natural storm event, respectively.*** ***Salt Loading Impacts: Although there would not be an increased concentration of total dissolved solids as a result of the increase in effluent being discharged from the GCA outfall, there would be a minor contribution to the existing salt loading in the draw because the increase in the quantity of effluent would allow for additional salt loading in Monahans Draw after evapotranspiration occurs.*** Floodplains ***I***mpacts to floodplains ***from linear facilities*** would ***be minor and temporary***.	Oil and gas exploration, land development, ranching, and other existing activities and uses would continue to affect surface water resources in the ROI.
Biological Resources	**Polygen plant site**: Construction and operations could result in the permanent loss of up to ***a maximum of 600 ac (243 ha)*** of the Mesquite Shrub-Grassland vegetation community and associated habitat functions. Construction equipment and activities could unintentionally disperse invasive seeds, noxious species seeds, or both. Construction activities could result in direct mortality of slow-moving terrestrial species not able to escape the path of construction equipment. Noise associated with construction could result in wildlife displacement and behavioral changes that could have minimal impacts on reproductive success. Noise associated with plant operations would have negligible effects on wildlife. **Linear facilities**: Construction of the linear facilities would result in the permanent removal of ***132–1,032 ac (53–418 ha*****)** of the Mesquite Shrub-Grassland community and associated habitat functions, based on the smallest and largest combinations of the linear facility options. An additional ***246–949 ac (100–384 ha)*** of habitat could be temporarily removed or disturbed during construction. Impacts to terrestrial species would be similar to those described above.	Oil and gas exploration, land development, ranching, and other existing activities and uses would continue to affect biological resources in the ROI.

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Resource	Summit's Proposed Project	No Action Alternative*
	Aquatic Species **Polygen plant site**: No impacts to aquatic species from construction or operation of the polygen plant site would occur. **Linear facilities**: Impacts to aquatic species from construction of WL1**,** WL3***, and WL5*** could occur as a result of the impacts described for surface waters. Any water quality degradation associated with surface waters would also have the potential to adversely impact aquatic species using those water bodies. Migratory Birds **Polygen plant site**: ***a maximum of 600 ac (243 ha)*** of suitable habitat for scrubland-nesting migratory birds and their nesting sites would be permanently removed. Introduced species (European starlings and house sparrows) commonly associated with development activities (e.g., maintained landscaping, open trash receptacles) could encroach on the plant site and displace or outcompete native songbird species. Migratory birds could experience similar indirect impacts as those described for terrestrial species**.** **Linear facilities**: Habitat loss could occur from the construction and operation of some of the linear facility options. Disturbance from construction and operation noise could displace migratory birds from areas adjacent to the linear facilities. Bird mortalities due to collisions with man-made structures associated with the TCEP (e.g., transmission lines) could occur during operation. **Technology options:** ***Among the waste*** disposal options, solar evaporation ponds could affect waterfowl by enticing them to land thereby exposing them to concentrated brine water; however, covering the ponds with netting would deter birds from landing in the brine. Bats Bat mortalities due to collision with man-made structures associated with the TCEP could occur during operation. Rare, Threatened, and Endangered Species **Polygen plant site**: Construction and operation of the polygen plant would result in the loss of ***600 ac (243 ha)*** of Texas horned lizard (*Phrynosoma cornutum*) (state listed, threatened) habitat as well as suitable habitat for 11 state-listed rare species. **Linear facilities**: Construction and operation of linear facilities would result in the loss of Texas horned lizard habitat as well as potential loss of habitat for 11 state-listed rare species. Total acres affected would vary by facility option. Impacts during operation of buried pipelines would be unlikely, and impacts due to operation of transmission lines would be primarily associated with maintenance activities and avian strikes.	
Aesthetics	Polygen Plant Site **Daylight conditions**: The impacts to KOPs 1, 3, 4, 5, and 6 from the polygen plant would be no more than minor, depending on local lighting conditions and atmospheric haze (KOP 1 is Monahans Sandhills State Park). Impacts to KOP 2 (1.6 mi [2.5 km]) east of the polygen plant site, view looking west across the topographic basin) would be different than those affecting the other KOPs. During construction, exposed soil and construction materials would create line and color contrasts. Fugitive dust could create localized haze that may reduce visibility. Impacts would be moderate, direct, and adverse because the size of the site and its proximity to I-20 would attract viewer attention and be a focus of view for westbound and eastbound motorists.	No impacts to aesthetics beyond existing trends (which have stagnated since the 1960s and 1970s when Penwell became largely abandoned) and conditions would

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	During operations, the height and size of the plant structures, cooling towers, and coal storage piles would create moderate, adverse, direct impacts to KOP 2 aesthetics because of the strong form, color, and line contrasts with the surrounding landscape. Water vapor emitted from the cooling tower would increase the degree of contrasts with the surrounding landscape by creating a form and color-contrasting plume. **Night sky conditions**: Adverse impacts to night sky conditions could occur during both construction and operations due to the installation of high-intensity lighting within and around the site. Light reflected upward would create regionally visible light pollution and skyglow. FAA-required strobe lighting (if required) on the top of the cooling tower and the higher polygen plant structures would adversely affect night sky conditions by imposing highly visible, high-intensity flashing lights that would be regionally visible. Linear Facilities **Transmission line**: Direct adverse impacts would occur because the transmission line structures would create visible, intrusive vertical form contrasts in the landscape, and would be visible from major travel routes. Impacts would be minor because 1) large, cross-country transmission lines are presently visible in the ROI; 2) constructing another transmission line would be consistent with the level of development in the ROI; and 3) the lines would be visible to the casual viewer, but because of existing power lines, they would not attract attention or become a focus of viewer attention. **Pipeline structures**: Minor adverse impacts would occur during construction because equipment would be visible in the middle ground and background during ROW vegetation and soil removal, trenching, pipeline laying, and pipeline burial. Although pipelines would be buried, negligible long-term impacts to aesthetics could occur because ROWs would be maintained. **Technology options:** ***Among the waste*** disposal options, solar evaporation ponds would noticeably add to the aesthetic impacts of the polygen plant. Given the presence of oil and gas wells in the vicinity, deep injection wells would minimally affect aesthetics.	occur.
Cultural Resources	Polygen Plant Site Direct impacts could occur to one historical site (consisting of historic-era pump jack foundations and associated debris scatter) that is not eligible for the NRHP. One historical complex or set of buildings, the Rhodes Welding Complex, is considered eligible for the NRHP. Changes to the setting would not affect NRHP eligibility. Linear Facilities There is one previously recorded archaeological site in the WL1 ROW ***and one in the WL5 ROW***. No evidence of ***either*** site was found during ground surveys. No other cultural resources have been documented in the linear facilities corridors. A full cultural resources study would be conducted after the alignments have been finalized and before construction and installation of the facilities. At this time, there appears to be a low probability of impacts to cultural resources. Native American Resources There are no known Native American resources documented in the cultural resources ROI. Impacts associated with increased access (e.g., WL3 and WL4) to areas previously not accessible by roads could occur; however, impacts associated with the project would not occur. Coordination with the Texas Historical Commission occurred in the fall of 2010 and provided concurrence with DOE's findings.	There would be no effect on known or undocumented historic or cultural resources. The ground disturbance associated with construction would not occur, and in situ resources would remain in place. No structures would be built, and therefore no NRHP-eligible properties would be affected.

