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Meeting Renewable Energy Needs

Converting Worthless Property to Worthwhile

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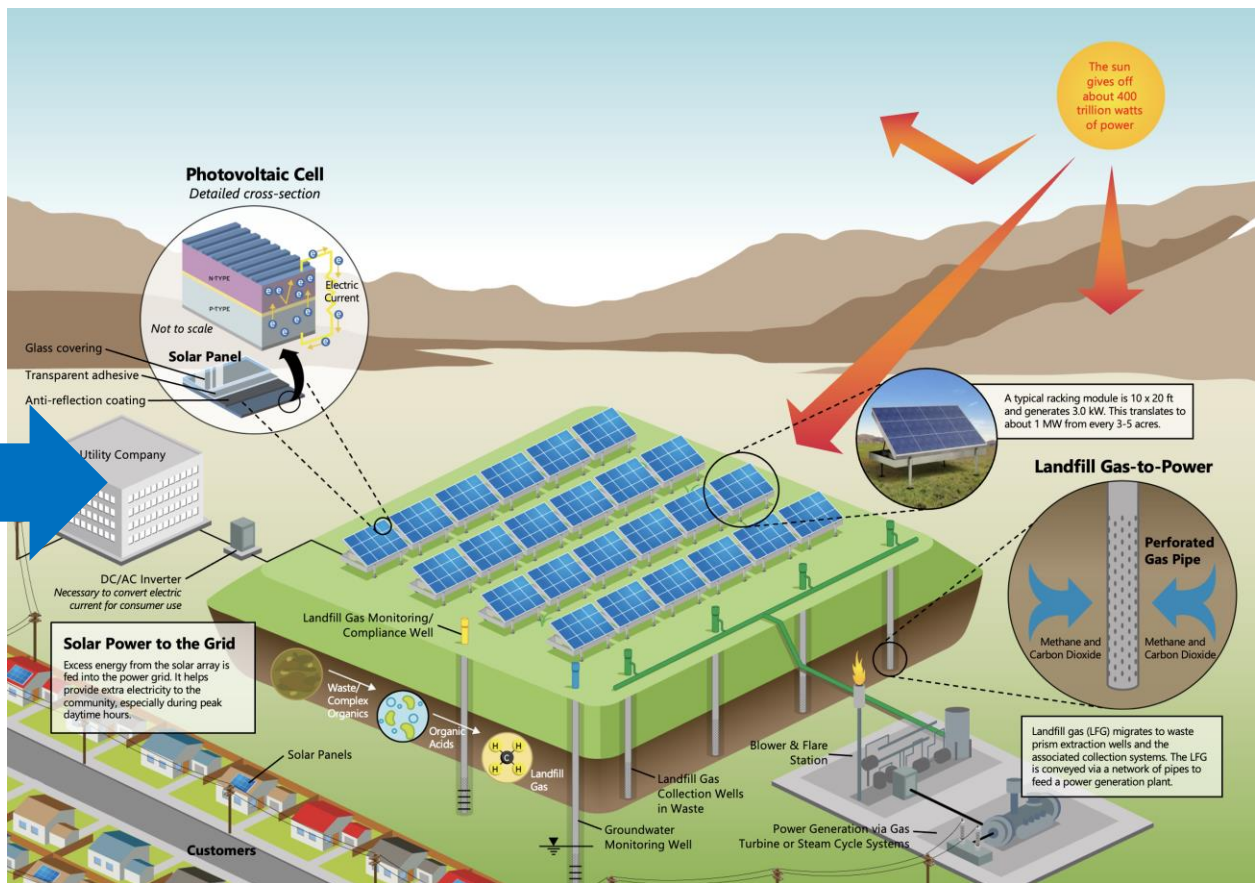
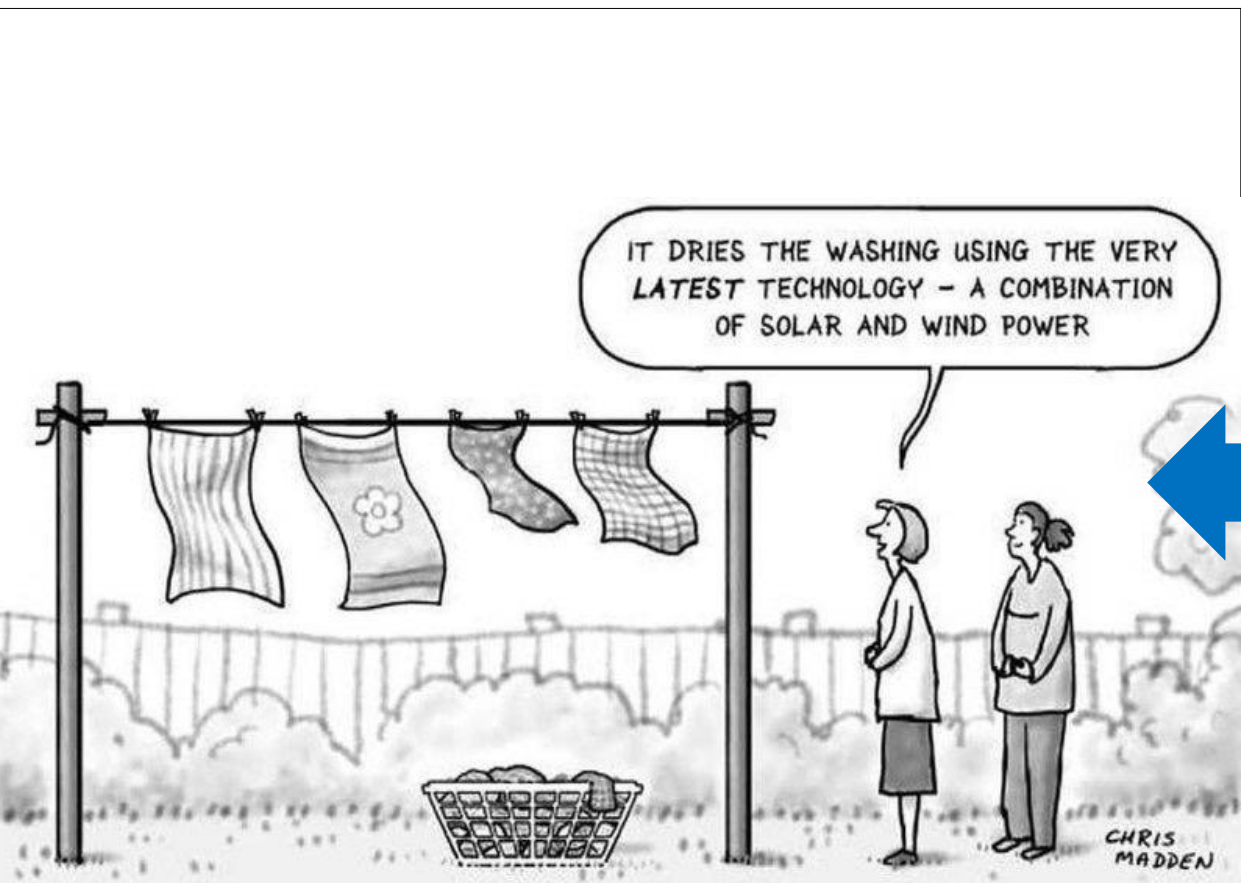
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Thinking Outside the Box to Generate Renewable Energy



