Attachment A.2

Air Dispersion of Methane Seeps – Fugitive Emission Evaluation

Geosyntec consultants

April 20, 2023

Evaluation Criteria

Geosyntec consultants

- **EPA Approved Model**

AERSCREEN used with both area and volume source characteristics

- **Terrain assumptions**

Forest and Grassland evaluated due to various terrain considerations

- **Basis of Data**

COGCC Seep Concentration studies from 2001, 2007 and 2015

Seeps measured via vehicle survey. Mass rates back-calculated at arbitrary distances of 25m, 50m, 75m, and 100m from the vehicle. Distance was capped at 100m for mass rate analysis, however a larger distance would result in higher mass rate values. The likelihood of distances greater than 100m is high.

Study Area

Geosyntec consultants

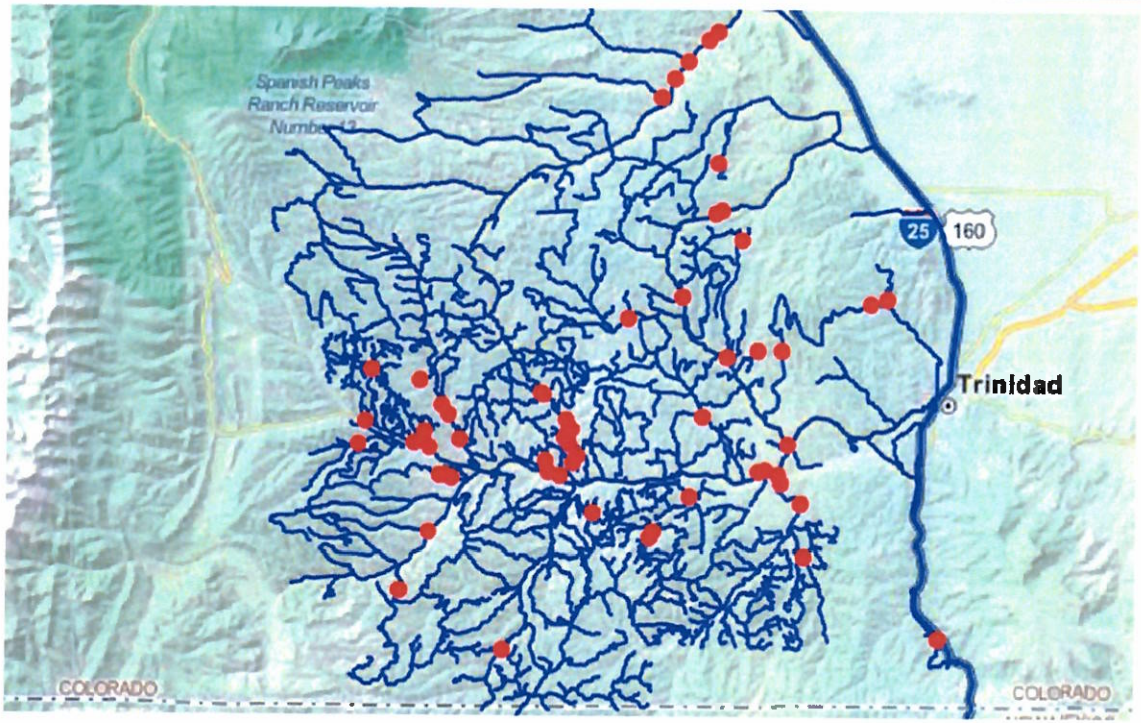
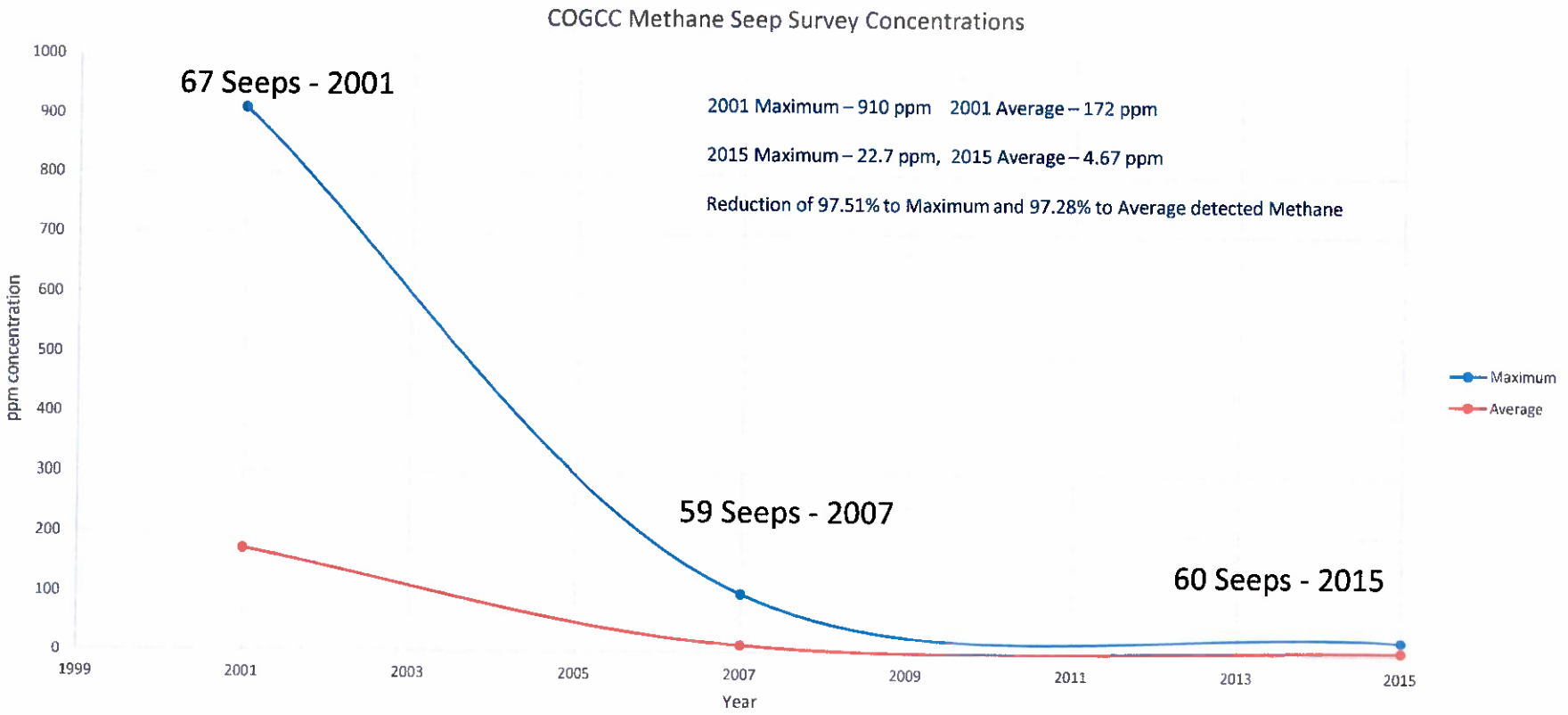