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Resource	Summit's Proposed Project	No Action Alternative*
Land Use	Polygen Plant Site Existing land uses on the 600-ac (243-ha) polygen plant site would be displaced by the TCEP industrial use. Existing subsurface rights would continue to be available for exploration and production. Operation of the polygen plant would not be incompatible with surrounding land uses. Construction and operation of the TCEP would have no notable effect on airspace; however, signal lights would be required atop the stacks. Linear Facilities Existing land uses would be briefly and temporarily affected by construction. During operations, impacts to land use would be limited to the ROW corridor use and maintenance. The amount of ROW land requirements vary by facility option, and the associated impacts would last for the life of the project. The linear facilities would be consistent with the intent of the zoning districts through which they pass. WL1 would temporarily impact 2.4 ac (1.0 ha) of prime farmland, which could be put back to use after construction completion. Construction of NG1, WL1, ***or WL5*** could temporarily impact access to Penwell Knights Raceway Park located south of the polygen plant site; however, impacts could be reduced by coordination with raceway operations.	There would be no impacts to land use beyond a continuation of existing upward trends in residential, commercial, and industrial uses. The area in the polygen plant site would remain undeveloped, and no new land uses would be imposed on the landscape.
Socioeconomics	Demographics Impacts to population numbers during construction would be minor because most workers would commute from nearby communities. Impacts to population numbers during operations would be negligible because most of the 150 permanent workers would come from the local population, although some would come from outside the area. Housing Existing housing and hotel/motel supply would be adequate for anticipated employment during construction. There would be no new housing needs as a result of operations. Economics During most of the construction, GDP in the ROI would increase 0.5 percent; during the final year of construction, it would increase 0.7 percent. During operations, GDP in the ROI would increase by 0.2 percent, representing a long-term and beneficial impact for the region. Tax revenue from the TCEP would have a beneficial and long-term impact to the region as revenue would be redistributed to counties, which in turn would allocate and redistributed to local communities.	Existing socioeconomic trends, including population growth and increase in residential, commercial, and industrial development would continue as they are.
Environmental Justice	Construction Activities Construction activities would have neither disproportionately high nor adverse effects on minority or low-income communities. Short-term beneficial impacts could include an increase in employment opportunities with potentially higher wages or supplemental income through jobs created during plant construction. Operations Activities Operations activities would have neither disproportionately high nor adverse effects on minority or low-income communities.	There would be no disproportionately high or adverse effects on minority or low-income communities in the ROI.
Community Services	Law Enforcement, Emergency Response Services, and Health Services Because TCEP workers would come primarily from the existing workforce in the ROI, no impacts to the demand for local law enforcement, emergency response, or health services would occur.	There would be no impacts to community services in the ROI.

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Resource	Summit's Proposed Project	No Action Alternative*
	Schools Because TCEP workers would come primarily from the existing workforce in the ROI, no increase in school enrollment and no increased burden on the school systems would occur. Recreation Because TCEP workers would come primarily from the existing workforce in the ROI, population-related impacts to recreation (including nearby city, county, and state parks) would not occur. Likewise, no project-induced impacts to the regional recreational experiences would occur.	
Utility Systems	Polygen Plant Site Existing utilities would not be adversely impacted by construction or operation activities at the polygen plant site. Linear Facilities **Construction activities**: Existing utilities infrastructure could inadvertently be damaged or have service disrupted during construction of the linear facilities. Risk of construction-related impacts would be greatest during trenching activities. **Operations activities**: *TL1–TL6*: There is a potential for system upgrades associated with the interconnection to either the ERCOT or Southwestern Power Pool grid. *WL1* ***and WL5****:* ***WL1 or WL5*** could impact the ***city*** of Midland ***WWTP***. ***Either option*** would divert all or some portion of the water currently being used to irrigate city-owned cropland ***near*** the **c**ity of Midland ***WWTP***. Current agricultural activities would be reduced by the amount of Midland's waste water diverted under the WL1 option. *WL2 and WL3:* No impacts to water treatment utility systems would occur as a result of WL2 or WL3. *WL4:* The GCA Odessa South Facility would make use of more of its full treatment capacity with the use of WL4 ***as a backup water supply option***. ***WL6 and other backup water supply options: No impacts to water treatment utility systems would occur because backup water would only be provided if it is available.*** **Technology options:** Among the cooling tower options, the use of a wet cooling tower, instead of a dry cooling tower, for the chemical process part of the TCEP plant may require a larger water supply pipeline than currently proposed under the various waterline options. However, the wet cooling tower option would have a lower electricity demand than the dry cooling tower option. ***Out of the options for waste disposal, the mechanical crystallizer*** and filter press ***system*** may require the greatest parasitic electricity demand, depending on the choice of equipment. Alternatively, the solar evaporation ponds would require the least parasitic electricity demand.	There would be no impacts to utility systems beyond existing trends, which generally include an increase in electricity, CO_2, and water demand.
Transportation	Roadways **Construction activities**: AADT would increase in four primary locations (listed below). Increases would vary depending on the construction year. *I-20 at Penwell* ***(AR1)****:* 15,580 current AADT; would increase to 15,660, 15,685, and 15,730 projected AADT (1 percent increase) in construction years one, two, and three, respectively.	There would be no additional roadway traffic imposed on the federal or TxDOT road system, or railroad traffic on the UPRR rail