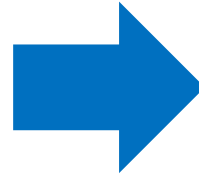
Expanding Energy Options to Include Renewable Energy

The need for renewable energy is becoming critical for the U.S. and the world.

- A transformation is shifting from the reliance on fossil fuels to the adoption of cleaner forms of energy.
- The past year we have seen a rising number of countries pledging to reach net zero emissions in the coming decades.

Meeting these targets will reshape the power sector in the coming decades.

Opportunity to Convert Brownfields to Meet the Power Targets



Brownfield

An abandoned, idled, or underutilized property where expansion or redevelopment is complicated by real or perceived environmental contamination.

Brightfield

A brownfield site that is redeveloped through the incorporation of 1 or more solar energy technologies, including photovoltaic arrays.

Converting Impacted Land to Renewable Assets – Opportunities & Challenges

- All Brownfield sites will not meet renewable development criteria, but their former uses usually have much of the needed infrastructure and suitably located.
 - *Electric lines, transformers, capacitors, etc.*
 - *Roadways*
 - *Drainage structures*
- However, environmentally impacted sites come with regulatory, environmental, and construction challenges.
 - *Environmental Orders*
 - *Institutional Controls*
 - *Engineered Controls*



Benefits to Developing Renewable Energy on Impacted Properties

1. Income from underutilized properties
2. Reduce the need to build on land with higher use
3. Utilizing property that was otherwise undevelopable
4. Addressing past Superfund, and RCRA type sites by repurposing hazardous sites to the benefit of the community and region
5. Supporting a clean energy economy with local jobs
6. Locating clean energy to energy-intensive facilities, and data centers such as Crypto Industry
 - Bitcoin, the world's largest cryptocurrency, now consumes more electricity annually than Argentina, a country with a population of 45 million
7. Increased tax revenue to local governments
8. Relieving grid demand during peak energy needs
9. Opportunities for public-private partnerships, active investment community
10. No capital needed from property owner

Introducing BREG/PVN Energy <> Developer/Integrator

Who is BREG/PVN?

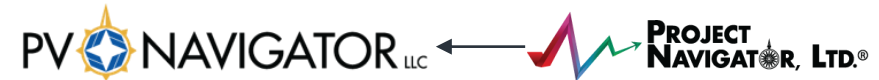


BREG + PVNAVIGATOR vision, people and means to bring about solar development:

- Focus on distressed property
- Knowledge of the renewable energy procedures
- Newest technical PV/SOLAR panel technology
- We have the ability to finance the project



BREG is a Renewable Energy Project Developer, Builder and Operator with worldwide projects in wind, solar and waste-to-energy. BREG performs the necessary technical site assessment for solar sites as sourced by PVN. BREG procures the financing for the renewable project.



PVN has a track record in sourcing sites for PV/SOLAR-projects. We manage environmental permitting and land restrictions specific to solar siting. We work together with landowners and other stakeholders in realizing interconnect feasibility, utility permitting and power offtake so that the solar plant can be constructed.