Figure 2. Map showing seeps detected during the 2015 survey (red boxes) and vehicle track (blue line).

2001 – 2015 COGCC Methane Seep Survey Trends

Geosyntec consultants



AERSCREEN Modeling Results

Geosyntec consultants

AERSCREEN-Predicted Basin-Wide Methane Seep Emissions By Downwind Distance and Land Use (US tons per year)

Source Type	25 m 2001	25 m 2007	25 m 2015	50 m 2001	50 m 2007	50 m 2015	75 m 2001	75 m 2007	75 m 2015	100m 2001	100m 2007	100m 2015
Volume Source - Forest	37,275	2,647	906	113,148	8,035	2,751	223,333	15,859	5,430	363,123	25,786	8,829
Area Source - Forest	2,521	179	61	6,637	471	161	11,842	841	288	17,843	1,267	434
Volume Source - Grassland	2,769	197	67	4,645	330	113	6,629	471	161	8,770	623	213
Area Source - Grassland	1,215	86	30	1,850	131	45	2,889	205	70	4,120	293	100

	2001	2007	2015
Survey Average Seep (ppm)	172	13.87	4.67
Total Number of Seeps	67	59	60

Notes:

1) All data in this table represent calculated emission rates based upon monitored concentrations with samples assumed to be monitored at 1m elevation.
2) The volume and area sources are the two source types in AERSCREEN that most accurately represent the physical nature of a methane seep.
3) The AERSCREEN model is a conservative 2-dimensional air dispersion model.
4) For a given source, the surface roughness estimated by the grassland (0.005 m) and the Coniferous Forest (1.3 m) provide a "bounding" of AERSCREEN-predicted downwind concentrations.
5) AERSCREEN Model Version 16216