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	I-20, east of FM 866 exit ***(AR2–AR4)****:* 16,700 current AADT; would increase to 17,350, 18,840, and 19,750 projected AADT (4 percent, 13 percent, and 18 percent) in construction years one, two, and three, respectively. ***FM 1601 (AR1): 20 current AADT; would increase to 50, 125, and 170 projected AADT (150 percent, 525 percent, and 750 percent) in construction years one, two, and three, respectively.*** *FM 866* ***(AR2 and AR3)****:* 1,500 current AADT; would increase to 2,120, 3,535, and 4,400 projected AADT (41 percent, 136 percent, and 193 percent) in construction years one, two, and three, respectively. ***Existing, unnamed well access road (AR4): 90 current AADT; would increase to 710, 2,125, and 2,990 projected AADT (690 percent, 2,260 percent, and 3,220 percent) in construction years one, two, and three, respectively.*** Delays associated with merging traffic and increased percent of time spent following slow vehicles would affect LOS of each road. Construction of ***an access road (either AR2 or AR3)*** between the polygen plant site and FM 866 would result in temporary, localized traffic delays. ***Construction of an access road from the I-20 frontage road (AR4) would result in temporary, localized, and significant delays.*** Use of FM 1601 ***(AR1)*** for emergency and secondary access to the polygen plant site would require construction of **a *TxDOT-supported,*** below-rail underpass for crossing the UPRR rail line. Construction activities would result in temporary localized traffic delays**.** **Operations activities**: AADT would increase in four primary locations during operations (listed below). *I-20 at Penwell* ***(AR1)****:* 15,580 current AADT; would increase to 15,595 projected AADT (<1 percent increase). *I-20, east of FM 866 exit* ***(AR2–AR4)****:* 16,700 current AADT; would increase to 17,400 projected AADT (2 percent increase). ***FM 1601 (AR1): 20 current AADT; would increase to 35 projected AADT (75 percent increase).*** *FM 866* ***(AR2 and AR3)****:* 1,500 current AADT; would increase to 1,835 projected AADT (22 percent increase). ***Existing, unnamed well access road (AR4): 90 current AADT; would increase to 417 projected AADT (363 percent increase).*** **LOS changes**: *I-20:* No changes are forecast for LOS as a result of the TCEP. *FM 1601:* FM 1601 would remain at an acceptable LOS (A–C) during construction and operations. *FM 866:* FM 866 could degrade to LOS D or lower (unacceptable) during construction years 2 and 3 and would remain at an acceptable LOS (A–C) during operations. Impacts would mostly occur during shift changes. ***Existing, unnamed well access road: No identified LOS for either the unnamed well access road or the I-20 frontage road that it connects to.*** **Impacts from linear facilities**: Construction of the ***waterline*****,** natural gas, CO_2, and transmission lines would cause temporary and localized congestion ***at road crossings****;* impacts would be minor.	system.

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Resource	Summit's Proposed Project	No Action Alternative*
	Railways Increases in rail traffic would occur due to transportation of supplies and products in and out of the polygen plant site. **Construction activities**: Temporary and minor adverse impacts to the existing rail lines would occur as the polygen plant railroad spur (RR1) is connected to the existing system and if an overpass, underpass, or at-grade intersection is constructed for AR1. Once constructed, there would be no delays or congestion along the UPRR line due to unloading of construction materials. **Operations activities**: During operations, there would be an average of ***four*** additional ***150***-car-unit trains per week along the UPRR line, a ***3*** percent increase over the existing rail traffic. ***Under the peak urea production option, there would be an average of approximately six 150-car unit trains per week along the UPRR line, a 5 percent increase in rail traffic. Neither option*** would represent an increase that would exceed system capacity nor cause delay to existing railway operations. Because the loading and unloading of TCEP-related materials would occur on the railroad spur, no impacts to the UPRR rail line would occur.	
Materials and Waste Management	Materials Management Construction materials would vary widely, including concrete, crushed stone and aggregate, asphalt, steel, lumber, sand, insulation, wire and cables, joining and welding materials, and other materials. No impacts would occur from the management of these materials. No impacts would occur to the supply of materials as a result of the demand from the project. Operations materials would include coal, natural gas, process water, process chemicals, and commercially marketable products. No impacts from the management of these materials would occur. Plans for delivery, handling, and storage of operations materials would be in place before operation of the project. Waste Management All wastes would be disposed of, treated, or recycled at or through properly licensed facilities. Impacts to the environment as a result of waste management would be minimized. **Technology options:** ***One waste disposal option, the mechanical crystallizer and filter press system, presents a small possibility that salt from the concentrated solids, which would be transported to landfills, could eventually leach into the ground water.*** Of the cooling tower options, wet cooling tower operations would have a greater demand for biocides in the cooling water.	There would be no change to the amounts of materials and wastes currently generated, stored, or transported on or near the project area.
Human Health, Safety, and Accidents	Occupational Health and Safety **Construction activities**: The TCEP construction management would develop manuals with OSHA procedures to assure compliance with OSHA and EPA regulations and to serve as a guide for providing a safe and healthy environment for workers, contractors, visitors, and the community. Based on industry workplace hazard statistics, the TCEP construction workforce could experience 91.65 nonfatal, recordable incidents and 48.75 lost workdays. Statistics imply that fatalities are unlikely (0.19 fatality) during the three-year construction period. **Operations activities**: Polygen plant design features and management programs would be established to address hazards. Based on industry workplace hazard statistics, over the life of the project the TCEP operations workforce could experience 158 recordable incidents, 122 lost workdays, and fewer than one fatality.	There would be no impacts to human health and safety related to occupational safety, traffic fatalities, risks related to the construction of the at-grade rail crossing at FM 1601 or increases in rail traffic, or risks from accidents or intentional acts of

Table 4.1. Summary of Impacts from Summit's Proposed TCEP and the No Action Alternative