BREG/PVN In Summary



Our Dedication and Commitment



Maximize the transformation towards Green Energy



Commitment to off takers as a reliable Renewable Energy Producer



Commitment to the local community through corporate and social responsibility programs/projects



Assessment/Interconnect Study/Design/Development/Operations –
At no cost to property owner

Team Pursuing Successful Solar Projects

BREG

- Business Administrators
- Project Managers
- Engineers
- Lawyers



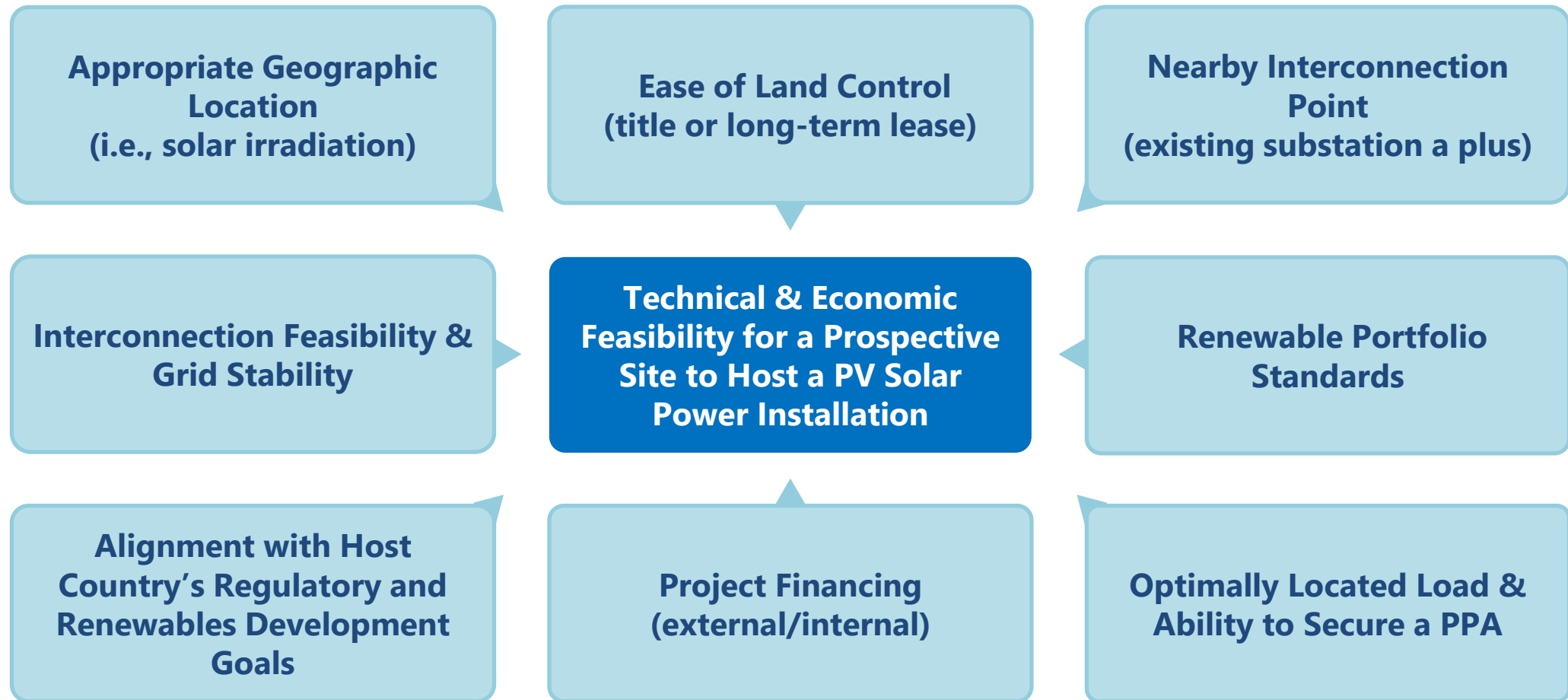
PVN

- Project Managers
- Engineers
- GIS Professionals
- Geologists
- Scientists


The “team” also needs:

- Ingenuity – resourcefulness to connect project puzzle pieces
- Innovation – willingness to approach project challenges with an open mind to new methods, and
- Business acumen – insightfulness to work through project challenges, including delays with objective
- Willingness to work within a Team setting

Key Criteria for Renewable Power Development



Examples: Solar Development on Brownfield Sites



Case Study: PVN Has Planned, Permitted and Installed a 3MW Solar Power Facility at the Milliken Landfill, Ontario, California

Key Facts

- Racking of 9,500 X 335W solar panels
- Ballasted ground mount; No cap penetration
- 6 X 500 kW inverters
- 6 X 500 kVA step-up transformers
- 12.5kV AC switchgear for metering and interconnect to SCE
- 50-60 construction personnel at peak times
- Forecasted operation by December 2016
- System owned and operated by PVNavigator

