TYPES OF SENSORS

PHOTO EYE
- Photo Eye sensor is an infrared beam installed ~8 inches above grade.
- Beam is directed to reflector and returns to the same device to complete the loop.
- Photo eye detects any object that breaks the path of the beam.
- Can be adversely affected by condensation on lens and/or misalignment if hit.
- SO currently has photo eyes aligned across the closed positions of the entry gate.
- Ditto for exit gate.

MAGNETOMETER
- A sensor buried 6-12 inches deep under pavement or in the shoulder.
- Only detects moving steel objects. Range up to 12 ft. Sensitivity greatest nearest the sensor.
- SO currently has a magnetometer installed in the exit lane to open the exit gate ("free exit")

INDUCTION LOOP / WIRE LOOP
- Loops of wire buried 1½ inch deep in pavement in a saw cut, then sealed with caulk.
- Detects presence of a conductive metallic object (e.g., steel, aluminum, copper) inside loop.
- Vertical sensitivity (height above top of pavement) is a function of loop size.
- SO currently has no wire loops installed.
- ***If installed, any wire loop would most likely need to be replaced after a repaving project.***

<u>CONTROLLER FUNCTIONS</u>

OPEN/CLOSE CYCLES
- Entry gate open command is currently activated only via entering 4-digit code at keypad.
- Upon successful code entry, controller opens gate (10 sec to fully open) and starts the timer-to-close (20 sec).
- If no interrupt detected (see below), when timer-to-close expires, controller closes gate (10 sec to fully close).
- If interrupt is detected while gate is closing, gate motion is reversed and gate returns to open position and timer-to-close is reinitiated.
- If interrupt is detected during timer-to-close, timer-to-close count is paused. Timer-to- close is reinitiated when interrupt is cleared.
- Gate will also reverse if excessive force is encountered on gate **in a direction opposing gate movement**.   Excessive force will reverse a closing or opening gate.
- Exit gate controller functions the same except that free exit sensor (see below) initiates gate opening instead of keypad.

EXIT LOOP (aka FREE EXIT)
- When detected, sends signal to controller to open exit gate with no need for code.
- This functionality currently provided by a magnetometer in the exit lane marked with orange dot.
- A wire loop could be used in place of the magnetometer.

INTERRUPT (aka REVERSING LOOP)
- Existing photo eyes provide this function **for objects detected between the gate posts**.
- When detected, controller holds open gate at open limit and pauses timer-to-close until detection is cleared.
- When detected, controller will also stop and reverse a closing gate to open limit and pause timer-to-close at open limit.
- ***A reversing loop located outside of the entry gate swing path will encourage coat-tailing.***

SHADOW LOOP
- Wire loop positioned under the swing path of the gate.
- When detected, holds open gate at open limit.
- Could be used in addition to existing photo eyes to protect a larger area, however, ***shadow loop detection is only active when the gate is at the open limit, not when gate is moving.***

ARMING or PERMISSIVE LOOP
- A special purpose loop to be used in conjunction with a remote opener.
- Located near keypad to detect if a vehicle is within sight of entry gate.
- If vehicle is not close to keypad, signal from a remote opening device is ignored.

Adding shadow loops – one each in the entry and exit lanes – would cost ~$3,000.

<u>ADDING CAPABILITY TO USE REMOTE GATE OPENERS</u>

<u>ISSUES INTRODUCED WITH ANY OF THE OPTIONS DESCRIBED BELOW</u>

- Management of unintended consequences associated with use of remote when activated by vehicle not at keypad position in full view of entry gate. May be possible to limit range of remotes with antenna tuning but still risk of vehicle in exit lane or vehicle farther back in the queue sending signal to open the entry gate. Use of an arming loop at keypad would not entirely eliminate this problem (cost of arming loop not included in prices below).
- 200 remote devices to be supplied with initial purchase (2 for each lot). All options introduce a significant administrative burden to track ownership of remotes, to add new/replacement remote devices beyond initial 200, and to delete remote access for lost or stolen devices.

<u>Option A1</u>: 1-BUTTON REMOTES; ALL REMOTES WITH COMMON CODE ($7,000-8,000)

- Makes use of existing controller hardware.
- No capability to turn off access for a single remote. To change common code, would need to recall all remotes and reprogram them.

<u>Option A2</u>: 1-BUTTON REMOTES; EACH REMOTE WITH UNIQUE CODE ($8,000-9,000)

- Requires new receiver/antenna but will recognize up to 450 unique remote devices.
- Provides capability to turn off access for a single remote without need to reprogram all other remotes.

<u>Option B</u>: RFID STICKER ON VEHICLE ($12,000-13,000)

- RFID = Radio Frequency Identification (similar to EZPass as used for toll collection).
- Requires a new receiver/antenna but will recognize up to 3000 stickers
- Price includes laptop-based software to manage sticker ownership (but not the laptop).
- Offers best means to restrict reception of an "open" signal from only the vehicle at the keypad position (but not foolproof).
- RFID sticker/tag is attached to vehicle windshield; not transferable from one vehicle to another; not as portable as a 1-button remote.
- RFID sticker/tag may need to be replaced after 3-5 years (ongoing expense and administrative burden).