Resource	Summit's Proposed Project	No Action Alternative*
	Transportation Safety **Motor vehicles**: Based on TxDOT 2012–2014 forecasts, approximately 0.35 fatality could occur due to the movement of workers and supplies from trucks and personal vehicles during construction (TxDOT 2010a). During the 30-year operations period, approximately 0.61 fatality could occur as a result of worker travel during operations. **Railroads**: Risk of a hazardous materials spill during rail transport of TCEP products would be low. ***If selected, c***onstruction of an at-grade rail crossing ***at the polygen plant site*** would result in an increased risk to those accessing the TCEP from FM 1601**; *however, TxDOT has begun to develop plans for a below-grade rail crossing*.** Each additional train added to the UPRR system could delay emergency vehicles attempting an at-grade rail crossing by approximately three to five minutes. CO_2 and Natural Gas Pipeline Safety The project would require the installation of **a** new natural gas ***pipeline ranging from 2.8 to 3.5 mi (4.5–5.6 km) in length*** and 1.0 mi (1.6 km) of CO_2 pipeline. The probability of an accidental release associated with these lengths of new pipeline would be negligible. Exposure to Contaminated Sites The risk of discovering soils contamination during construction of the polygen plant would be low. Risk to residents or TCEP personnel during linear facility construction could be eliminated through proper due diligence, including conducting a Phase 1 environmental site assessment where needed along ROW sections prior to construction (If necessary) or Phase II environmental site assessments. If necessary, Phase III remedial actions would be performed. Risk Analyses **Polygen plant site**: Toxic hazards would be dominated by the potential releases of NH_3 gas from the pipeline leading from the NH_3 synthesis unit to the urea synthesis plant, or through NH_3 production or storage processes. Risks would be greatest to those workers closest to the NH_3 synthesis unit. The highest level of fire risk in the polygen plant would result from processes involving the production and transfer of syngas. Fire hazards at the polygen plant site would not extend beyond the plant itself. The risk of a person being fatally affected by exposure to a toxic hazard in the event of a release would vary depending on their location relative to the release. The risk per year would range from one in 1,000 to one in 100,000,000 of being killed in the project area. The risk levels posed by potential releases of flammable, toxic, and asphyxiant fluids from the proposed TCEP and associated pipelines would be considered acceptable by several international standards. **TCEP CO_2 injection-related activities**: The potential for accidents considered in the analysis were expressed on a per annum basis: likely (frequency ≥ 1×10^{-2} per year); unlikely (frequency from 1×10^{-2} per year to 1×10^{-4} per year), and extremely unlikely (frequency from 1×10^{-4} per year to 1×10^{-6} per year). The following scenarios were analyzed as part of a study for a project similar to the TCEP: • Ruptures in the pipeline transporting CO_2 and H_2S from the plant to the sequestration site (considered unlikely) • Punctures in the CO_2 pipeline (considered unlikely to likely depending on the site) • Wellhead failures at the injection well (considered extremely unlikely)	destruction at the polygen plant site or its supporting linear facilities.

Table 4.1. Summary of Impacts from Summit's Proposed TCEP and the No Action Alternative

Resource	Summit's Proposed Project	No Action Alternative*
	• Slow upward leakage of CO_2 from the injection well (considered extremely unlikely) • Slow upward leakage of CO_2 from other existing wells (considered extremely unlikely to unlikely) Site-specific risk for oil fields that purchase and use TCEP's CO_2 cannot be estimated until after the specific fields are identified. However, for those operators that currently implement CO_2 injection, the CO_2 is a valuable resource that is monitored and recycled back into the oil-bearing formation to minimize future purchases of the gas. The numbers of residents or sensitive receptors that could be exposed to CO_2 cannot be estimated until a more exact area for EOR is identified. However, it can be inferred from the study that if residential receptors are present, assumed downwind distances of concern and exposures to potentially released CO_2 would be unlikely to pose a risk because assumed exposures to CO_2 from EOR activities do not exceed either the acute (for short-term) or chronic (for long-term) toxicity criteria.	
Noise and Vibration	Construction Activities **Stationary source analysis:** *Polygen plant site:* Construction-related equipment noise would be perceptible outdoors during the busiest periods of activity at the Penwell receptor locations north of I-20; however, receptors south of I-20 would likely not hear a substantial noise level increase owing to the existing ambient noise levels from vehicular traffic on I-20. Intermittent increases in noise would result from steam venting prior to and during polygen plant startup and commissioning. Although this venting would briefly exceed acceptable FTA levels for residential areas (series of short blasts over a two-week period), FTA commercial and industrial-area construction threshold levels would bet met. *Linear facilities:* The construction of WL3, TL5, TL6, NG1***–NG3***, and AR1 would likely create temporary, adverse noise impacts to sensitive receptors because the proposed lines would be constructed close to residential receptors near these facilities. **Mobile source analysis**: Use of I-20 and FM 866 ***(AR2 and AR3)*** for construction-related activities would not result in substantial noise impacts on noise-sensitive receptors (<1 dBA); however, there would be a substantial temporary increase (8.8 dBA) in noise intensity along FM 1601 ***(AR1)*** for the two noise-sensitive receptors located north of I-20 in Penwell**.** The increase in nose along these access roads ***(AR1–AR3)*** would meet FTA noise threshold levels. ***A significant increase (15.2 dBA) along the unnamed well access road proposed for AR4 would exceed FTA noise threshold levels, but AR4 is in an industrial use area only (road leads to limestone quarry) and would be temporary.*** Operations Activities **Stationary source analysis**: Several plant components (e.g., generators, pumps, fans, vents, relief valves, coal delivery/handling system) would generate noise during operations. This operational noise would attenuate to levels at the two closest noise-sensitive receptors in Penwell that slightly exceed the EPA 55 dBA Ldn outdoor noise threshold (exceeding the threshold by 6 and 4 dBA). Long-term indoor noise levels would be in compliance with the EPA health and safety guidelines. Temporary and brief adverse noise impacts from unscheduled restarts or emergency-pressure safety-valve discharges could occur within approximately 3,000 ft (914 m) of the polygen plant.	There would be no additional noise impacts beyond the existing trends of noise from traffic and oil and gas development.

Table 4.1. Summary of Impacts from Summit's Proposed TCEP and the No Action Alternative

Resource	Summit's Proposed Project	No Action Alternative*
	Mobile Source Analysis: Use of I-20 and FM 866 for project operations and commuting would not produce substantial noise impacts on noise-sensitive receptors located along either roadway. There would be an increase in noise activity on FM 1601 (a 2.4-dBA increase) that could impact noise-sensitive receptors in Penwell. ***An increase in noise activity on the unnamed well access road proposed for AR4 (a 6.7-dBA increase) would occur, but this increase would meet FTA noise threshold levels.*** There would also be an adverse, minor increase in noise impacts to receptors located near the railroad in the ROI caused by the approximately 3 percent increase in rail traffic.	

Note: PM_{10} = PM with aerodynamic diameters equal to or less than 0.00039 in (10 micrometers);
$PM_{2.5}$ = PM with aerodynamic diameters equal to or less than (0.000098 in (2.5 micrometers).

* Summit has stated that, should the TCEP not go forward, the 600-ac (243-ha) polygen plant site would be sold. It is probable that the purchaser of the site would develop that tract for industrial, commercial, or residential uses that could impose impacts to the respective resources shown in this table. The specific impacts would be dependent upon the type of development pursued.