Milliken Landfill with Solar Array



Mine Sites

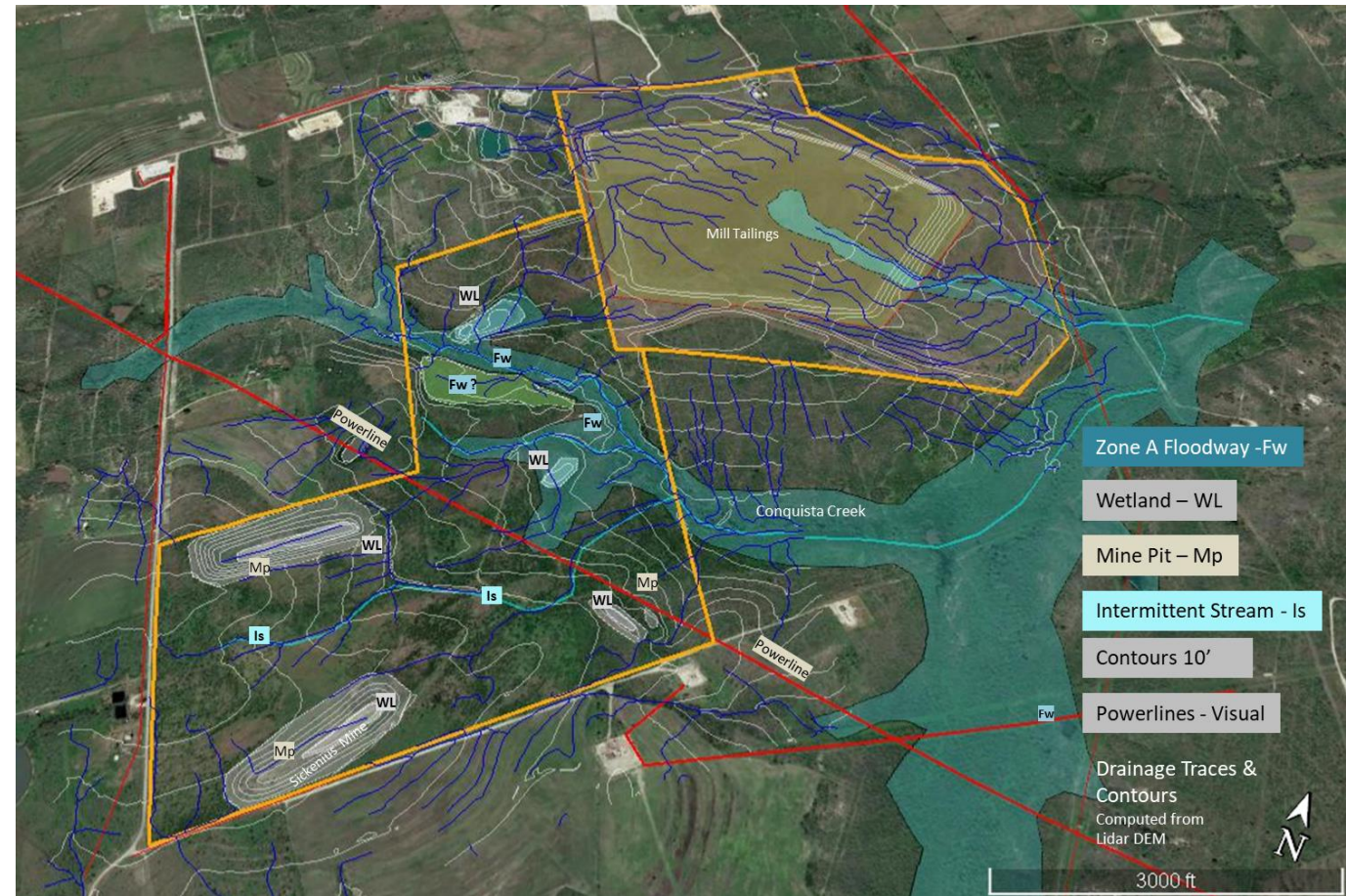
- Uranium, copper, coal, phosphate, and other mineral deposits are found throughout the US.
- Mines date from the turn of the century to the present. Large areas of tailings and waste rock may be present.
- After closure and reclamation, most contain institutional controls that limit development of the property.
- Solar development is a good use of mined land since it is typically close to utilities and power grid.



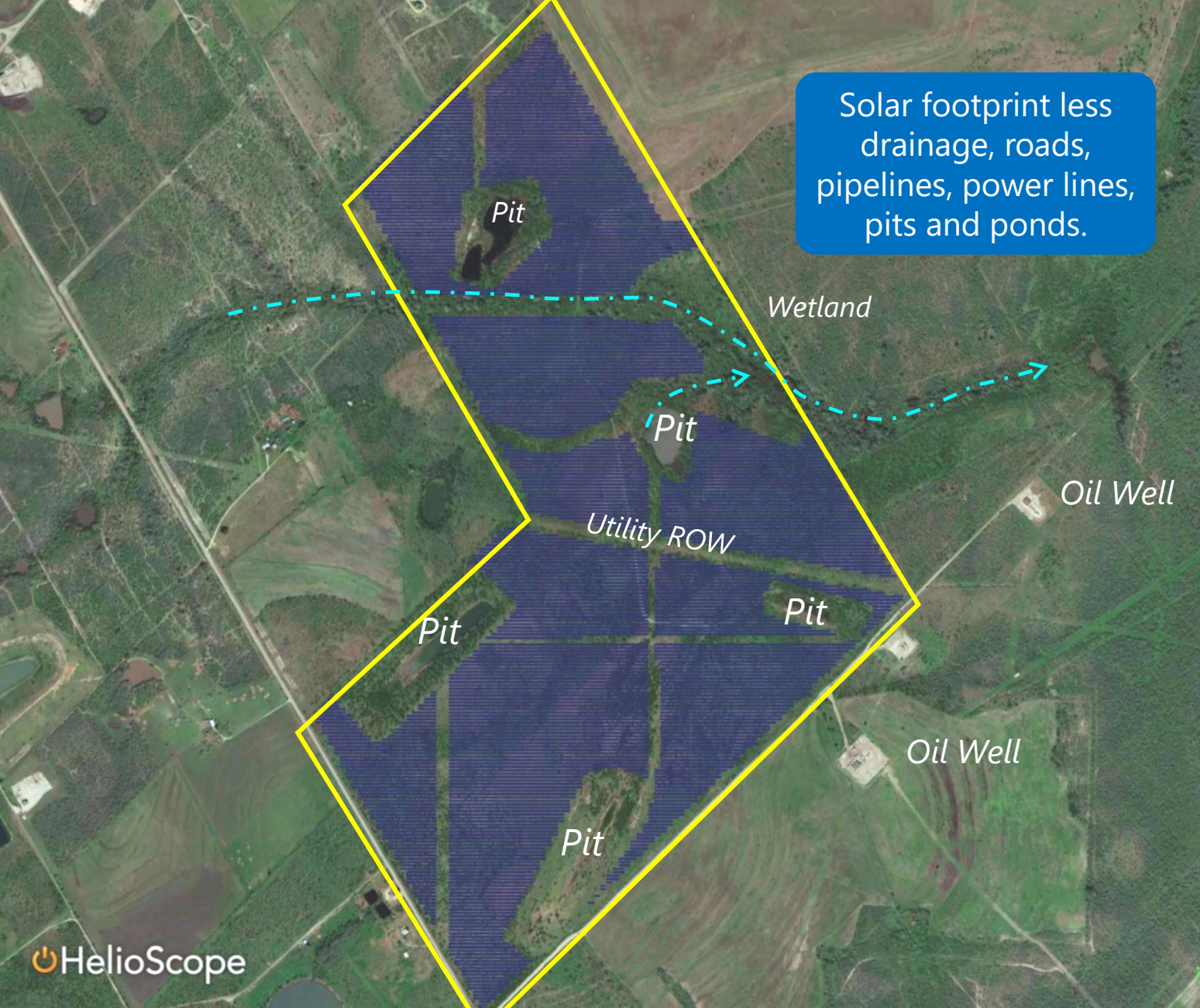
Former Uranium Surface Mines: Re-Use Limited Due to Use Restrictions, Radioactivity, Mineral Rights, etc.