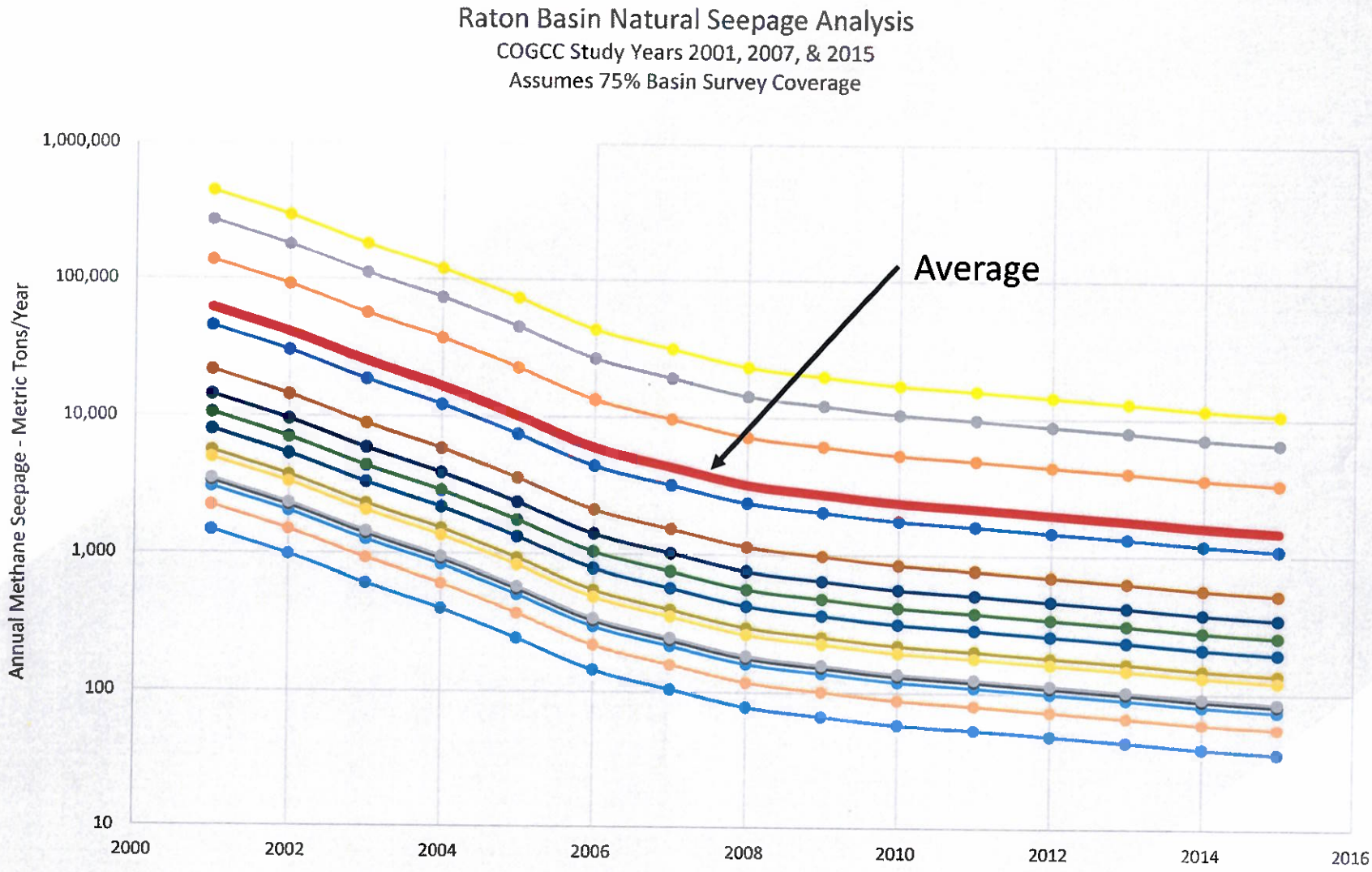
Attachment A.1

Raton Basin Seepage Analysis

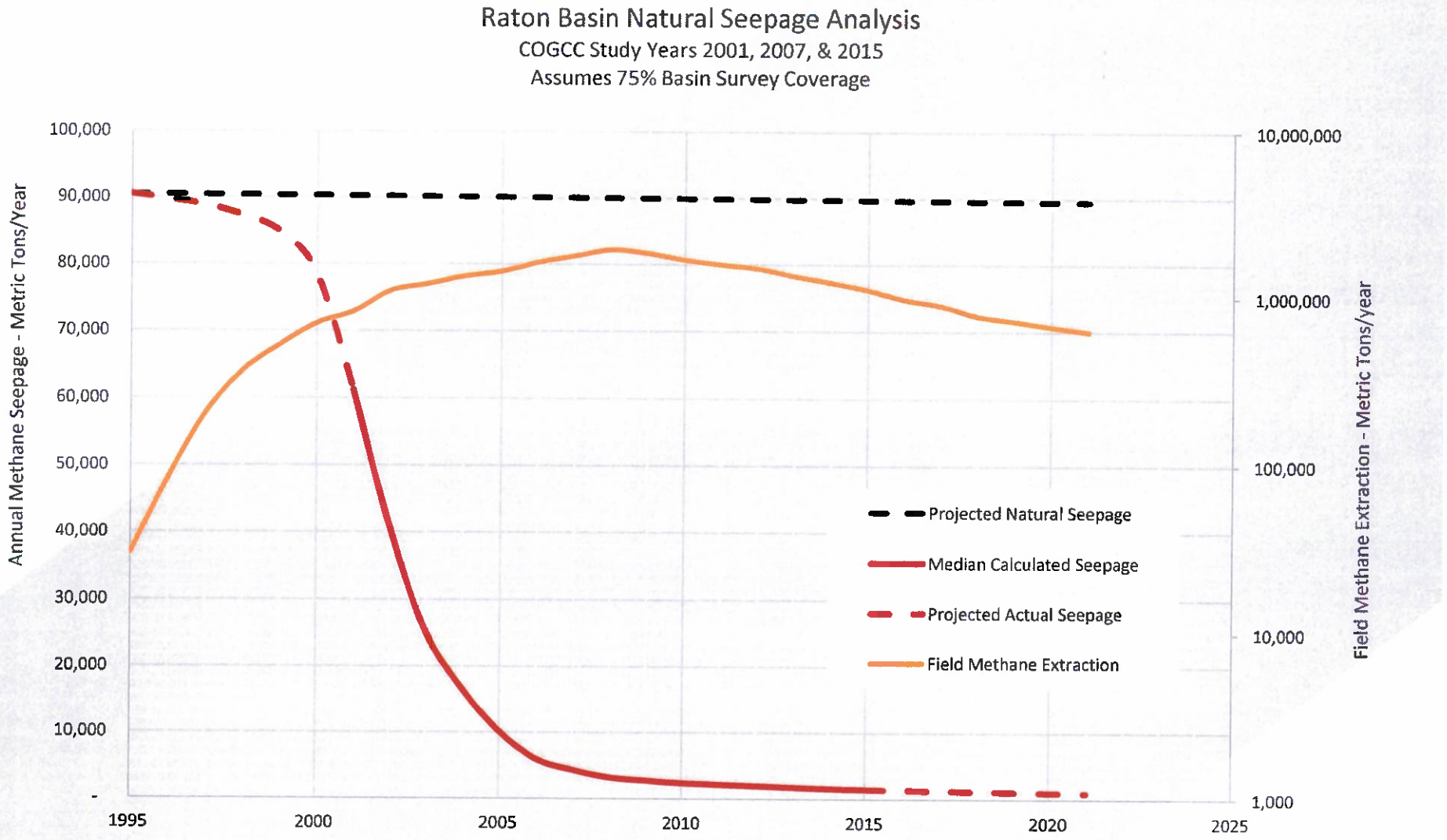
Evergreen Natural Resources LLC

Senate Bill 23-186 Testimony
April 20, 2023

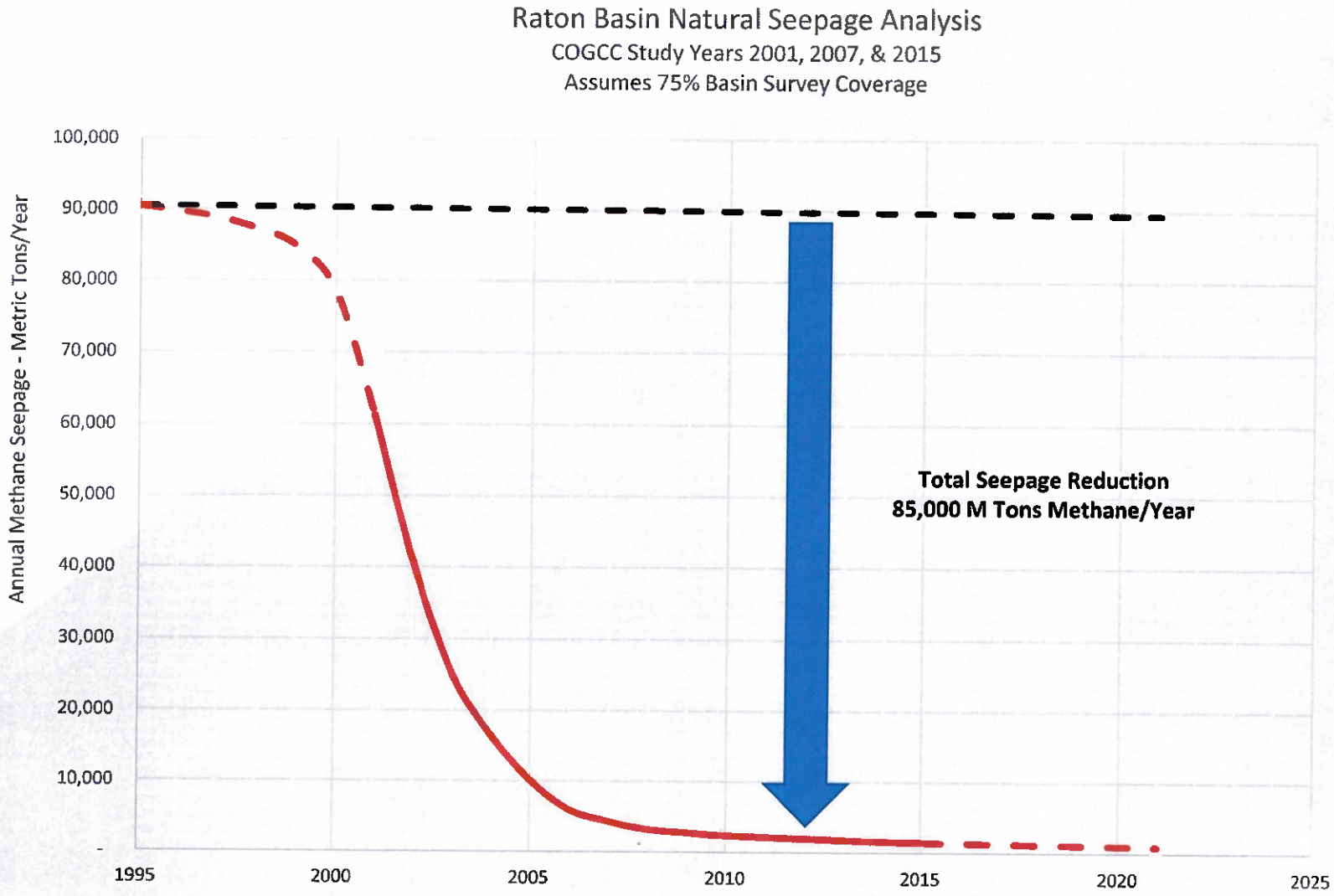
Geosyntec AERSCREEN Matrix Results on Semi-Log Plot to Better Illustrate Data Range



Methane Extraction Reduces Natural Methane Seepage



Methane Extraction Reduces Natural Methane Seepage



Methane Extraction Has
Reduced Natural Methane
the Atmosphere by Employing
sonable Cost Best Practices

by Independent Studies done by
Geosyntec

COGCC Study to Confirm Results

rmation, Raton Basin Coal Bed
as Should have Separate
n that Fits within Framework of
19-181 and 21-264.