Table 4.2. Summary Comparison of Impacts from Summit's Proposed Waterline Options for the TCEP

Resource		WL1	WL2	WL3	WL4	WL5	WL6
Linear Footprint	Length (mi [km])	41.3 (66.4)	9.3 (15.0)	14.2 (22.8)	2.6 (4.2)	45.9 (73.9)	3.0 (4.8)
	Temporary Disturbance (ac [ha])	539.1 (218.2)	169.1 (68.4)	257.7 (104.3)	48.4 (19.6)	834.1 (337.5)	54.8 (22.2)
	Permanent Impact (ac [ha])	179.6 (72.7)	56.3 (22.8)	85.9 (34.7)	16.0 (6.5)	278.1 (112.5)	18.2 (7.4)
Air Quality and GHG Emissions		Direct impacts from vehicle exhaust and dust-generating activities would occur during construction of the process waterline(s).					
Climate		No climate impacts to or from construction or operation of the process waterline(s) would occur.					
Soils, Geology, and Mineral Resources		Soils: Temporary impacts such as soil disturbance would occur during construction of the process waterline(s). See linear footprint areas listed above.					
		Geology: No impacts to geologic resources or from events such as earthquakes, landslides, or subsidence would occur during construction or operation phases.					
		Mineral Resources: Minor obstructions to mineral resource access along the process waterline alignment(s) could occur during construction and operation phases.					
Ground Water Resources		No impacts to ground water quantity or quality would occur as a result of construction or operation of the process waterline linear facilities.					
Surface Water Resources	Temporary Impacts (ac [ha])	1.71 (0.69)	0	0.56 (0.23)	0	0.81 (0.33)	0
		Temporary, short-term impacts during construction activities would be as follows: increased turbidity, sedimentation, streambed disturbance, and streambank vegetation removal.					
	Permanent Impacts (ac [ha])	0.82 (0.33)	0	0.30 (0.12)	0	0.48 (0.19)	0
		Either traditional open-cut trenching methods or horizontal directional drilling would be used during construction to minimize impacts.	n/a	Ephemeral playa is isolated and nonjurisdictional and would not require a permit.	n/a	Either traditional open-cut trenching methods or horizontal directional drilling would be used during construction to minimize impacts.	n/a

Table 4.2. Summary Comparison of Impacts from Summit's Proposed Waterline Options for the TCEP

Resource			WL1	WL2	WL3	WL4	WL5	WL6
			Increase in effluent discharge from the GCA would 1) not contribute significantly to anticipated future flooding events in downstream low-lying areas, and 2) have a minor contribution to the existing salt loading occurring in Monahans Draw.				Increase in effluent discharge from the GCA would 1) not contribute significantly to anticipated future flooding events in downstream low-lying areas, and 2) have a minor contribution to the existing salt loading occurring in Monahans Draw.	
Biological Resources (habitat impacts [ac (ha)])	Terrestrial Species	Temporary Impacts	539.1 (218.2)	169.1 (68.4)	257.7 (104.3)	48.4 (19.6)	834.1 (337.5)	54.8 (22.2)
		Permanent Impacts	179.6 (72.7)	56.3 (22.8)	85.9 (34.7)	16.0 (6.5)	278.1 (112.5)	18.2 (7.4)
	Aquatic Species	Temporary Impacts	1.71 (0.69)	0	0.56 (0.23)	0	0.81 (0.33)	0
		Permanent Impacts	0.82 (0.33)	0	0.30 (0.12)	0	0.48 (0.19)	0
	Migratory Birds*	Temporary Impacts	539.1 (218.2)	169.1 (68.4)	257.7 (104.3)	48.4 (19.6)	834.1 (337.5)	54.8 (22.2)
		Permanent Impacts	179.6 (72.7)	56.3 (22.8)	85.9 (34.7)	16.0 (6.5)	278.1 (112.5)	18.2 (7.4)

Table 4.2. Summary Comparison of Impacts from Summit's Proposed Waterline Options for the TCEP

Resource			WL1	WL2	WL3	WL4	WL5	WL6
	State-listed Species (Texas horned lizard) *	Temporary Impacts	539.1 (218.2)	169.1 (68.4)	257.7 (104.3)	48.4 (19.6)	834.1 (337.5)	54.8 (22.2)
		Permanent Impacts	179.6 (72.7)	56.3 (22.8)	85.9 (34.7)	16.0 (6.5)	278.1 (112.5)	18.2 (7.4)
Aesthetics			Minor, short-term, temporary, adverse impacts during construction activities would occur due to visibility of construction equipment.					
Cultural Resources			No known cultural resources are within the linear facility corridor; four ineligible archaeological sites were identified.	No known cultural resources are within these linear facility corridors.			No known cultural resources are within the linear facility corridor; one ineligible archaeological site was identified.	No known cultural resources are within this linear facility corridor.
Land Use	ROW Area (ac [ha]) Requirements		179.6 (72.7)	56.3 (22.8)	85.9 (34.7)	16.0 (6.5)	278.1 (112.5)	18.2 (7.4)
	Land Use Impacts		Permits and ROW would be required in zoning districts. Temporary impact to 2.4 ac (1.0 ha) of prime farmland would occur, which could be put back to use after construction.	n/a	Temporary impacts would occur to Penwell Knights Raceway Park access during construction.	Land use zoning permit would be required.	n/a	Land use zoning permit would be required.
Socioeconomics			No socioeconomic impacts would occur as a result of the construction or operation of the process waterline(s).					
Environmental Justice			No disproportionately high and adverse impacts to low-income or minority populations would occur as a result of the construction or operation of the process waterline(s).					