Disturbed areas from mine development



Terrain, drainage, wetlands, utilities in development area

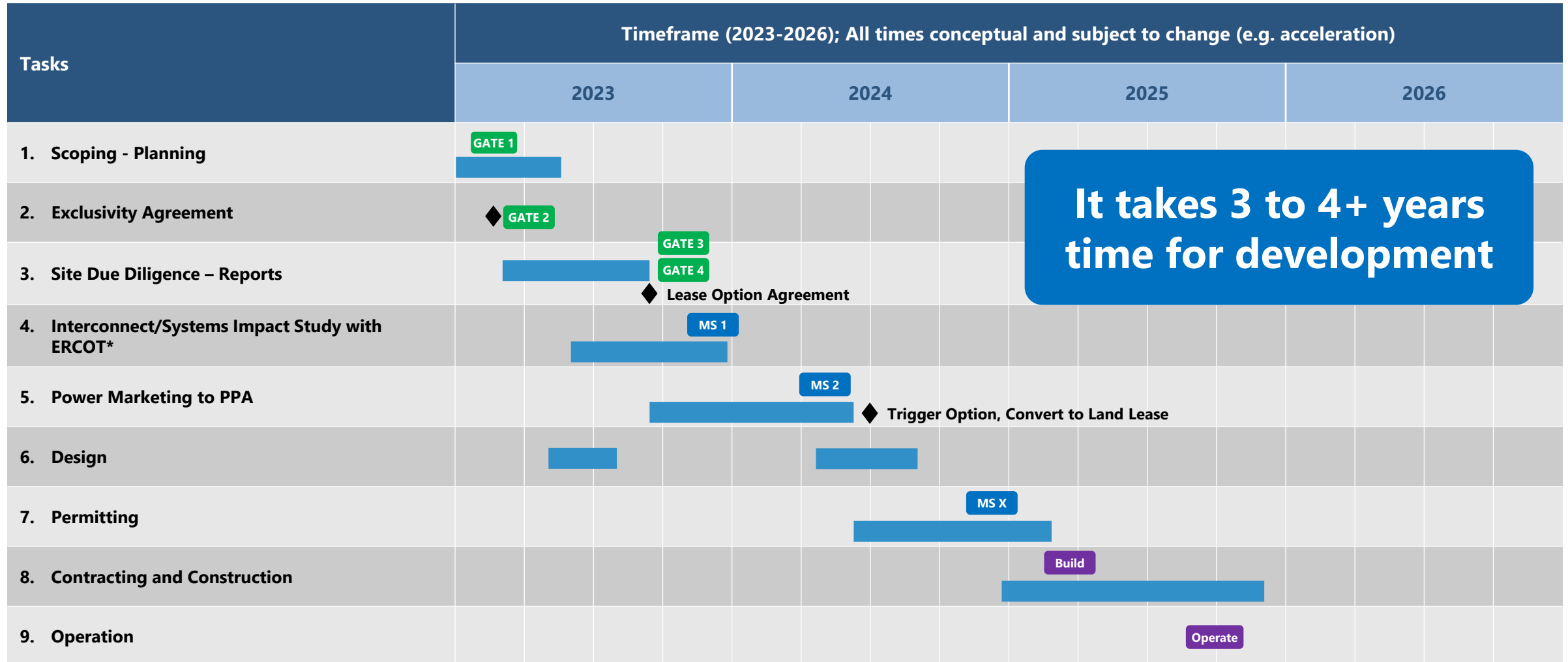


Conceptual Solar Development Plan

- Canadian Solar Panel 590 Wp
- 150 Kw SMA Sunny High Power Peak3 inverter considered for the design
- Water bodies and high slope areas are not considered for the design

Disclaimer: Preliminary design, to be optimized and finalized according to additional information

Conceptual Development Project Schedule



Smelter Sites

- Former metal smelters were operational between 1890s to 1970s.
- Primary contamination is heavy metals: copper, lead, cadmium, arsenic & zinc.
- Waste consolidated in landfills, capped and covered.
- Reclaimed smelters are good candidates for solar.

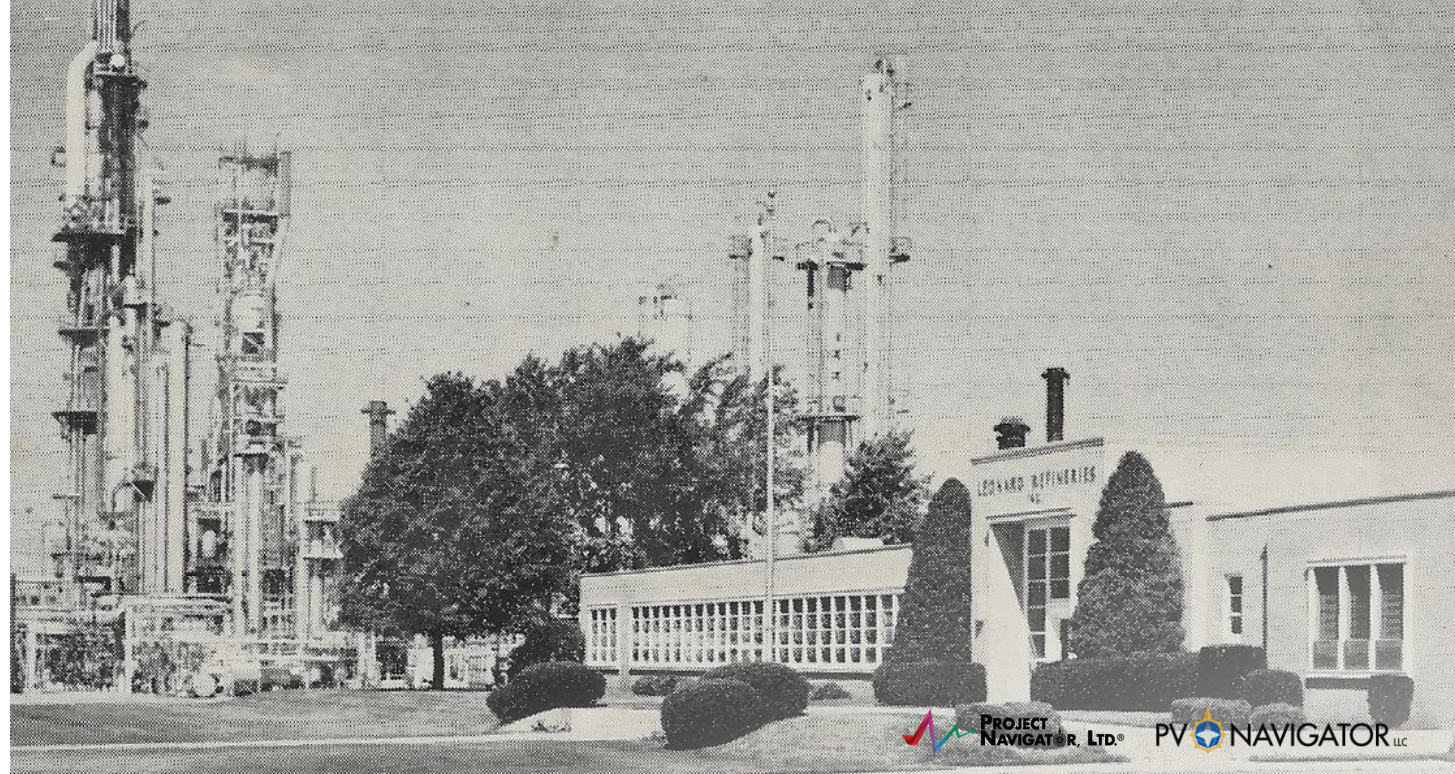
Conceptual layout for this site next.





An Example of How Solar Can Be Incorporated into a Remedy for “Forever Chemical” Impacts

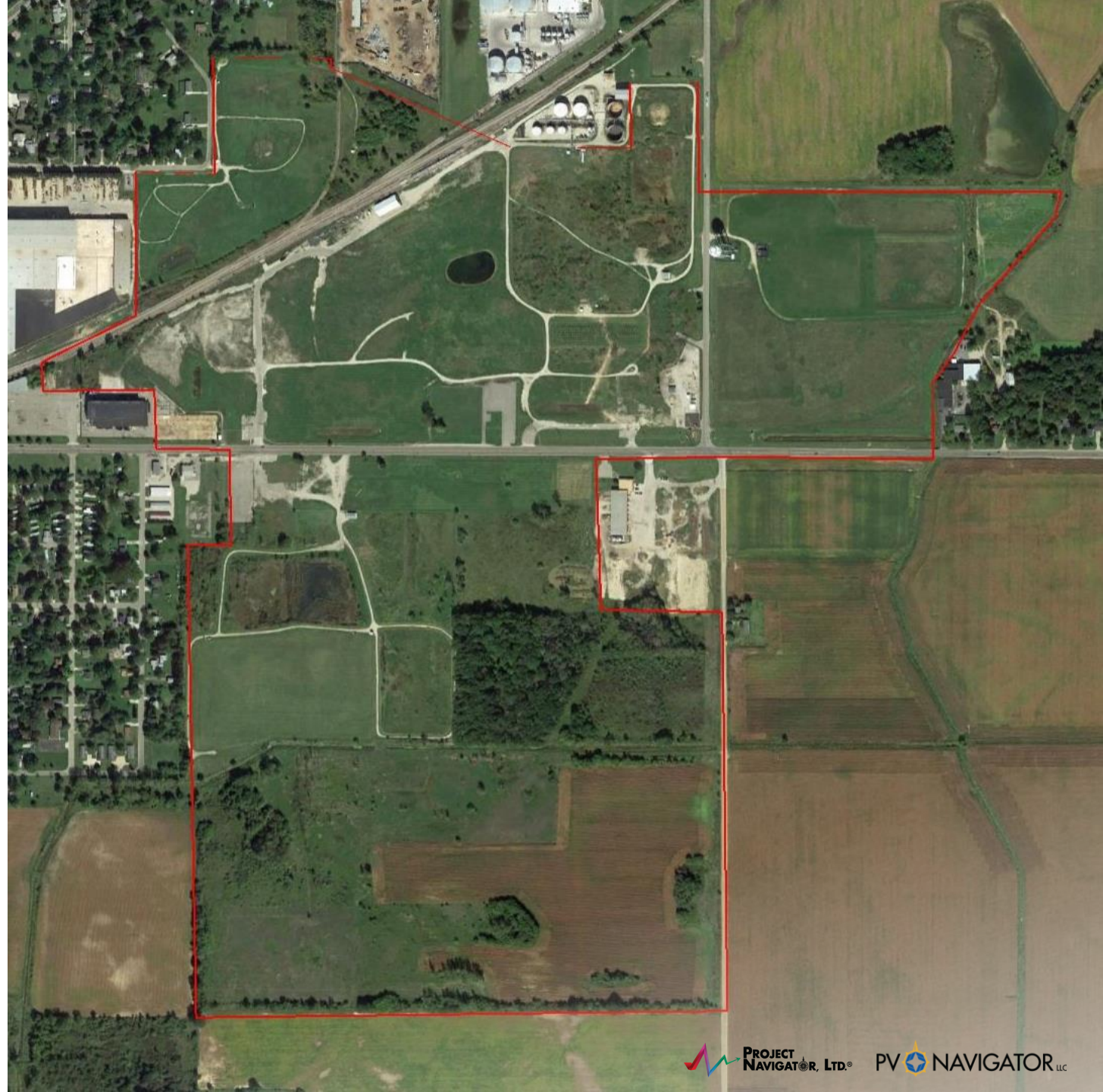
- PFOS was used in fire-fighting foam. Fluorine fire retardants contaminate soil and groundwater.
- Former refineries typically have both hydrocarbon and PFOS contamination.
- We are working with site owners to create a solar farm that diverts rainwater away from surface soils that can leach PFOS to groundwater.