Table 4.2. Summary Comparison of Impacts from Summit's Proposed Waterline Options for the TCEP

Resource		WL1	WL2	WL3	WL4	WL5	WL6
Community Services		No impacts to community services would occur as a result of the construction or operation of the process waterline(s).					
Utility Systems	Number of Known Pipeline ROW crossings	40	11	13	2	57	6
	Number of Transportation ROW crossings	9	9	2	2	14	2
	Utility Impacts	Potential impacts to city of Midland WWTP agricultural activities would occur due to diversion to GCA Odessa South Facility for TCEP.	No impacts to water treatment utility systems would occur.		There would be a potential for GCA Odessa South Facility to make better use of its capacity.	Potential impacts to city of Midland WWTP agricultural activities would occur due to diversion to GCA Odessa South Facility for TCEP.	No impacts to water treatment utility systems would occur.
Transportation		Construction of the process waterline(s) would cause minor, temporary, and localized congestion at road crossings.					
Materials and Waste Management		No impacts would occur to supply/demand of materials to construct the process waterline(s). Minor impacts to waste collection services and regional disposal capacity would occur during construction of the process waterline(s). Negligible impacts to waste collection services and regional disposal capacity would occur during operations of the process waterline(s).					
Human Health, Safety, and Accidents		Occupational Health and Safety: Risks and hazards associated with construction of process waterline(s) would be addressed through a worker protection program currently under development by Summit for the TCEP. Transportation Safety: No specific impacts would occur as a result of the construction or operation of the process waterline linear facilities. Exposure to Contaminated Sites: Risk during construction of the process waterline(s) could be eliminated through proper due diligence, including conducting a Phase 1 environmental site assessment where needed along ROW sections prior to construction (If necessary) or Phase II environmental site assessments. If necessary, Phase III remedial actions would be performed.					

Table 4.2. Summary Comparison of Impacts from Summit's Proposed Waterline Options for the TCEP

Resource	*WL1*	*WL2*	*WL3*	*WL4*	*WL5*	*WL6*
Noise and Vibration	***n/a***	***n/a***	***Temporary, adverse impacts to sensitive noise receptors would occur during construction.***	***n/a***	***n/a***	***n/a***

Impacts to migratory bird and state-listed species habitats are generalized as the same footprint of impacts to terrestrial species habitat. These areas do not represent a duplication of the area, but rather, an identical impact as the terrestrial species' area of impacts.

Table 4.3. Summary Comparison of Impacts from Summit's Proposed Transmission Line Options for the TCEP

Resource			TL1	TL2	TL3	TL4	TL5	TL6
Linear Footprint	Length (mi [km])		9.3 (14.9)	8.7 (13.9)	2.2 (3.6)	0.6 (1.0)	36.8 (59.3)	32.8 (52.9)
	Temporary Disturbance (ac [ha])		224.6 (90.9)	209.9 (84.9)	54.3 (22.0)	15.2 (6.2)	893.1 (361.4)	796.3 (322.3)
	Permanent Impact (ac [ha])		168.5 (68.2)	157.5 (63.7)	40.7 (16.5)	11.4 (4.6)	669.8 (271.1)	597.3 (241.7)
Air Quality and GHG Emissions			Direct impacts from vehicle exhaust and dust-generating activities would occur during construction of the transmission line.					
Climate			No climate impacts to or from construction or operation of transmission line would occur.					
Soils, Geology, and Mineral Resources			Soils: Temporary impacts such as soil disturbance would occur during construction of the transmission line. See linear footprint areas listed above.					
			Geology: No impacts to geologic resources or from events such as earthquakes, landslides, or subsidence would occur during construction or operation phases.					
			Mineral Resources: No obstructions to mineral resource access would occur during construction and operation phases along the transmission line.					
Ground Water Resources			No impacts to ground water quantity or quality would occur as a result of construction or operation of the transmission line.					
Surface Water Resources			No impacts to surface waters would occur from the construction or operation of the transmission line.					
Biological Resources (habitat impacts [ac (ha)])	Terrestrial Species	Temporary Impacts	224.6 (90.9)	209.9 (84.9)	54.3 (22.0)	15.2 (6.2)	893.1 (361.4)	796.3 (322.3)
		Permanent Impacts	168.5 (68.2)	157.5 (63.7)	40.7 (16.5)	11.4 (4.6)	669.8 (271.1)	597.3 (241.7)
	Aquatic Species	Temporary Impacts	0	0	0	0	0	0
		Permanent Impacts	0	0	0	0	0	0
	Migratory Birds*	Temporary Impacts	224.6 (90.9)	209.9 (84.9)	54.3 (22.0)	15.2 (6.2)	893.1 (361.4)	796.3 (322.3)

Table 4.3. Summary Comparison of Impacts from Summit's Proposed Transmission Line Options for the TCEP

Resource			TL1	TL2	TL3	TL4	TL5	TL6
		Permanent Impacts	168.5 (68.2)	157.5 (63.7)	40.7 (16.5)	11.4 (4.6)	669.8 (271.1)	597.3 (241.7)
	State-listed Species (Texas horned lizard) *	Temporary Impacts	224.6 (90.9)	209.9 (84.9)	54.3 (22.0)	15.2 (6.2)	893.1 (361.4)	796.3 (322.3)
		Permanent Impacts	168.5 (68.2)	157.5 (63.7)	40.7 (16.5)	11.4 (4.6)	669.8 (271.1)	597.3 (241.7)
Aesthetics			Minor, permanent adverse impacts from the construction and operation of the transmission line would occur due to new vertical form contrasts on the landscape.					
Cultural Resources			No known cultural resources are within these linear facility corridors.					
Land Use	ROW Area (ac [ha]) Requirements		168.5 (68.2)	157.5 (63.7)	40.7 (16.5)	11.4 (4.6)	669.8 (271.1)	597.3 (241.7)
Socioeconomics			No socioeconomic impacts would occur as a result of construction or operation of the transmission line.					
Environmental Justice			No disproportionately high and adverse impacts to low-income or minority populations would occur as a result of the construction or operation of the transmission line.					
Community Services			No impacts to community services would occur as a result of the construction or operation of the transmission line.					
Utility Systems	Number of Known Pipeline ROW Crossings		15	13	4	2	44	41
	Number of Transportation ROW Crossings		3	3	0	0	12	14
	Utility Impacts		There would be a potential for system upgrades associated with interconnections.			Oncor identified upgrades: constructing a switching station, rebuilding existing 138-kV transmission line, and various other improvements	There would be a potential for system upgrades associated with interconnections.	

Table 4.3. Summary Comparison of Impacts from Summit's Proposed Transmission Line Options for the TCEP

Resource	*TL1*	*TL2*	*TL3*	*TL4*	*TL5*	*TL6*
Transportation	*Construction of the transmission line would cause minor, temporary, and localized congestion where it crosses roads.*					
Materials and Waste Management	*No impacts would occur to supply/demand of materials to construct the transmission line.* *Minor impacts would occur to waste collection services and regional disposal capacity during construction of the transmission line.* *Negligible impacts would occur to waste collection services and regional disposal capacity during operations of the transmission line.*					
Human Health, Safety, and Accidents	*Occupational Health and Safety: Risks and hazards associated with construction of the transmission line would be addressed through a worker protection program currently under development by Summit for the TCEP.* *Transportation Safety: No specific impacts would occur as a result of the construction or operation of the transmission linear facilities.* *Exposure to Contaminated Sites: Risk during linear facility construction could be eliminated through proper due diligence, including conducting a Phase 1 environmental site assessment where needed along ROW sections prior to construction (If necessary) or Phase II environmental site assessments. If necessary, Phase III remedial actions would be performed.* *Electromagnetic Fields: Any exposure-related health risk to an individual from electromagnetic field of transmission line would likely be small.*					
Noise and Vibration	*n/a*	*n/a*	*n/a*	*n/a*	*Temporary, adverse impacts would occur to sensitive noise receptors.*	

**Impacts to migratory bird and state-listed species habitats are generalized as the same footprint of impacts to terrestrial species habitat. These areas do not represent a duplication of the area, but rather, an identical impact as the terrestrial species' area of impacts.*

Table 4.4. Summary Comparison of Impacts from Summit's Proposed Access Road Options for the TCEP

Resource			*AR1*	*AR2*	*AR3*	*AR4*
Linear Footprint	*Length (mi [km])*		*0.3 (0.5)*	*3.8 (6.1)*	*5.0 (8.1)*	*2.8 (4.5)*
	Temporary Disturbance (ac [ha])		*5.5 (2.2)*	*69.3 (28.0)*	*91.2 (36.9)*	*50.1 (20.3)*
	Permanent Impact (ac [ha])		*1.8 (0.7)*	*23.1 (9.3)*	*30.4 (12.3)*	*16.7 (6.7)*
Air Quality and GHG Emissions			*Direct impacts from vehicle exhaust and dust-generating activities would occur during construction of the access roads.*			
Climate			*No climate impacts to or from construction or operation of the access roads would occur.*			
Soils, Geology, and Mineral Resources			*Soils: Temporary impacts such as soil disturbance would occur during construction of the access roads. See linear footprint areas listed above.*			
			Geology: No impacts to geologic resources or from events such as earthquakes, landslides, or subsidence would occur during construction or operation phases.			
			Mineral Resources: Minor obstructions to mineral resource access along access roads could occur during construction and operation phases.			
Ground Water Resources			*Minor, permanent impacts would occur to ground water quantity from development of new impervious surface in aquifer recharge area. See footprint areas listed above.* *No impacts to ground water quality would occur as a result of access road development.*			
Surface Water Resources			*No impacts to surface waters would occur from the construction or operation of the access roads.*			
Biological Resources (habitat impacts [ac (ha)])	*Terrestrial Species*	*Temporary Impacts*	*5.5 (2.2)*	*69.3 (28.0)*	*91.2 (36.9)*	*50.1 (20.3)*
		Permanent Impacts	*1.8 (0.7)*	*23.1 (9.3)*	*30.4 (12.3)*	*16.7 (6.7)*
	Aquatic Species	*Temporary Impacts*	*0*	*0*	*0*	*0*
		Permanent Impacts	*0*	*0*	*0*	*0*
	*Migratory Birds**	*Temporary Impacts*	*5.5 (2.2)*	*69.3 (28.0)*	*91.2 (36.9)*	*50.1 (20.3)*
		Permanent Impacts	*1.8 (0.7)*	*23.1 (9.3)*	*30.4 (12.3)*	*16.7 (6.7)*

Table 4.4. Summary Comparison of Impacts from Summit's Proposed Access Road Options for the TCEP

Resource			AR1	AR2	AR3	AR4
	State-listed Species (Texas horned lizard) *	Temporary Impacts	5.5 (2.2)	69.3 (28.0)	91.2 (36.9)	50.1 (20.3)
		Permanent Impacts	1.8 (0.7)	23.1 (9.3)	30.4 (12.3)	16.7 (6.7)
Aesthetics			Minor, short-term, temporary, adverse impacts during construction activities would occur due to visibility of construction equipment.			
Cultural Resources			No known cultural resources are within these linear facility corridors.			
Land Use	ROW Area (ac [ha]) Requirements		1.8 (0.7)	23.1 (9.3)	30.4 (12.3)	16.7 (6.7)
Socioeconomics			No socioeconomic impacts would occur as a result of the construction or operation of the access roads.			
Environmental Justice			No disproportionately high and adverse impacts to low-income or minority populations would occur as a result of the construction or operation of the access roads.			
Community Services			No impacts to community services would occur as a result of the construction or operation of the access roads.			
Utility Systems	Number of Known Pipeline ROW Crossings		3	7	14	8
	Number of Transportation ROW Crossings		0	0	0	0
Transportation	Current AADT		I-20 at Penwell = 15,580 FM 1601 = 20	I-20, east of FM 866 = 16,700 FM 866 = 1,500	I-20, east of FM 866 = 16,700 FM 866 = 1,500	I-20, east of FM 866 = 16,700 Existing, unnamed well access road = 90
	AADT Percentage Increase During Peak Construction (LOS)		I-20 at Penwell = 1 (acceptable) FM 1601 = 750 (acceptable)	I-20, east of FM 866 = 18 (acceptable) FM 866 = 193 (unacceptable)	I-20, east of FM 866 = 18 (acceptable) FM 866 = 193 (unacceptable)	I-20, east of FM 866 = 18 (acceptable) Existing, unnamed well access road = 3,220 (not available)
	AADT Percentage Increase During Operation (LOS)		I-20 at Penwell = <1 (acceptable) FM 1601 = 75 (acceptable)	I-20, east of FM 866 = 2 (acceptable) FM 866 = 22 (acceptable)	I-20, east of FM 866 = 2 (acceptable) FM 866 = 22 (acceptable)	I-20, east of FM 866 = 2 (acceptable) Existing, unnamed well access road = 363 (not available)

Table 4.4. Summary Comparison of Impacts from Summit's Proposed Access Road Options for the TCEP