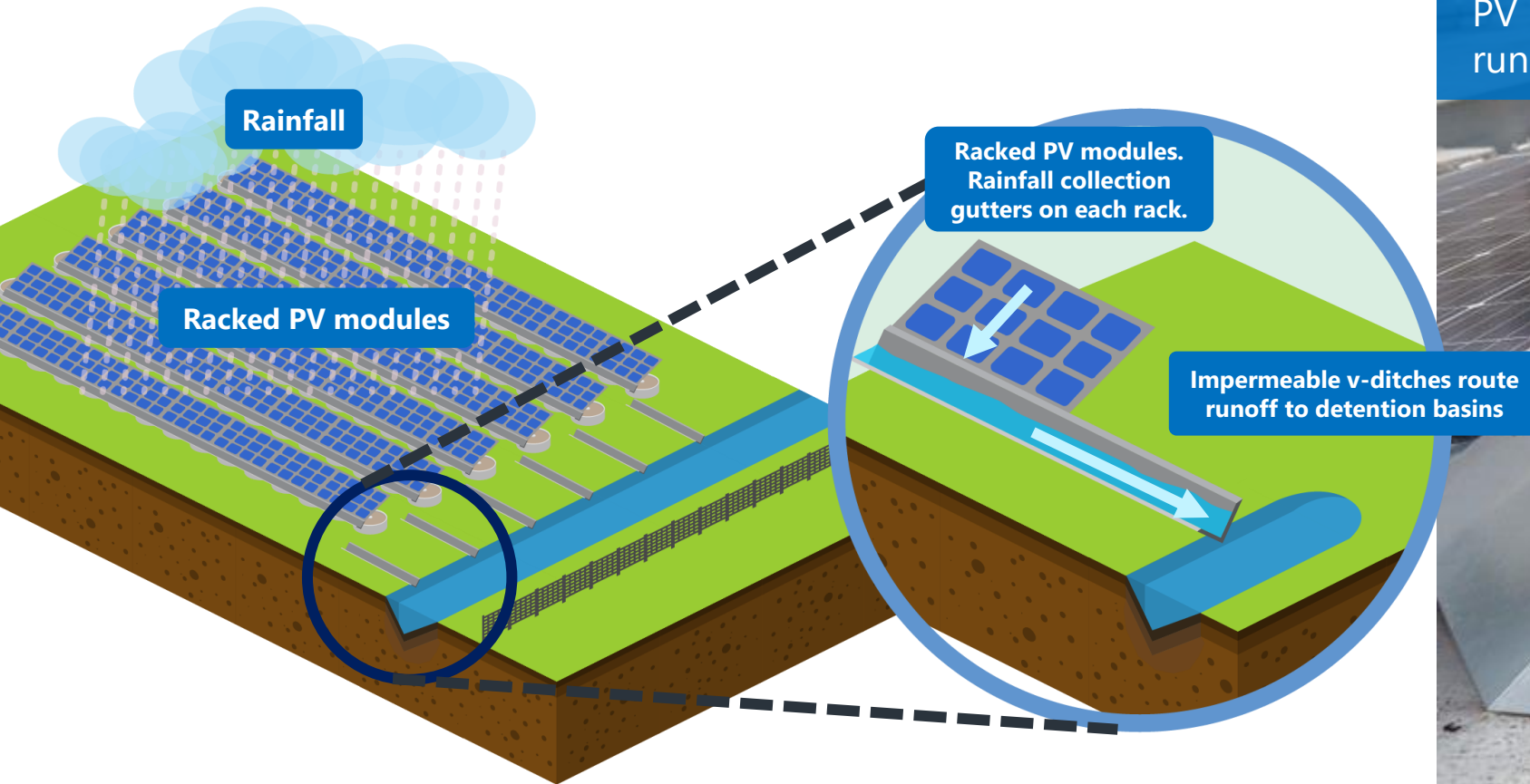
PFOS Cleanup – Complex and Costly

- Cleanup of the site would require extensive remediation of soils and groundwater to parts per trillion levels that are nearly unattainable.
- Conventional remediation options include:
 - Dig and haul
 - Thermal Heating
 - Encapsulation
- Conventional remediation would be very costly.