Resource		*AR1*	*AR2*	*AR3*	*AR4*
Materials and Waste Management		*No impacts would occur to supply/demand of materials to construct the access roads.* *Minor impacts would occur to waste collection services and regional disposal capacity during construction of the access roads.* *Negligible impacts would occur to waste collection services and regional disposal capacity during operations of the access roads.*			
Human Health, Safety, and Accidents		*Occupational Health and Safety: Risks and hazards associated with construction of access roads would be addressed through a worker protection program currently under development by Summit for the TCEP.* *Transportation Safety: Fewer than 1 fatality would be expected to occur due to the travel of workers during TCEP operations.* *Exposure to Contaminated Sites: Risk during linear facility construction could be eliminated through proper due diligence, including conducting a Phase 1 environmental site assessment where needed along ROW sections prior to construction (If necessary) or Phase II environmental site assessments. If necessary, Phase III remedial actions would be performed.*			
Noise and Vibration	*Projected Change in Noise Levels During Peak Construction (dBA)*	*I-20 at Penwell = 0.2* *FM 1601 = 8.8*	*I-20, east of FM 866 = 0.2* *FM 866 = 1.6*	*I-20, east of FM 866 = 0.2* *FM 866 = 1.6*	*I-20, east of FM 866 = 0.2* *Existing, unnamed well access road = 15.2*
	Projected Change in Noise Levels During Operation (dBA)	*I-20 at Penwell = 0.1* *FM 1601 = 2.4*	*I-20, east of FM 866 = 0.1* *FM 866 = 0.6*	*I-20, east of FM 866 = 0.1* *FM 866 = 0.6*	*I-20, east of FM 866 = 0.1* *Existing, unnamed well access road = 6.7*

Impacts to migratory bird and state-listed species habitats are generalized as the same footprint of impacts to terrestrial species habitat. These areas do not represent a duplication of the area, but rather, an identical impact as the terrestrial species area' of impacts.

Table 4.5. Summary Comparison of Impacts from Summit's Proposed Natural Gas Pipeline Options for the TCEP

Resources			NG1	NG2	NG3
Linear Footprint	Length (mi [km])		2.8 (4.6)	3.5 (5.6)	2.8 (4.5)
	Temporary Disturbance (ac [ha])		51.7 (20.9)	63.6 (25.7)	49.9 (20.2)
	Permanent Impact (ac [ha])		17.2 (7.0)	21.2 (8.6)	16.6 (6.7)
Air Quality and GHG Emissions			Direct impacts from vehicle exhaust and dust-generating activities would occur during construction of the natural gas pipeline.		
Climate			No climate impacts to or from construction or operation of the natural gas pipeline would occur.		
Soils, Geology, and Mineral Resources			Soils: Temporary impacts such as soil disturbance would occur during construction of the natural gas pipeline. See linear footprint areas listed above.		
			Geology: No impacts to geologic resources or from events such as earthquakes, landslides, or subsidence would occur during construction or operation phases.		
			Mineral Resources: Minor obstructions to mineral resource access along the natural gas pipeline alignment could occur during construction and operation phases.		
Ground Water Resources			No impacts to ground water quantity or quality would occur as a result of construction or operation of the natural gas pipeline linear facility.		
Surface Water Resources			No impacts to surface waters would occur from the construction or operation of the natural gas pipeline.		
Biological Resources (habitat impacts [ac (ha)])	Terrestrial Species	Temporary Impacts	51.7 (20.9)	63.6 (25.7)	49.9 (20.2)
		Permanent Impacts	17.2 (7.0)	21.2 (8.6)	16.6 (6.7)
	Aquatic Species	Temporary Impacts	0	0	0
		Permanent Impacts	0	0	0
	Migratory Birds*	Temporary Impacts	51.7 (20.9)	63.6 (25.7)	49.9 (20.2)
		Permanent Impacts	17.2 (7.0)	21.2 (8.6)	16.6 (6.7)

Table 4.5. Summary Comparison of Impacts from Summit's Proposed Natural Gas Pipeline Options for the TCEP

Resources			*NG1*	*NG2*	*NG3*
	*State-listed Species (Texas horned lizard) **	*Temporary Impacts*	*51.7 (20.9)*	*63.6 (25.7)*	*49.9 (20.2)*
		Permanent Impacts	*17.2 (7.0)*	*21.2 (8.6)*	*16.6 (6.7)*
Aesthetics			*Minor, short-term, temporary, adverse impacts during construction activities would occur due to visibility of construction equipment.*		
Cultural Resources			*No known cultural resources are within these linear facility corridors.*		
Land Use	*ROW Area (ac [ha]) Requirements*		*17.2 (7.0)*	*21.2 (8.6)*	*16.6 (6.7)*
	Land Use Impacts		*Temporary impacts would occur to Penwell Knights Raceway Park access during construction.*	*n/a*	*n/a*
Socioeconomics			*No socioeconomic impacts would occur as a result of the construction or operation of the natural gas pipeline.*		
Environmental Justice			*No disproportionately high and adverse impacts to low-income or minority populations would occur as a result of the construction or operation of the natural gas pipeline.*		
Community Services			*No impacts to community services would occur as a result of the construction or operation of the natural gas pipeline.*		
Utility Systems	*Number of Known Pipeline ROW Crossings*		*5*	*6*	*7*
	Number of Transportation ROW Crossings		*1*	*1*	*1*
Transportation			*Construction of the natural gas pipeline would cause minor, temporary, and localized congestion at road crossings.*		
Materials and Waste Management			*No impacts would occur to supply/demand of materials to construct the natural gas pipeline.* *Minor impacts would occur to waste collection services and regional disposal capacity during construction of the natural gas pipeline.* *Negligible impacts would occur to waste collection services and regional disposal capacity during operations of the natural gas pipeline.*		

Table 4.5. Summary Comparison of Impacts from Summit's Proposed Natural Gas Pipeline Options for the TCEP

Resources	*NG1*	*NG2*	*NG3*
Human Health, Safety, and Accidents	***Occupational Health and Safety**: Risks and hazards associated with construction of natural gas pipeline would be addressed through a worker protection program currently under development by Summit for the TCEP.* ***Transportation Safety**: No specific impacts would occur as a result of the construction or operation of the natural gas pipeline linear facility.* ***Pipeline Safety**: The probability of an accidental release associated with the new length of natural gas pipeline would be negligible.* ***Exposure to Contaminated Sites**: Risk during linear facility construction could be eliminated through proper due diligence, including conducting a Phase 1 environmental site assessment where needed along ROW sections prior to construction (If necessary) or Phase II environmental site assessments. If necessary, Phase III remedial actions would be performed.*		
Noise and Vibration	*Temporary, adverse impacts to sensitive noise receptors would occur during construction.*	*n/a*	*n/a*

Impacts to migratory bird and state-listed species habitats are generalized as the same footprint of impacts to terrestrial species habitat. These areas do not represent a duplication of the area, but rather, an identical impact as the terrestrial species area' of impacts.