Now here is our solution for this site...



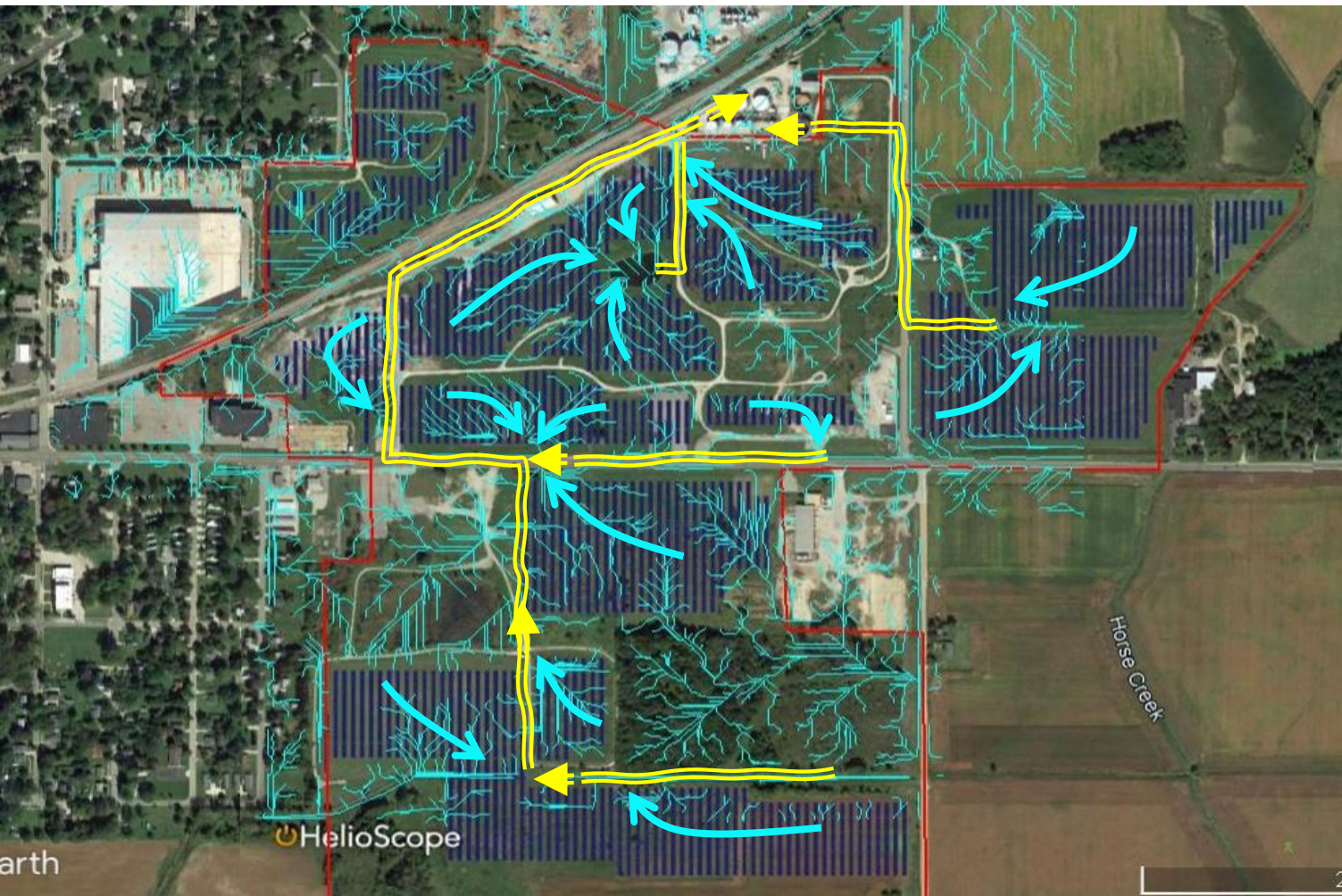
PV Installation Stormwater Conveyance Concepts to Minimize Rainfall-Top Soil Contact



PV module racking system with stormwater runoff & conveyance (Source: Rolla-Rack)



The BREG/PVN Team Conceptual PFOS Remedial Design Using Solar with Impermeable Cap for a Closed Drainage Structure



- Solar development used as a component of the final remedy.
- Solar panel configuration interconnected with other capping materials.
- Combined drainage system will be designed to eliminate contact with rain runoff > closed drainage system.

Conclusion

Innovated examples of renewable development on impacted properties...

We saw the need for solar power and opportunity to use our unique team skills to provide environmental, regulatory and financial expertise to develop solar energy on impacted sites.

There are thousands of brownfield sites that could potentially be developed, and ***we are excited about the opportunity to display our services and visions to this conference.***

GO COUGARS!!

From Worthless To Worthwhile

PNL's PVNavigator + BREG, USA Assists Site Owners with:

**PV Siting and
MW-Capacity
Computations**

**Site's
Capability to
Host PV**
*(Geotechnical &
Interconnect)*

**Oversight &
Representation
of Landowner's
Interests**
(vs PV Developers)

**Risk I/D &
Management**
*(i.e. Assured
Environmental
Compliance for
Site Owner)*

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